VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES

HEARING

BEFORE THE

SUBCOMMITTEE ON
OVERSIGHT AND INVESTIGATIONS

OF THE

COMMITTEE ON VETERANS' AFFAIRS
HOUSE OF REPRESENTATIVES

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SECOND SESSION

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VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES

WEDNESDAY, JULY 20, 1994

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS,
COMMITTEE ON VETERANS' AFFAIRS,
Washington, DC.

The subcommittee met, pursuant to call, at 8:30 a.m., in room 334, Cannon House Office Building, Hon. Lane Evans [chairman of the subcommittee] presiding.

Present: Representatives Montgomery, Evans, Gutierrez, Kreidler, Long, Brown, Ridge.

OPENING STATEMENT OF CHAIRMAN EVANS

Mr. EVANS. The hearing will come to order.

The chair welcomes everyone in attendance this morning, and particularly the many witnesses who will be participating in today's hearing.

This morning, the subcommittee will examine the subject of telemedicine and VA health care. The word "telemedicine" conjures up many images.

For some, telemedicine is futuristic, super high tech and far from ordinary. It is virtual reality, bandwidths, supercomputers and incredible quantities of information being communicated at incredible speeds flawlessly. Its potential appears to be limited only by our imagination and our ability to solve problems.

For others, telemedicine is a reality already. It is a veteran at home using her phone to schedule an outpatient appointment or to ask a VA triage nurse a question. It is a bedside phone making it easier for a veteran, hospitalized hundreds of miles from home, to communicate with his loved ones and friends. For another veteran, it may be using the phone to monitor a heart pacemaker. These and many other applications are a routine and ordinary part of daily life.

Telemedicine is not new to the VA. The Department of Veterans Affairs has long used both information and communication technologies to deliver and improve veterans health care. Other public and private sector organizations also have a substantial history with telemedicine.

While not new, telemedicine is certainly enjoying a rebirth of interest today. Without question, two initiatives of the new Administration have contributed to this rebirth. Separately and together, national health care reform and the National Information Infrastructure, or superhighway, have spotlighted the role and importance of telemedicine.

Many distinguished witnesses are scheduled to present testimony this morning, and without objection, the prepared statement submitted by each will be included in its entirety in the printed hearing record.

These individuals can address in the most technical of terms the present and future promise of telemedicine, but we encourage them to share with us their insights and aspirations in terms which will help us all understand this subject.

Following the first presentation and demonstration this morning by representatives of the VA, witnesses are again requested to limit their oral testimony to 5 minutes.

Among issues of interest to the subcommittee are:

How are communication and information technologies being used to deliver and improve VA health care today?

What are the barriers to increased use of telemedicine and how can these barriers be best overcome?

What are the benefits and costs of telemedicine?

And how can communication and information technologies enhance VA health care in the future?

We look forward to examining these issues and other topics of interest to the subcommittee.

The chair is now pleased to recognize the chairman of the full committee for any remarks he would like to make.

Mr. MONTGOMERY. Thank you, Mr. Chairman.

I appreciate you calling this hearing this morning. It is very important to all veterans.

I wish the word could get out more on what VA is doing in health care and medicine as this hearing will show today.

Thank you for giving me this opportunity.

Mr. EVANS. Thank you, Mr. Chairman.

Our first witness this morning is Dr. Robert Kolodner, Director, Medical Information Resources Management Office, Veterans Health Administration, Department of Veterans Affairs.

The chair understands this is your first appearance before the committee. We welcome and appreciate your participation today. We also hope this experience will be satisfying and enjoyable for you and your colleagues.

Before presenting your statement, please introduce those who are accompanying you today and who will be participating in the Department's demonstrations this morning.

STATEMENT OF DR. ROBERT M. KOLODNER, DIRECTOR, MEDICAL INFORMATION RESOURCES MANAGEMENT OFFICE, VETERANS HEALTH ADMINISTRATION, DEPARTMENT OF VETERANS AFFAIRS ACCOMPANIED BY DR. RUTH DAYHOFF, DIRECTOR, DHCP INTEGRATED IMAGING PROJECT; DANIEL L. MALONEY, DIRECTOR, WASHINGTON INFORMATION SYSTEMS CENTER; DR. ROSS FLETCHER, CHIEF OF CARDIOLOGY, WASHINGTON (DC) MEDICAL CENTER; MR. JOSEPH DE FRANCIS; AND DR. FRANCIS GOLDSTEIN, ASSOCIATE CHIEF OF STAFF FOR AMBULATORY CARE, DORN VA MEDICAL CENTER, COLUMBIA, SC

Dr. KOLODNER. Mr. Chairman, Mr. Montgomery, and members of the committee, with me today at the table, starting at my far right, are Dr. Ruth Dayhoff of the Washington VA Information Systems Center, and Dan Maloney, Director of the Washington Information Systems Center.

On my left are Dr. Ross Fletcher, Chief of Cardiology at Washington VA Medical Center, and one of Dr. Fletcher's patients, Mr. Joseph De Francis.

And joining us via video teleconference is Dr. Francis Goldstein, Associate Chief of Staff for Ambulatory Care at the Dorn VA Medical Center in Columbia, SC.

Thank you for the opportunity to testify today and demonstrate how VA is using telemedicine to care for our veteran patients. VA makes extensive use of telecommunications in the practice of medicine. A patient away from his home can now be SURE that his or her doctor has access to the information necessary to provide quality care.

A patient with a complex case can obtain the services of the best specialists in the field, even if that patient lives in a rural area. Today, the focus of health care delivery is changing from the individual care providers to integrated health care delivery networks. Telemedicine is the key to making this transition.

Telemedicine techniques can even allow us to extend health care benefits into a patient's home, something VA has been doing with cardiac pacemaker monitoring for over 12 years. Introduced in 1982, the Cardiac Pacemaker Surveillance System was one of the first uses of telemedicine in the VA. This system has provided a valuable service to our veteran patients, allowing them to call a Surveillance Center from their home telephone and transmit their pacemaker tracings for analysis.

Telemedicine is about patient care. Over the years the Pacemaker Surveillance System has made a real difference in the lives of our veterans. For example, one of our patients was ready to go on vacation. Her husband and son were in the car and ready to go on a wilderness camping trip. She called us for her routine check, and we determined that her pacemaker was not functioning correctly and needed immediate emergency replacement. If this dysfunction had not been found, the patient could have died in the wilderness.

Telemedicine also permits us to perform remote interventions which result in life-saving emergency treatment. Another patient had a pacemaker implemented at the Bay Pines VA Medical Center. The patient went on to vacation in Jackson Hole, WY.

When the patient started feeling dizzy, he called in to the Pacemaker Surveillance Center. When the doctor at the Surveillance Center saw the tracings, he knew that the pacemaker was malfunctioning.

The doctor asked the patient, "Do you have a pacemaker magnet with you?" The patient said yes, and the doctor told him to place the magnet on the pacemaker, tape it, and go to the local hospital in Jackson Hole.

The Surveillance Center then contacted the hospital to let staff know that the patient was on the way. The physician at the local hospital immediately operated on the patient and replaced both the pacemaker leads and the generator. The patient went back home to Bay Pines VA Medical Center for long-term follow up. Later, we will demonstrate how this surveillance process actually works.

Today, VA Medical Centers use a broad range of telemedicine techniques, showing tremendous innovation in the field. VA Medical Centers have found many uses for "low tech" telemedicine applications such as patients using the telephone to contact staff, or voice response systems. The relatively low cost and the enthusiastic acceptance by patients and staff have led many sites to use these technologies.

The most frequent use of telemedicine in VA is higher technology applications, such as the transmission of x ray images and ECG readings for diagnostic interpretation by staff located at another VA facility.

In addition, new and innovative techniques are being piloted and researched to determine how they can best be used in VA. Among these innovative techniques are networked medical imaging and video teleconferencing, both of which we will show you today.

Telemedicine provides many benefits to VA patients. The clinical information available at the time of treatment is greatly increased. This expansion of the provider's information base reduces the number of repeat studies required for referral patients, greatly adding to the comfort of the patient, reducing cost, and improving timeliness.

As a practicing VA physician, I greatly appreciate the marked improvements to the quality and availability of information on the wards and in the outpatient clinics.

Telemedicine offers great promise of benefits in the area of patient and provider education as well as clinical consultation. It allows us to better serve our veterans in rural areas.

VA is sponsoring initiatives that encourage sharing resources to meet the needs of health care professionals located in isolated rural communities. These resources include information, education and the services of specialized health professionals.

Telemedicine brings the remote provider in closer touch with the broader medical community. Thus, VA has been using telemedicine for staff education. Downlink satellite dishes have been installed for over 5 years at 205 VA facilities, covering all of the VA Medical Centers and many of the outpatient clinics. These serve as distribution points for educational video programs and time-critical administrative communications and may have other telemedicine uses in the future.

Mr. Chairman, telemedicine will also greatly enhance our ability to exchange data with networks of health care providers under the health care reform model. The VA Medical Center, the community-based clinic, the affiliated medical school, the specialist with the needed expertise for the task at hand, the medical record, and most important, the patient—all can be brought together at the point of need.

VA has an advantage in implementing telemedicine technologies because it is the largest health care network in the country with over 10 years of experience in exchanging data among hundreds of medical facilities and central data repositories.

The foundation of VA's communication is the electronic mail system at every VA Medical Center. VA-wide, these electronic mail systems have over 100,000 users.

The VA has also established a standards-based electronic communication network that connects all VA medical and benefit facilities. Secretary Brown uses this network to send a daily message to employees at these VA facilities. Traffic on this network is approximately 75 billion characters per month. That is nearly 150 million pages of text.

Through this network, VA has established a connection with Internet for mail and will soon be able to transfer files as well. This feature enables clinicians and researchers to confer electronically with colleagues in Federal agencies, medical facilities, and academic settings across the Nation and around the world.

In addition, the VA has an electronic teleconferencing resource with 36,000 active users and 16,000 sign-ons per day, and we have just this past week established an Internet mosaic server to distribute information about the VA to the public.

Recently, we saw just how much the quality of patient care can be affected by our ability to transfer data between medical facilities. A water main broke at the Syracuse, NY VA Medical Center and compromised their water supply. The medical center was required to transfer all of their inpatients to other hospitals.

The VA's patient data exchange software was used to transfer administrative and clinical data in the Syracuse DHCP system to the receiving VA Medical Centers. On the paper orders that accompanied some of the patients, two patients were identified as having an antibiotic-resistant bacterial infection that required them to be placed in isolation.

When the receiving staff reviewed the electronic records of the patients transferred, they were able to identify four additional patients who were infected with the same antibiotic-resistant bacteria. Without this information obtained from these electronic medical records, cross-contamination could have occurred, with the infection being spread to other patients.

In addition to a comprehensive communications network, VA has extensive experience in the transfer of administrative data. For example, procurement can be accomplished electronically by VA users from order, through delivery, to receipt and vendor payment.

For years, VA Medical Centers and regional offices have routinely shared data on veteran eligibility for care and incidents of hospitalization that affect compensation and pension payments through such software as the Hospital Inquiry, Patient Data Exchange and the Automated Medical Information Exchange, or AMIE, capabilities.

The general pattern we have seen in VA telemedicine networking is for two VA facilities to establish an initial telemedicine link. After that link stabilizes, the network begins to extend outward, adding other VA facilities, satellite care facilities or medical care affiliates.

VA has an installed base of computer hardware and software in a wide variety of clinical settings, large and small primary and tertiary care hospitals located in urban and rural settings. The VA developed its public domain Decentralized Hospital Computer Program, or DHCP, which is in operation at all 171 VA Medical Centers.

Currently, there are over 60 DHCP administrative and clinical applications available, including admissions, scheduling, procurement, electronic mail, health summary, order entry, laboratory, pharmacy, radiology, mental health, medicine, surgery, and nursing.

VA is planning for the cooperative use of telemedicine with other Federal agencies, including the Department of Defense and the Indian Health Service. VA is working with DOD to create the same standards-based connection between our two health care information systems and commercial, off-the-shelf technologies.

We are developing plans to provide a link between VA Medical Center, American Lake, WA, and the DOD Medical Digital Imaging System at Madigan Army Medical Center. This same initiative has already been used to link the DOD's Composite Health Care System to their medical imaging system, and DOD has arranged with the VA to supply a copy of the VA link at all of the DOD sites using the Medical Digital Imaging System.

VA and the State of Washington are planning for the five Washington State VA Medical Centers to band together to form their own health plan network. Sites will be able to freely exchange patient information. Private providers will be able to access this data through dial-in capabilities and to receive health summaries, scheduling and other clinical data for the patients that we are contracting with them for.

VA has many opportunities for expanding sharing of telemedicine initiatives with Federal and non-Federal partners. There are many other telemedical applications where centralized reading and interpretation of clinical results could benefit remote clinics or medical center consortia that are being formed to meet the medical needs of today.

VA's transmission of prescriptions to a centralized location for remote processing, called Consolidated Mail-out Pharmacy, will result in economies of scale and streamlined service to the patient.

Mr. Chairman, this concludes my formal statement. Attached to my statement is a fact sheet about telemedicine applications we are currently using. A live demonstration will also give you a better understanding of how various telemedicine technologies are used together in the care of VA patients.

We will be happy to answer any questions you may have during or after the demonstrations.

At this point, I would like to thank the many support staff who have labored long and hard to provide the equipment you see here today for these demonstrations. The support of the Committee is gratefully acknowledged.

This morning, we will be demonstrating four different telemedicine technologies VA is using today. We are going to start off with a demonstration of video teleconferencing using a new system provided by AT&T. Following that we will demonstrate an innovative medical imaging system developed by VA professionals. This system is currently being used by a number of VA Medical Centers nationwide.

The next two demonstrations are telemedicine technologies being used by veterans across the country from their homes. These are a voice response system that allows veterans to check on appointments and prescription information and the Cardiac Pacemaker Surveillance System which I referred to earlier.

For our first demonstration, which involves video teleconferencing, I am pleased to introduce Dr. Francis Goldstein, who is on the screen on the left. He is the Associate Chief of Staff for Ambulatory Care at the Dorn VA Medical Center in Columbia, SC.

Dr. Goldstein happens to be in Washington this week and he joins us from the Information Systems Center in Silver Spring, MD.

Over the last year Columbia has developed a number of video teleconferencing links with its satellite outpatient clinic 100 miles away in Greenville, SC.

Dr. Goldstein, would you tell us how your hospital and clinic make use of video teleconferencing?

Dr. GOLDSTEIN. Thank you, Dr. Kolodner. Actually, there are two principal video links between the VA Hospital in Columbia and the outpatient clinic in Greenville. First, is video teleconferencing which is used for administrative and clinical purposes, and second is teleradiology.

Before video teleconferencing, a committee meeting meant 4 hours of downtime for staff members who are on the road. With video teleconferencing, which is essentially the technology that we are using right now for this link-up, we can hold discussions on any subject of mutual interest; for example, new accreditation standards, safety practices, et cetera. We have essentially solved our communication problem.

Clinically, we are experimenting with video teleconferencing technology to transmit high resolution patient images between Greenville and Columbia. We can obtain views of internal as well as external parts of the body even as small as an ear drum. We think that this can often eliminate the need for a Greenville patient to travel all the way to the hospital to be treated by specialists such as ear surgeons or dermatologists, plastic surgeons, et cetera. This is particularly significant, of course, when patients are debilitated or otherwise unable to travel long distances.

Dr. KOLODNER. You also mentioned teleradiology.

Dr. GOLDSTEIN. Right. The Greenville clinic has a radiology suite. After an x ray is taken, a technician scans the image into a computer which transmits it directly to another computer in the Columbia radiology reading room. The film can be read immediately and the results communicated back to Greenville. This greatly shortens the patient waiting time and saves having to hire dedicated radiologists at the clinic.

The quality of the images is excellent, and with the ability to manipulate the images many radiologists actually prefer this method to the old-fashioned films on a viewbox.

Dr. KOLODNER. How do you think patients will feel about being examined by a doctor who is not in the same room?

Dr. GOLDSTEIN. Well, patient satisfaction, of course, needs careful attention. It is difficult to be someone's primary care physician and establish a therapeutic relationship without personal contact. This doesn't mean that every encounter between a patient and a doctor requires a tactile evaluation. I will give you an example.

Our surgeons are excited about using video teleconferencing to follow up on patients who are hospitalized with diabetic foot ulcers. A trained nurse practitioner can perform the general evaluation and then guide the camera to show the area of interest to the surgeon. If the specialist, nurse or veteran is not satisfied, the patient can still be transported to Columbia for a direct visual examination.

Dr. KOLODNER. What effects do you think teleconferencing will have on the care we deliver to our veteran patients?

Dr. GOLDSTEIN. In many cases, teleconferencing can extend the eyes of the physician. With our current technology, patients from rural and underserved areas can have direct access to the most skilled and expert doctors in the system.

Dr. KOLODNER. Thank you, Dr. Goldstein, for being with us today. Please stay on the line to answer questions after we complete all the demonstrations.

As you can see, video teleconferencing is live video transmission between two sites. In fact, we can teleconference with more than two sites connected. It is one attractive solution in the spectrum of telemedicine solutions.

As the cost of telecommunications continues to decrease, we anticipate that video teleconferencing will be used by more and more sites.

Now, I would like to introduce Dan Maloney, Director of the Washington Information Systems Center, who will tell us about the VA's innovative development in the field of medical imaging.

Mr. MALONEY. Thank you, Rob.

The VA's medical information system is known as DHCP—the Decentralized Hospital Computer Program. VA has several state-of-the-art automation pilots underway. The DHCP Integrated Medical Imaging Program is one such pilot that has received recognition for outstanding achievement.

This system easily locates and displays all types of true color and black and white medical images in the hospital medical database. These images then become a permanent part of the patient record and they can be viewed simultaneously by multiple people on work stations throughout the medical center.

We will now briefly show you the DHCP Integrated Medical Imaging Program that is unique in the world. This is not another stand-alone imaging system. It is much more than that since it is built upon the integrated medical information system of the VA that contains a wide range of patient medical information and administrative data.

This imaging system has been operational at the two VA Medical Centers in Washington, DC, and Baltimore, MD. Ten other sites are currently installing the system.

These systems handle a wide variety of medical images such as those shown on the right monitor, the medical imaging display. The user can view these images in full resolution, for example, dermatology image showing psoriasis; the dental image; the hematology slide showing red blood cells containing malaria; standard chest x ray which shows the ability to change level and to focus on a particular area of interest. This allows the clinician to find details which may not be detected with normal films; and many other types of images.

It is my pleasure now to introduce the Project Director of the DHCP Integrated Medical Imaging Program who makes all of this possible, Dr. Ruth Dayhoff.

Dr. DAYHOFF. The VA's electronic mail system allows clinicians to send a summary of a patient's medical record, including their medical images, to a clinician at another medical center for consultation. Using electronic mail to exchange medical information for a consultation allows the remote clinician to accept the request for processing even if he is involved in another case at the time, just as voice mail allows staff to exchange messages when they are otherwise occupied. Let us demonstrate how images would be sent to another medical facility.

An electronic mail message would be created at an imaging work station, as you see here on the lefthand monitor. A short referral note such as this would be sent to the consulting physician with the appropriate images attached. This message says that the demonstration patient was originally seen at one medical center for shortness of breath. He was found to have an irregular heartbeat, most likely requiring a pacemaker.

What we will show now is adding another image to this message. We are going to select an x ray image. This image you can see on the righthand monitor will be added to the mail message.

The message with these images is then sent to Dr. Fletcher, Chief of Cardiology and Director of the Pacemaker Center at the Washington, DC VA Medical Center. Dr. Fletcher would have the message within a few minutes. He would then advise treatment for the patient which might include referral to the Washington, DC VA Medical Center.

Studies would be performed to determine the cause of the patient's arrhythmia, and in this case a pacemaker would be implanted.

These images created during the consultation and the patient's health summary report would then be sent back to the referring site in another mail message so that appropriate follow-up care could be given.

As we see here, the health summary is a report that summarizes multiple aspects of the patient's medical condition. The health summary shown includes information such as demographics, disabilities, pharmacy prescription profile, procedures, surgery reports, outpatient clinic visits, hematology reports, electrocardiogram analysis reports, radiology reports, laboratory orders, crisis notes, clinical warning, and a summary of the patient's allergies.

Health summary information such as this is currently exchanged electronically between VA Medical Centers.

As additional imaging sites become operational, the images can also be exchanged, as we have seen here.

The VA system is unique. It integrates medical text and images with the patient's medical record across sites. There is no other system with these features in the world.

Dr. KOLODNER. Thank you, Mr. Maloney and Dr. Dayhoff.

For the last two demonstrations, we would like to show systems being used by veterans from their homes. The first system has been acquired during the past year at over 20 VA Medical Centers and allows veterans in their homes to check their scheduled appointments and the status of their prescriptions from the VA pharmacy. The system is purchased from a commercial vendor and connects with a DHCP system.

Now, I am going to dial up a system at the VA Medical Center in Wilkes-Barre, PA, and show you how this works.

Wilkes-Barre VAMC: Hello! Welcome to the Wilkes-Barre VA Automated Information System. Please enter your Social Security number. When you are done, press the pound sign.

Dr. KOLODNER. I will now enter the patient's Social Security number.

Wilkes-Barre VAMC: Social Security number 0098765432 is not on file. Please enter your Social Security number. When you are done, press the pound sign.

Dr. KOLODNER. What happened is I made a mistake, so it gives me another chance.

Wilkes-Barre VAMC: For appointment information press 1. For pharmacy prescriptions press 2. To enter another Social Security number press star.

Dr. KOLODNER. Now, I will press 1 to select the option to check the status of my appointment.

Wilkes-Barre VAMC: The following are your appointments for the next 14 days. You have one appointment on Wednesday July 27 at 3 p.m..

For appointment information press 1. For pharmacy prescriptions press 2. To enter another Social Security number press star.

Dr. KOLODNER. I am now going to press 2 to select the pharmacy options.

Wilkes-Barre VAMC: To refill a prescription press 1. To check on a prescription press 2. To talk with pharmacy press 8.

Dr. KOLODNER. And I am going to press 1 to refill a prescription.

Wilkes-Barre VAMC: Enter the prescription number that you want refilled followed by the pound sign. This prescription is refillable. It will be filled and placed in the mail within 48 hours.

To refill a prescription press 1. To check on a prescription press 2. To talk with pharmacy press 8.

Dr. KOLODNER. And now the system won't be insulted when I hang up.

The prescription is now renewed and will be mailed to me at my current address kept on file in the DHCP system. This example shows how a simple phone call can result in a veteran obtaining needed information quickly and easily.

An important aspect to keep in mind here is that the system maintains privacy and confidentiality by not revealing unnecessary information to the caller.

You will notice that the patient's name and the name of the clinic where the patient had an appointment were not revealed during the call.

The system is available 24 hours a day, 7 days a week. It is very simple to use if the caller has a Touch-tone phone. If the caller does not have a Touch-tone phone or wishes to speak to a medical center employee he or she may still do so. The voice response system merely provides an additional method of serving our patients.

The system can also be configured to issue reminders of appointments through a system-initiated telephone call to the patient. This feature of the system connects with the DHCP scheduling system and helps patients receive the medical care they need, reduces the rate of missed appointments, improves hospital operations and decreases cost. Presently the scheduling portion of the system is the most frequently used. The pharmacy application is quickly being implemented at many facilities.

As additional voice response methods are developed, it is anticipated that they will be connected with DHCP as well.

And now for the final technology that we would like to demonstrate today. I would like to again introduce Dr. Ross Fletcher, Chief of Cardiology and Director of the Pacemaker Center at the Washington, DC VA Medical Center. Dr. Fletcher will discuss the Pacemaker Surveillance System, which has been operational for 12 years.

Dr. Fletcher?

Dr. FLETCHER. Thank you, Rob.

As mentioned before, the VA Pacemaker Surveillance Centers call veterans in their homes and monitor both their symptoms, normal and abnormal, and their on-line electrocardiograms.

The data from each of over 600,000 phone calls made on 45,000 patients since 1982 has been entered into a database which then becomes part of an expert decision support system for each individual patient call.

What you will notice on the screen is that during each call we have important information on the patient which allows us to customize the call for that particular individual pacemaker generator and important individual characteristics of the patient such as whether the patient uses wrist electrodes or is hard of hearing.

I would like to introduce Mr. De Francis who has been our patient at the VA in Washington for quite some time. Actually, he has been a patient at the VA less long than I have been a physician there, and I met him very early in my career. Fortunately, in part due to some of our medical interventions over the years, I am still there and so is he.

Mr. De Francis, how long have you required a pacemaker?

Mr. DE FRANCIS. Well, it was in June of 1973 that the first pacemaker was implanted in me by the Veteran's Hospital. Prior to that, without the pacemaker I was very weak, tired, nauseated and could hardly walk, and had shortness of breath—without a pacemaker.

I was referred to Dr. Fletcher and his staff of cardiologists to put the first pacemaker in, and it has been a godsend. It has made me brand-new again. I have stamina. I have more stamina today than I had 21 years ago especially with the newest pacemaker.

Dr. FLETCHER. Mr. De Francis is referring to the fact that his original pacemaker would go only 70 beats a minute when he was walking or exercising. We have since converted him to a dual-chamber pacemaker which tracks his upper chamber and will go as fast as his exercise needs require.

He was telling me that he can walk quite far, and chops wood. How far can you walk, sir?

Mr. DE FRANCIS. I walk every morning at five in the morning, 7 days a week at least 5 miles plus every day. And I never felt better.

Dr. FLETCHER. How old are you now?

Mr. DE FRANCIS. I am 81.

Dr. FLETCHER. I think we all wish we could be in his health at that age.

How do you connect with us at our Pacemaker Surveillance Center? Can you show us how to do that?

Mr. DE FRANCIS. Yes. Once a month the technician—Mrs. Wright, the VA technician, calls me up and I place this on my wrist and turn this on and she monitors me, what condition my pacemaker is in.

Dr. FLETCHER. You haven't noticed, but he has wrist electrodes that we put on earlier that he puts on at home.

Mr. DE FRANCIS. Pacemaker.

Dr. FLETCHER. And this is his actual EKG coming across the screen now. And the system that you are looking at was actually developed by the Marquette Corporation, which was kind enough to come down again today as well.

Notice that every beat of his heart is initiated by that pacemaker spike. Without the pacemaker spike, he would not have a heartbeat, since he is 100 percent paced.

Then what do you do?

Mr. DE FRANCIS. Then I put this magnet on my pacemaker.

Dr. FLETCHER. That increases the rate to a magnet rate. We use this magnet rate to determine whether the pacemaker still has good battery life.

When he removes the magnet, the rate will slow back to its normal rate. If the magnet rate becomes slow we need to change his generator. We would change it before it actually fails.

We enter the data, as you will see, rather quickly and produce a report. There is the report. Notice that on the report, the asterisks on the graph indicate the pacemaker rate is unchanged. It has not yet decreased.

This data then becomes a part of a total database from which we can produce, actuarially, curves and actually look at on line and see whether his pacemaker lead or generator is failing.

The one that you are seeing now is a lead that failed quite early and it is not the one that Mr. De Francis has, fortunately. But this was eventually recalled by the FDA. As a matter of fact, this kind of information has been asked of us by GAO. We frequently have produced independent reports for government agencies.

If we see a problem, we can always review the information in the DHCP database which is immediately available such as you see on this monitor. We can pull up his x ray and see if his lead is appropriately placed. You will see the atrial lead, actually, in the lower righthand corner and the pacemaker generator with the ventricular leads at the bottom of his heart. These sometimes are misplaced and we can see whether they were correctly placed.

We also can pull up his ECG, which would be a 12-lead taken in the clinic, and compare it to the tracing that we are now getting over the telephone.

It is extremely valuable to have this imaging system available with the regular system. This is his 12 lead tracing and then his rhythm strip.

During each call we are entering this data and providing information to help patients like Mr. De Francis. The veteran patient is our primary concern. We are able to deliver care much faster and much quicker than we otherwise could and follow a large number of patients with a fairly small number of personnel used to run the center.

Mr. De Francis is our major concern. I want to thank him very much for coming in this morning and helping us out.

Mr. DE FRANCIS. Thank you very much, Dr. Fletcher.

[Applause].

Dr. KOLODNER. Thank you, Dr. Fletcher.

This concludes our demonstration and we would now be happy to answer any questions you may have.

[The prepared statement of Dr. Kolodner appears at p. 66.]

Mr. EVANS. Doctor, thank you, and Mr. De Francis, we want to thank you very much as well for making this very real to us. Because we are not experts, we appreciate you making it very vibrant and real for us.

Mr. DE FRANCIS. Thank you very much.

Mr. EVANS. You are welcome.

I do want to recognize Congressman Mike Kreidler for any remarks he might want to make at this time.

Mr. KREIDLER. Thank you, Mr. Chairman. I will submit for the record.

Mr. EVANS. Doctor, can you describe to us the VA's telemedicine policymaking and application decisionmaking process and what VA's priorities for telemedicine will be in the near future, and what budgetary resources you have available for effecting those priorities?

Dr. KOLODNER. Yes, sir. The policy that we have for telemedicine is one that at this point has to remain quite flexible because it has to be able to be responsive to health care reform whatever shape that might actually take in upcoming legislation, because that will be affecting how we need to practice medicine in the future.

Although there are certainly some elements that are becoming clear, such as a move from inpatient to outpatient to ambulatory care, primary care, and bringing the care out close to the veteran instead of having the veteran have to come to a limited number of medical centers. That will require that we get the data out to the providers who are caring for the veterans close to their home, and that is a major change in how we deliver care and also puts a major requirement in terms of getting the information out.

First of all, paper records are notoriously slow getting out remotely and the veteran may turn up at different places and have an emergency and we need to provide them with that information. So, that is certainly one of the main guiding principles, is to be able to move the information where the veteran is. And we see that doing that and we are continuing to expand that.

The Patient Data Exchange software that I mentioned and the health summary allow us to take any of the information that is in our computer systems and move it to where the veteran is, where the provider is. We can fax it to a provider, if they happen not to have computer software but have a fax system available. We can also have direct electronic access.

We also are working very closely within the VA with all of the elements in the VA having to do with telephone systems and communications. Nada Harris in the Office of IRM and I and others in Veterans Benefits are really working very closely together to make sure that we have a comprehensive policy that allows us to move the veteran's information where it needs to be moved.

And we are also working with DOD to establish closer links and be able to move information back and forth at joint venture sites, and also between different sites, as veterans move from the military service into the VA.

As far as budget, that is something that right now we are certainly doing within the budget that we have available, and we hope that as health care reform moves forward we will be looking very carefully if there is an investment fund that is established to see if that can speed up the implementation of the telemedicine resources that would help us to be competitive in the future.

Mr. EVANS. How are innovative applications of telemedicine developed at one facility transferred to other VA facilities and throughout the VA system? And can you give us an example of this?

Dr. KOLODNER. The strength of the VA has been the "D" in its DHCP—the decentralized—in that we provide a basic framework for each of the medical centers that is common across the medical centers, and we provide coordination so that software that is developed at one center can actually be used at any other VA Medical Center or any other facility that is using the VA software by using some conventions so that the software doesn't crash into one another, the software that is developed between different systems.

Thus, facilities that have some resources that they decide to put in, to invest locally, can develop applications and move it out nationally.

One recent example of something that has really grown from the grassroots is this voice response system that I showed you. This is one that is commercially available. It is one that medical centers on their own have decided is worth their local resources. They have put it in.

They have made some minor modifications to our core software and then been able to implement it. And they have shared amongst the 20 or so facilities that have used the system these changes in the software to allow them to run the software. Considering that the software wasn't out there a year ago, the fact that there are already 20 facilities running it is just very impressive.

Let me also turn the microphone over, if I may, to Dan Maloney, who can talk about one of the other applications.

Mr. MALONEY. There is also a system recently developed at the Hines ISC called the On-line Inquiry System. It takes information from administrative reports that are sent to our national databases and makes the information available on-line. Inquiries can be sent electronically to find out where the veteran has been seen in the last year and a half. This system has been distributed and is running at over 50 sites now.

Mr. EVANS. Dr. Dayhoff, I understand when I was up at the VA Medical Center here in the District that at that time that hospital was one of the few that had bedside patient kind of computers. Is that correct? Do you know?

Dr. DAYHOFF. I think maybe Ross is appropriate to answer that.

Mr. EVANS. The question I am leading at is when we say things can be transmitted, records can be transmitted, how many of the medical centers now have the capability of actually making what is transmitted part of the permanent records of a veteran at that particular hospital?

Dr. DAYHOFF. All of the hospitals.

Dr. KOLODNER. What is transmitted right now is a report, and the reports can be printed and can be included in the medical record as a report, just like we would from any other facility, whether it be VA or non-VA.

In the future we have the strategy laid out for actually moving the data from the VA's DHCP system at one facility into the system at the other facility so it is readily available for decisionmaking and other kinds of decision support.

Mr. EVANS. The chair recognizes the gentleman from Washington State.

Mr. KREIDLER. Thank you, Mr. Chairman.

Perhaps you could give me an idea of where you see the best or the highest benefits coming? I would presume that perhaps in certain specialty areas, certain types of monitoring and so forth where it would be particularly helpful. I can see where in the area of perhaps cardiology and that type of monitoring as was presented today as an example.

Are there some areas where it really works well, and some other areas where perhaps it isn't quite so beneficial?

Dr. KOLODNER. If I could ask for a little clarification. We have talked a little bit about a spectrum of the telemedicine.

Mr. KREIDLER. Right.

Dr. KOLODNER. Are you specifically referring to the video conferencing?

Mr. KREIDLER. The video, exactly.

Dr. KOLODNER. Okay.

Mr. KREIDLER. The doctor's office, the speciality, or whatever.

Dr. KOLODNER. If I may, Dr. Goldstein is still available, and see, Francis, if you have some thoughts about that.

Dr. GOLDSTEIN. I need to hear the question again, Rob. We have a poor audio link.

Dr. KOLODNER. Okay. The question was in what specific areas the video teleconferencing may be most useful? Do you think it is going to be limited to certain specialties, or is it something that may have some wider application in terms of future benefits?

Dr. GOLDSTEIN. From the administrative standpoint I think that it is going to have huge benefits as far as holding conferences and committee meetings.

Clinically there are still a number of questions that need to be answered. It is not just the new technology. It is a paradigm shift, in fact. Doctors aren't accustomed or trained to treat patients based on images, and we have to experiment a little bit with the system and find what are its most useful applications. And that is what we are doing in Columbia and that is what a lot of other people are doing around the country.

There are some obvious uses for it. There are some that may be a little surprising. We were pleasantly surprised with the example of the diabetic foot ulcers. That had not occurred to us as being an important use for it, but it is turning out to be very useful in that.

I think it is going to take some adjustments on the part of the providers and on the part of the patients. It will take a little bit of time for us to find its uses. It will have a role and just what that role is is currently being defined in a number of places.

Mr. KREIDLER. Thank you very much.

I guess, and I appreciate that this probably does represent the paradigm shift as the doctor described here when it comes to working with teleconferencing with a specific patient and say with a primary care provider communicating with a specialist.

Where I wonder here is the differences that might take place with this type of technology as opposed to what you might get from just what you can, so to speak, fax in the way of information whether it be EKGs or whatever it might be in the way of information that couldn't fill in an awful lot of, let's say, not so much the teleconferencing but talking about just the information shift, would you need this level of technology? Could you get by with a lot less?

Dr. KOLODNER. I think that is an excellent question. I think that is also why we can identify some of the telemedicine applications that have gotten widespread acceptance and others like this where the cost is still high and where the utility of the added cost hasn't yet been well defined. Nor has the acceptance by the patient. We need to be guided by that also.

We know that there are some areas that are not easy to define, such as the ability to see somebody, where although administrative meetings can be carried on by audio teleconference there seems to be an added benefit from being able to see the person at the other side.

It is not easily measurable. But it is something that is a challenge for us and that we need to do our best to measure in terms of effectiveness. We may find, for example, that we can take care of psychiatric patients at a distance, having established the rapport face to face but being able to maintain contact. It probably is different being able to see somebody and see their expression than to just have the audio.

So, I think that this is the challenge to us. We need to continue to do some of the pilots that we have so that we can find those areas where the added benefit is not justified versus those areas where the new technologies really do bring a new capability.

Mr. KREIDLER. And I can certainly realize and appreciate the difference there between having a conference where you are actually seeing people or seeing a patient, particularly in a psychiatric situation where that kind of exchange and body language and so much more can be communicated beyond just verbal.

I guess I am looking at it from the standpoint of the doctor, the primary care provider and the kind of specialty connection here that you might not have in the medical center where that kind of exchange of information takes place.

Where does this technology get you ahead in that situation? This would be where you wouldn't have the patient right there necessarily. It would be a situation where you may be wanting to look at the x rays and so forth like this. Where do you see this technology getting you something that you don't get with, say, a sophisticated fax machine?

Dr. KOLODNER. Certainly I think that a lot of the telemedicine can be carried on without the live video teleconferencing. I think still images, voice and text can do an awful lot of teleconsulting.

And maybe Dr. Dayhoff has a comment about that also.

Dr. DAYHOFF. However, the resolution that is provided by sending a still radiology image is much higher than would be provided by faxing such an image. A fax would not be diagnostic. You couldn't make a diagnosis from a fax of a radiology image. It is the same for some of the other images that we are talking about. You need a diagnostic——

Mr. KREIDLER. I can appreciate that particularly with radiology. Do you reach the kind of resolution here that is close enough so that it is not like you had somebody Fed-Ex your film to you and you are reading it the next day? Is it the same comparable quality? Or how close is it?

Dr. DAYHOFF. Yes. In fact, at the Baltimore VA images are acquired digitally and it is the same resolution that we can transmit between sites.

Mr. KREIDLER. Fantastic. Thank you very much.

Thank you, Mr. Chairman.

Mr. EVANS. The chair now recognizes the distinguished ranking member of the subcommittee, Congressman Tom Ridge from Pennsylvania.

Mr. RIDGE. I thank the chairman. I thank our panel of witnesses. And I can tell you, as someone from a very large rural State such as Pennsylvania, we do have, unbeknownst to a lot of people, the largest rural population in the country. The whole notion of telemedicine technology reaching out to rural America, veterans or not, is an exciting prospect as we not only deal with the issues of health care reform in a legislative way, but deal with it giving access to the best and the world-class technology in medicine that we have in the country today.

So, I apologize for being late. I am fascinated by it all, will never pretend to understand it completely, and I am grateful that people like you continue to press the envelope further so other—all folks, veterans and nonveterans, can benefit by all this.

One of the concerns that I have, and it is something that the health care delivery system is going to have to deal with, not only within the VA but hopefully down the road, the continuum of care, including the VA system and the system external to the VA will have to develop some kind of standards, some kind of network so that we have a comprehensive health care information and delivery unit really operating with the same technologies.

I guess one of the concerns I have right now is whether certain hospitals and certain doctors would be connected to one another although that still wouldn't maximize the access of the most prominent and the best information to all health care users. Would you care to comment on the efforts that the VA is undertaking internally to develop a systemwide telemedicine strategy, and whether or not you are also dealing with the private sector as you proceed in that direction?

Dr. KOLODNER. Yes, that is an excellent point. The VA is absolutely committed to supporting and using standards as they become defined. We started 12 years ago with our DHCP before many of the standards were in place, and as the standards have developed we have participated in the development of those standards and have incorporated those in our system.

If I may, I would like to turn the microphone over to Dan Maloney, who can comment a little bit more since he has been our attendee at many of these meetings.

Mr. RIDGE. Good. Mr. Maloney, please.

Mr. MALONEY. The point that you make is very appropriate. And within the VA we are a little bit lucky because we have a consistent system. It makes it therefore easier for us to move information between facilities.

However, even within that area, formularies are slightly different at each medical center, et cetera, so the importance of standards from the standpoint of defining of data, defining of standard transactions, defining of content is very important.

We have been involved with multiple standards groups and are actually increasing our level of interaction that way. But health care reform and the electronic transmission of information will not move forward very significantly if we don't have very good standards. We all need to agree to agree and select one of the standards.

Mr. RIDGE. Mr. Maloney, do you from your vantage point, from your perspective, see similar efforts being undertaken outside the VA system among private providers?

Mr. MALONEY. Yes. There is a wide variety of interest from private providers, also from the vendors who are building the automation systems, because it is actually quite expensive for everybody to have different nomenclature and different systems. So, there is a wide variety of support right now.

It is something that will require funds to develop these standards and AHCPR and HHS are focusing on that to determine who is best to lead that standards approach.

Mr. RIDGE. Yes. Well, speaking of the question of funds, doctor, do your expenditures on projects related to telemedicine research come out of the general operating account?

Dr. KOLODNER. Yes, they do.

Mr. RIDGE. And what is the level of funding? And from your perspective, given the incredible potential of this kind of effort, is it adequate?

Dr. KOLODNER. The level of funding actually is intertwined with the whole level of funding for our ADP efforts because having telemedicine and not having data to move would not get us much closer. So that the total investment within the VA is that 2 percent of our budget, or less than 2 percent of our budget, of the veteran health budget, is spent on ADP-related activities. This is somewhat below that of the private sector, which we are told is somewhere between 3 and 6 percent depending on the institution.

And I think that we have accomplished amazing things with the investments that we have made so far. The DHCP and the networking that underlies that and the network that connects the VA facilities, not just veteran medical but also benefits, is something that really is very cost effective compared to what we see in the private sector or in other agencies.

I think that we will certainly do whatever we can with the budget we have and we will continue to move it forward. The issue is how fast we get there, and we will move those as quickly as we can with the money that we have.

Mr. RIDGE. I am fairly confident, Mr. Chairman, if we could have this demonstration sometime before the full committee there might be a little bit more sensitivity to the need for earlier and greater investment in telemedicine technology.

Again, I want to thank you for your leadership within the VA. Once again we have things going on in the Department of Veterans Affairs with research and technology that will benefit not only veterans but all of us, and I thank you for that very very much.

Mr. EVANS. Thank you for participating.

Dr. Kolodner, you indicated that telemedicine can improve the services provided to veterans in rural and underserved areas. I think that is also, perhaps, one of the best ways of helping educate veterans about how valuable this might be to a veteran in my district who has a 2½ hour drive in cold and rainy weather when he is not feeling well. This may be the best way of helping veterans make this adjustment and have the level of comfort that they need.

Could you expand upon this and explain how this technology might improve the accessibility and quality of VA health care services?

Dr. KOLODNER. Certainly. With the telemedicine we are able to move the information where it is needed, where the veteran is, where the provider is, and to do that quickly and easily, so that we have a continuity of care that we don't have without telemedicine. For example, without telemedicine veterans may show up at the primary doctor where information may not be readily available from their hospitalization prior to that time and where they may have to be rescheduled because the information just isn't there for the provider to be able to do the follow up. Telemedicine will prevent that by making sure that information is there in a timely manner in a form that the veteran needs and that their provider needs.

It allows us to do more frequent follow up. For example, there is one study that we have undertaken that shows that we can actually extend the time that we need to bring the veteran into the hospital by having telephone contact in between, and that there is no compromise in the quality of patient care.

And for the veteran that means they don't have to make the trek down to the medical center, check in, wait in line, and make the trek back. After seeing their provider, they can have a 5-minute call or 10-minute call, whatever is needed, that is scheduled ahead of time, that the VA places out to the veteran and that we can take care of anything that is needed.

If something shows up where the veteran needs to be seen they can be brought into the hospital immediately or into the outpatient clinic. But otherwise, it is a touching base. It is letting the veteran know that we do care.

And I think that one of the things that is important is to understand that telemedicine isn't remote, unfeeling kinds of technology. It really is something that brings together the contact that lets veterans know that we are there to serve them and to be available to them.

And they then have a choice as to whether this time they want to come in or this time they want a telephone contact or this time they want to call the voice response system and refill their medicines. And so we provide more choice to the veteran using these technologies, and it provides the continuity and the quality that we want to be delivering.

Mr. EVANS. I would be remiss if I didn't direct at least a follow-up question to Dr. Goldstein and ask him how it has worked in Columbia, SC. How have they been able to get that level of comfort for some of their veterans? Is he still there with us?

Dr. KOLODNER. We think that he had to leave, and so right now we don't have him. We apologize.

Oh. Excuse me. There he is.

Francis, are you still there?

Mr. EVANS. I am not sure he heard my question.

Dr. Goldstein, I asked you how you have been able to help achieve a level of comfort with your patients in providing telemedicine services to them without the physician being in the same room with them.

Dr. KOLODNER. Would you like me to repeat that?

Dr. GOLDSTEIN. Yes, would you repeat the question?

Dr. KOLODNER. The chairman is asking how you have been able to achieve a level of comfort with your patients regarding telemedicine without the provider actually being there right next to them, touching them in person?

Dr. GOLDSTEIN. Well, actually, in the setting that we have there is a provider. Often it is the patient's primary care provider who is with the patient and who is communicating with a specialist. That is the model that I think is the most useful right now.

In other situations we can anticipate maybe a nurse practitioner being with the patient, and again a consultation to a specialist. And I think that is an important thing. It leads back to what Rob was saying. That this is really people technology. It requires hands-on.

And telemedicine is an additive. It doesn't replace the personal care that we deliver to the veteran. It adds a new dimension to it.

Mr. EVANS. Thank you, doctor. We appreciate it.

One final question, doctor, relating to concerns about patient confidentiality. Can you elaborate on the protections that will be accorded to maintain and protect patient's medical record confidentiality?

Dr. KOLODNER. Yes. The confidentiality, especially as we move into electronic medical records, is absolutely critical, because I certainly wouldn't want to have any of my information put in the system that I didn't feel was absolutely secure and provided only to the people who needed to have access to it.

We have within our system a high level of security. We have a separate security office that recently was a finalist in the National Security Agency recognition of Federal activities, and we received one of the runner-up awards.

And we have a high level of security not only of access into the system. In fact, the electronic information is much more secure than the paper record where we have time and again anecdotes about people who would put on a white coat, walk into a clinic or a nursing station on the wards and be able to pick up a record and have access to information that they should not have.

We have a dual-level security system going into our system. We are also looking at encryption of that data so that as we transmit it between sites it is not something that anyone can tap the lines and have access to. And also I think an example of how we have dealt with Internet represents our high concern with security.

As you know, Internet has been receiving a lot of attention these days. It is on the cover of Time magazine this week. And there has been a rush to connect into the Internet. We have had a very cautious approach to that. We have even asked NSA to come in and work with us and evaluate our vulnerabilities as we move forward, and we have determined those levels of access that will not compromise at all our network or our data security, so that, for example, we have full E-mail access but we will at this point have no plans to have people be able to come into our network from the Internet.

We will be able to have our providers and staff go out, but they will not be able to come in. However, that doesn't mean that we ignore the Internet. As I mentioned in my remarks, we have this week set up an Internet server, so that we can provide information out there. It is outside of something we call a firewall. So we build the firewall. That is for security. We put the information that is for the public outside that firewall, and we make it readily available to any who desire to get the information. And I think that approach, that cautious approach is one that we certainly intend to continue as we move forward in terms of automating the medical record.

Mr. EVANS. Doctor, thank you.

Do any of my colleagues have any questions?

Doctor, I want to thank you and your panel and everybody that helped make this demonstration possible today. I think we have bipartisan enthusiasm for what you are doing and look forward to working with you in the future.

Dr. KOLODNER. Thank you very much, Mr. Chairman.

Mr. EVANS. Because we understand technicians will now remove some of the equipment which has been demonstrated, we will recess for 5 to 10 minutes at this time.

[Recess].

Mr. EVANS. If everyone will please be seated, we will reconvene.

Our next witnesses are Dr. John Silva, Dr. Donald Lindberg, and Dr. Helen Smits.

Dr. Silva is Program Manager, Advanced Research Projects Agency, Department of Defense, and chair of the Health Information and Application Working Group, Applications and Technology Committee, the White House Information Infrastructure Task Force.

Dr. Lindberg is Director, National Library of Medicine, National Institutes of Health.

Dr. Smits is Deputy Administrator, Health Care Financing Administration, Department of Health and Human Services.

Each of your entire statements will be included in the printed record, without objection. Dr. Silva, you may proceed when you are ready.

STATEMENT OF DR. JOHN SILVA, PROGRAM MANAGER, ADVANCED RESEARCH PROJECTS AGENCY (ARPA), DEPARTMENT OF DEFENSE, AND CHAIR, HEALTH INFORMATION AND APPLICATION WORKING GROUP, APPLICATIONS AND TECHNOLOGY COMMITTEE, WHITE HOUSE INFORMATION INFRASTRUCTURE TASK FORCE; DR. DONALD A. B. LINDBERG, DIRECTOR, NATIONAL LIBRARY OF MEDICINE, NATIONAL INSTITUTES OF HEALTH, AND EXECUTIVE OFFICE OF THE PRESIDENT, HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS (HPCC), NATIONAL COORDINATION OFFICE; DR. HELEN L. SMITS, DEPUTY ADMINISTRATOR, HEALTH CARE FINANCING ADMINISTRATION, DEPARTMENT OF HEALTH AND HUMAN SERVICES

STATEMENT OF DR. JOHN SILVA

Dr. SILVA. Thank you.

Good morning, Mr. Chairman, and members of the subcommittee. I am John Silva, a surgeon in the United States Air Force currently assigned to the Advanced Research Project Agency, otherwise known as ARPA.

I am here today in my dual role as a program manager of ARPA and as chair of the Health Information and Application Working Group.

This morning I will discuss three areas: health information and health care reform; the efforts of the Working Group and its activities, specifically in telemedicine; and lastly, my agency, ARPA's efforts in advanced technology for health care.

First, health care reform. I think it is safe to say that our health care system is drowning in enormous volumes of data. But much like the thirsty man in the ocean, our data is not very usable.

There is a consensus agreement that we can simplify our system and improve its efficiencies through the use of standardized health data that is collected while providing care and operating the system.

This is reflected in the agreement across legislative proposals for health care reform that describe a national framework for health information, and that agree that this framework is essential to effective health care reform.

Key aspects of that framework include: (1) national standards for health information; (2) a national electronic network, not a large government-run system, but a system of privately run and maintained health information systems that operate within the National Information Infrastructure; (3) strong privacy and security protections for health information; (4) access to that system by all participants, especially those in rural areas. And certainly telemedicine activity must fit within this emerging framework.

Secondly, the Administration's agenda for action for the National Information Infrastructure identified principles and goals to guide government action with respect to information technology. One of the key premises is that the private sector has the lead in designing, building and operating the NII and also the health information component of it.

The Federal role is as a catalyst and as a facilitator by establishing the legal and policy guidelines and frameworks. The Health Information and Application Working Group developed a mission statement that was consistent with these overriding principles. Simply put, it is to foster the development, the deployment and use of the NII to improve the health of all Americans.

The Working Group facilitates collaboration and coordination among Federal agencies. Its members are represented by most of the Federal Departments, agencies and organizations with interest or activities in health applications, and it works closely with the Information Infrastructure Task Force and related interagency organizations like the High Performance Computing Program.

The Working Group recently formed a subgroup in telemedicine to look at many of the cross cutting issues in this area. It is cochaired by Diana Pushkin of the Office of Rural Health, and Lisa Leidig of NTIA. Its members include many of the departments and agencies and the VA and DOD.

The first product of this working group is a compendium, and from what I understand, perhaps the first compendium of telemedicine projects in the Federal Government. Sharing information on who is doing what in telemedicine, and participating in grant reviews helped coordinate each agency's telemedicine activities this summer. Based on this experience, the subgroup plans to develop a set of generic criteria to evaluate telemedicine programs and grants and promote cooperation across Federal agencies sponsoring telemedicine activities.

The group also supported a series of brown bag lunch briefings on telemedicine for members and their staff. Many requests for additional information has led our Working Group to sponsor a working conference on telemedicine policy and the NII that will be held in August this year. We plan to release the conference report in early September and we expect to address many of the issues that you raised in your invitation to testify.

I would like to conclude with a brief description of the ARPA Medical Technology Program. Last year, ARPA and the Department of Army conducted a battlefield telemedicine demonstration to provide a vision of how this program could affect health care. Vital signs of wounded soldiers were transmitted from the soldier's wristwatch, the Dick Tracey watch, to combat medics and then on to medical personnel in a simulated MASH unit. Battlefield physicians in this MASH unit transmitted patient information, including vital signs, clinical history and x rays, to specialists located at Walter Reed Army Medical Center and the University of Virginia hundreds of miles away.

The ARPA Medical Technology Program has two main components, one of these will develop advanced diagnostics, including this Dick Tracey wristwatch that monitors the soldier's vital signs and position, and when the soldier is injured, transmits the precise location and extent of injury to the medic. We are extending the range and the capability of teleconsultation and telementoring and are beginning to develop remote telepresence or robotic surgery for the battlefield. Education and training efforts will use virtual reality to create a simulated cadaver for physicians and medics to practice surgical operations on simulated battlefield wounds.

The second component of the ARPA Medical Program focuses on information infrastructure. It will develop advanced health information systems for DOD through new approaches to engineering complex information systems. We are collaborating actively with VA staff to assure that these systems will meet both DOD and VA needs. The resultant intelligent information system includes telemedicine and telepresence capabilities, provides doctors and nurses transparent and automatic access to up-to-date patient information from the battlefield to the largest hospital.

I believe these efforts will result in development of affordable and interoperable systems for telemedicine; that these systems will enhance the provision of clinical services either in the battlefield or remote rural areas and in tertiary care centers.

For DOD, it is our hope that the use of these systems on the battlefield will reduce the killed in action by at least 50 percent.

While the focus of the ARPA program is on the battlefield in military medicine, these technologies are dual-use by intent, and one of the successes of our programs is the ability to actively transfer this technology into the civilian sector and other Federal areas.

I have briefly reviewed key aspects of health information and health care reform, the activities of our Working Group, and a brief snapshot of some of the ARPA medical technology program. And thank you for your time this morning, and I will be glad to answer any questions you have.

[The prepared statement of Dr. Silva appears at p. 77.]

Mr. EVANS. Thank you, Dr. Silva. We appreciate your testimony. I am also a member of the Armed Services Committee, so you are doing double duty here.

I understand your children are with you here today——

Dr. SILVA. Yes, sir.

Mr. EVANS [continuing]. To learn a little bit about your job. They are John, Dan, Steve, Brian and Christin. If they can stand up, we would like to recognize them. [Applause].

Dr. Lindberg.

STATEMENT OF DR. DONALD A. B. LINDBERG

Dr. LINDBERG. Thank you, Chairman Evans, members of the subcommittee. It is a pleasure to be with you today.

I want to say at the outset that I endorse the concept of telemedicine. It is, in a sense, a well-accepted idea, although it has had a new flowering largely because of the great improvement in communication systems brought by the Internet and the High Performance Computer and Communications Program, what is broadly known currently as the electronic highway of the future.

The VA has really had a distinguished history in doing this kind of work. There has been a lot of talk about EKG today, and I recall with great pleasure working in the early 1960s with the late Hubert Pipberger, who was the cardiologist in the Washington VA who did the basic research on computer interpretation of EKG. So, its current experiments, it seems to me, are extremely well placed.

The VA is represented—the VA Medical Director is an ex officio member of the Board of Regents of NLM, so we benefit from the VA's advice in that case.

I also am Director of the High Performance Computing and Communications National Coordination Office for the OSTP, and in that capacity also work with the VA. They are guest members and we expect that they will consider joining the full OMB cross cut in FY96 and become part of the 10-agency program to develop high performance computers, the Internet, and the communications software.

You have asked in writing what does my agency, namely the National Library of Medicine, do in telecommunications and telemedicine. I would like to have you view just for the moment that telemedicine really can be thought of in three parts. The first part is it aids in medical decisionmaking. In that sense the access which NLM has provided for decades to MEDLINE and the scientific literature, Grateful Med that lets a doctor do the searching on his or her own personal PC, is very critical in supporting decisionmaking. There are numerous papers that show that better patient care comes from those services.

Again, the connectivity is very critical. The VA professionals utilize these systems and the VA librarians are extremely helpful in providing these services, this instruction, and the backup that gives the reader copies of the articles.

On the Board of Regents the alternate to the Medical Director is Wendy Carter, the Chief Medical Librarian of the VA, and she is an extremely good representative of the VA.

There are lots of other databases I won't take your time to mention. Next, there are artificial intelligence-based expert consulting systems. I was part of developing one of those in rheumatology, and that is getting field testing in two States already. We can already see that the addition of the more modern telemedicine facilities to show pictures as well as the text will be a great help in making that system a big hit.

You can consider that a second aspect of telemedicine is remote sensing, and again EKG is the classic example. This has been done for decades, and is very, very helpful.

I have to insert a story, if you don't mind. This really got started when Doctor Caesar Caceres, who was a Public Health Service officer, did an EKG in a room such as this. I have forgotten really which room it was, but it was on Senator Everett Dirksen. The demonstration proved the validity of it all, except that it was a very troublesome EKG, as it turned out, so we were somewhat sorry that it happened.

The EKG system then got implemented in the Regional Medical Program. I was running such a program at the University of Missouri. We for the first time did a statewide deployment of EKGs interpreted by computer.

I remember the very first day that anybody with a pacemaker came through, never happened before, they were very rare, and it destroyed the program. The program had no idea. The tracings that one saw had no P wave, no naturally generated impulse before that big QRS wave.

I only mention that because now, of course, we see that not only is the pacemaker not just viewed as a troublesome artifact but the system in the VA is to utilize that to monitor and help the persons with the pacemakers at home.

There are always changes, always improvements, and that is the reason the VA is to be complimented, I think, for retaining their own intramural capability to do this work, to roll with the punches, to take advantage of the changes, not just to be sold something.

I agree with John the NII has to be developed by the private side. But we can't just be sold the systems. We have to be able to adapt them and progress with them in a medical system like the VA.

NLM does that sort of work. I have already described that. We also have a system in which x rays are gathered up through the NHANES, the public health monitoring system. There is a Visible Human Project which is developing a 3-dimensional representation of the whole body. This is setting new standards for both prostheses and for anatomy.

The third part of telemedicine, in my view, is collaborative arrangements for management of patients at a distance. That is really the essence of it. That is not necessarily the technology. That is the arrangements within the system of persons and doctors and hospitals and medical professionals, and that is the critical thing.

There the VA is at a great advantage. But let me just speak briefly about the National Library of Medicine.

A year or so ago we did a broad agency announcement which was essentially to implement with new HPCC appropriations the health care provisions of the NII legislation which was under consideration in the Congress. This resulted in an extremely brisk response from 31 States, 140 proposals involving professionals—medical professionals, engineers, communications, communication companies, and in some cases Department of Veterans Affairs facilities.

In the end we funded citywide networks in Indianapolis and Chicago, areawide networks in Western Pennsylvania, statewide networks in Iowa and West Virginia, and networks that are focused on particularly medically underserved areas in Oregon and Kansas.

In West Virginia, the VA is a participant by funding the local VA to participate. That is the Clarksburg VA Medical Center.

But let me just read you a little bit about what that program intends to do: "to build and evaluate a regional telemedicine system for rural areas of West Virginia; to allow rural primary care physicians to consult with remote specialists to be facilitated by computer support of x ray images, ultrasound, voice annotations and other multimedia information."

But the point is to arrange all that to give complete care for that entire State. I think that is an area in which the VA has got a really great advantage. It will result in better service to veterans, faster progress in the field of telemedicine, and it will also, I am quite confident, if done right, be kind of a testbed network for evaluating all this technology in the new NII.

So, I encourage your support of this excellent work within the VA, and I compliment the folks you have heard on how well they have done.

Thank you.

[The prepared statement of Dr. Lindberg appears at p. 84.]

Mr. EVANS. Dr. Smits.

STATEMENT OF DR. HELEN L. SMITS

Dr. SMITS. Thank you, Mr. Chairman. It is a pleasure to be here.

The reason I am here is that last fall the Rural Caucus approached the Health Care Financing Administration with inquiries about whether or not we intended to pay for telemedicine services for Medicare beneficiaries and to encourage States to pay for Medicaid. In exploring that question, I have had the privilege of visiting a number of the pilot telemedicine sites and I must say I have been very excited by what I have seen.

I think telemedicine offers a great deal, particularly to remote rural sites, and specifically in providing primary care practitioners, including physicians, nurse practitioners, physicians assistants, with expert consultation quickly and easily, in ways that suit the rural patient and that greatly minimize unnecessary travel.

In evaluating our Medicare payment policy we make a very clear distinction between the transmission of images and the conducting of face-to-face consultation or other treatments. As far as we are concerned, HCFA never told a radiologist how to get his x ray or a cardiologist how to get her EKG. Unless quality problems surfaced, Medicare would continue to pay for the transmitted images via telecommunications just the way we had paid for the interpretation of those images when they were shipped by truck.

Correctly, we are looking, particularly in the radiology field, at whether this type of transmission raises quality questions and whether we ought to put out standards, not for transmission, but for the quality of the final image. I am not clear yet how we will decide this issue.

As far as the patient-physician contact is concerned, we do have rules that prohibit payment unless there is a face-to-face relationship. Those are applicable in academic health centers relating to when the attending physician may bill, and also are a part of our policies that prohibit payment for telephone consultation.

Before we change that policy universally, we need some experience with telemedicine, some knowledge of where it works and doesn't work, and some way to ensure that it doesn't lead to abuse and overuse, particularly in a fee-for-service system where it seems to raise questions about the possibility of excessive physician visits.

At the time I first began looking at this issue, there had been something less than 2,000 total consultations done in the entire country and many of those were not on Medicare patients. So clearly we need more experience before we can write a consistent national policy.

Currently, we are engaging in a variety of demonstration activities to try to explore how best to pay for telemedicine and how we might set up standards for it. We have just issued grants to facilities in the States of Michigan, West Virginia, Iowa and North Carolina. The grants will support existing networks and explore particular variations in payment method.

Many of the existing telemedicine sites tell us that it might make more sense to pay a fee to the central site, that is, a general fee with either a very small marginal fee for the amount of time that it is used or none.

Most of the work that we have seen that is relevant for Medicare involves the primary care practitioner at the remote site being with the patient and actually doing a consultation. That primary care practitioner is free now to bill. It is the consultant who can't bill when it is done exclusively by television.

Finally, I would like to note that one of the pleasures I have gotten out of this, and it has been fascinating learning the applications of telemedicine, has been that this is an area where I think the cooperation across agencies has really been very exciting. We have been working very closely with the rural health policy folks in the Public Health Service—even though we are in the same Department that hasn't always happened in other areas, with ARPA, and with Department of Commerce.

We know about the various other grants being awarded by Federal departments and agencies. Many of our staff are participating on the grant awarding boards, and staffers from other agencies have participated with us in determinations about our grants as well. So, although there is Federal money in a variety of different parts of the government, I think this is a real success story in terms of our ability to talk to each other and to build on each other's commitment to support and explore this very important area.

Thank you very much, Mr. Chairman. I would be glad to answer any questions you have.

Mr. EVANS. Thank you, doctor.

[The prepared statement of Dr. Smits appears at p. 91.]

Mr. EVANS. The chair recognizes Congresswoman Long for any remarks or questions she might have.

Ms. LONG. Thank you, Mr. Chairman. And I am going to have to go on to a markup in Agriculture, but I do want to commend you for holding this hearing, and also to point out that as chair of the Rural Caucus, telemedicine is very important to our constituencies all across the country, and certainly in my congressional district.

And it is really good to be able to serve on two committees and have the kind of testimony presented here today that I think will be useful to me both on this committee as well as on the Ag Committee. So thank you for your fine testimony.

Mr. EVANS. Thank you.

Dr. Smits, what will constitute the adequate study of telemedicine repeatedly emphasized throughout your testimony?

Dr. SMITS. That is a hard question, isn't it. I think we first need to define whether consultation should be limited to settings where the provider is available at the rural site or not. In addition, we probably need to look at what types of specialties are appropriate for telemedicine and which are not.

My own personal prejudice is that we ought to move into reimbursement in ways that strongly encourage the development of very comprehensive networks, and we ought to begin reimbursement in the rural setting rather than generally. I do think telemedicine offers a great deal in all areas of coordinating and organizing care, but we really don't have much information yet on the fee-for-service side to teach us anything about its utility, for example, in urban underserved areas.

Mr. EVANS. How quickly could this adequate study be accomplished? Could it be done by the end of this century or before that?

Dr. SMITS. I think it could be done within a few years. All of our actuarial estimates suggest that broadly expanded coverage for telemedicine would increase Medicare costs. And, as you know, that varies these days.

I think when we are done the question will be whether it would be an appropriate area for us to undertake coverage administratively or whether legislative action would be more appropriate.

Mr. EVANS. Dr. Lindberg, I am not sure I understand the process involved, but VA is now a guest member of the interagency High Performance Computing and Communications Initiative with full membership, I understand, a future possibility.

Is that dependent on your organization approving them or is it dependent on the VA seeking that status?

Dr. LINDBERG. No, sir. It is the latter. The ten organizations that form this—ARPA, DOE, NASA, NSF, HHS, and then within Commerce two of the science laboratories, NOAA and NIST, National Security Administration, EPA, and Education—those ten were named in legislation, the High Performance Computing Act, in 1991.

But we are given the opportunity to expand as required, and all of us welcome the participation of the VA. So they are for all practical purposes a member, but they are not really part of the cross cut, and we hope that they will choose to do that, but it is up to them to decide that.

Mr. EVANS. How can the social aspects and problems of telemedicine that you noted in your testimony be best addressed?

Dr. LINDBERG. Well, we think, sir, that this testbed network is the right approach. If you take—just taking one of them, privacy is perfectly obvious to all of us as a requirement if we are going to put medical records in.

But it is also equally obvious to each of us as an individual that we put a high priority on access of the record. If we have an accident in a remote place we want a record available. We don't want it locked up and enciphered by NSA so that it takes six supercomputers to break it out.

So some balance, therefore, some practical balance has to be established in a working, real medical situation where there are always trade-offs. We want privacy. We want access. We want practicality. We want safeguards. You have to work that out in an empirical fashion.

So, I think that VA would be one of the excellent places for a testbed such as that to be created.

I don't think it is a technical problem. NSA really can encipher the stuff so that it will be terribly difficult for anyone to get at. That really isn't our problem. The problem is a practical system.

Mr. EVANS. Dr. Silva, the Administration has set a goal of connecting all hospitals, clinics, libraries and classrooms to the National Information Infrastructure by the end of the century. Do you know what the expected cost for achieving this goal will be?

Dr. SILVA. No, sir, I do not.

Mr. EVANS. You don't.

Dr. SILVA. I do not.

Mr. EVANS. Can you give us your personal perspective on the issues which have to be resolved and the new policies and policy changes that are needed to achieve that goal?

Dr. SILVA. Well, I can address those specifically with respect to telemedicine and the health information systems that we are in the process of watching Congress develop.

The major aspect that we have identified over the past year and a half in discussions with the private sector is that the lack of standards across the country basically means that we don't have a common language and we can't share health information. Across all health care systems—ambulatory systems, hospital systems, et cetera, just cannot talk to one another. Telemedicine systems are typically proprietary and require a point-to-point connection because the sending system has to be exactly the same as the receiving system. With standards the capture of data, the storage of data, and the sharing of data, can all be separate processes so that we do not require a single vendor's system and will build towards an affordable and scalable solution in infrastructure for the country. That is, I think one of the key areas of investment for the Federal Government and where our working group and our ARPA programs in particular are focused.

Mr. EVANS. The gentleman from Pennsylvania is recognized.

Mr. RIDGE. Dr. Silva—actually, for all panelists, how far down the road have we progressed with the interagency cooperation in obtaining a medical information standard with regard to government-related health care? I mean where are we now? When did we begin the process? How long do you think it is going to take us to get there?

I know these are difficult questions, but we have Medicare, we have Medicaid, we have VA, and we have the health care in the DOD. We are spending billions of dollars through the Federal Government. We have agencies all over the place with this model here and this model there. Where are we today in this effort? And do you see light at the end of the tunnel?

Dr. SILVA. Well, I can start the conversation. I think Dr. Lindberg and Dr. Smits can add substantial personal experiences with that.

I think we are just beginning. I think we recognize that we have to collaborate. And one of the major benefits of our working group is to have the people sitting around the table actually sharing the same lessons learned or war stories about the lack of interoperability of data both at the Federal level as well as at the local level.

And I know the National Library and HCFA have been in the forefront of identifying those areas that could be standardized early with the significant administrative simplification savings versus those areas that are going to be much more difficult to do.

And, as we do all of these activities, it is under the rubric of the NII; that is, that we work in collaboration with the private sector, who, by the way, has to do 98 to 99 percent of all of the work. And so it is in that regard as a public-private partnership that we would want to push forward.

Dr. LINDBERG. I agree that in effect we are just beginning. But actually, research has gone on for the computer-based patient record, which is in many respects the focal point of your question, for at least 30 years with fairly strong support, although traditional grant project support from NIH, and to some extent other agencies.

One of the obstacles has been the absence of a unified medical language. We have now put 6 years into creation of this particular project, NIH, with direct earmarked congressional support for it. And this is now being tested in the VA. So we are really starting to come together around the vocabulary aspect of it.

There are many other parts that, as John said, need to be standardized, although in the end you don't want a standardized system. I mean the medical problems in the middle of Kansas are going to be quite different from ones in the middle of a metropolis like this one.

I think the technology—I don't think there is a technological impediment to doing this very quickly. I think it is mostly people working together, and I think that it could be accomplished inside of 5 years with a really serious effort, with a determination on the part of the government that it has to be done.

Mr. RIDGE. Dr. Smits?

Dr. SMITS. I would say that consistency across government health care deliverers isn't enough. That we need to be sure——

Mr. RIDGE. I agree.

Dr. SMITS [continuing]. That it is integrated with the private sector. Obviously, for both Medicare and Medicaid, HCFA must deal with a big issue in terms of who helps us pay the bills. We must also consider the providers that we are dealing with.

Mr. RIDGE. It certainly gets the provider's attention.

Dr. SMITS. Yes.

Mr. RIDGE. If you can't get limitation for any other reason, whoever is going to pay the fee might.

Dr. SMITS. Right. I think two things are happening. First of all, the technology is catching up. In a simpleminded sense, you know, my husband's MacIntosh and my IBM can now be networked onto a single printer without any difficulty. And I think there is technology around the system that really helps that.

We in Medicare for a long time have had standardized information sets for hospital discharges and for patient visits. The patient visit standardized information set needs some revision. In particular we need to deal with a fairly contentious set of issues about what HMOs ought to report and how often they see patients.

We have worked extensively with the private sector on collection, transmission and storage standards, and need to do more of that. We are also in the early stages developing something called the Medicare Transaction System which will have a single set of standard software publicly available, and government-developed software for our Medicare claims payment. In the absence of anything else, MTS will essentially set standards for transmission and retention for our beneficiaries.

And I am really pleased to say that, again, we are very committed to the concepts of a distributed system. Dr. Silva has been working with us to ensure that what we do in the Medicare Transaction System and some of the new work in defense are fully compatible. And that is 3 years in the future. The contract is out. We are in the active development process now. So, I think it is really moving along very well.

Mr. RIDGE. Well, that is good news and exciting.

Let me just ask one process question, because you obviously have different agencies and institutions within government moving along in the same direction.

Are decisions made internally within DOD, HCFA, VA, as to where their research money is going to go, what models they are going to promote, what initiatives they are going to undertake, and then after that a decision is unilaterally made within an agency, that information goes to the coordinating office, or is there some effort among all of you that given the limited resources that you don't overlap areas of research.

Do you make the decisions within the agency first and tell your friends, or does the Coordinating Council try to effectively utilize the resources and the attributes of a particular agency before you begin down the road on a particular model or initiative?

Dr. SMITS. I think one of the real tricks is modern communications. We send each other E-mail notes. I guess we are all pretty much available, and have Internet access at least for E-mail. That makes a big difference.

For example, if the two junior staff people in the two different agencies who were getting the grant solicitation ready, had day-to-day contact through E-mail, some phone contact and some face-to-face contact, then what is recommended for a senior decision is compatible. I really think that is happening. Again, John can probably comment on it more than I can.

Dr. SILVA. Actually, I think Helen already mentioned the success of the telemedicine subgroup this summer where staff members of each agency, including the VA, actually shared time reviewing grant proposals. They gained an understanding what each agency's specific area is and also assuring that these grants did not fund the same efforts.

Don Lindberg and I actually have accomplished that in a set of grants we awarded earlier this year. We were looking at the High Performance Computing and Communications Program approach and trying to replicate that in an informal way that we hope will serve as a model for other areas in health information across the Federal Government.

Mr. RIDGE. Thanks a lot. Thank you.

Dr. LINDBERG. I think there is a formal and informal answer, and then I agree with the good functioning of the informal. In the case of the formal, the High Performance Computing and Communications Program is an OMB cross cut, so all these things are formally looked at by all agencies, signed off, approved by OSTP. There for sure is no duplication.

Mr. RIDGE. Thank you.

Dr. SILVA. You may be aware that Mr. Panetta and Secretary Brown have recently requested an NII cross cut that was very comparable to what the HPCC program does each year. These issues will be identified. I suspect that this ad hoc, informal process will become much more a formal one in the future.

Mr. RIDGE. Thank you.

Mr. EVANS. I thank this panel for their testimony. We do have numerous written questions to submit to you. Your answers to those questions will be made a part of the permanent hearing record.

Thank you very much.

(See pp. 214 and 216.)

Mr. EVANS. The members of our next panel are Jim Elias, accompanied by Dr. Steven Carter. Dave Thistle and Marilyn Cade.

Jim is the Executive Director of Technology Assessment, US West Communications, Seattle, WA.

Dr. Carter is with the Department of Radiology, University of Washington Medical Center, School of Medicine.

Dave is National Coordinator, International Brotherhood of Electrical Workers, PT Phone Home, Incorporated.

Marilyn is Director of Technology/Infrastructure, Computer Products and Services, AT&T, Government Affairs.

Each of your statements will also be made a part of the record. Once you are situated, Jim, you may proceed.

STATEMENTS OF JIM ELIAS, EXECUTIVE DIRECTOR, TECHNOLOGY ASSESSMENT, US WEST COMMUNICATIONS, SEATTLE, WA, ACCOMPANIED BY DR. STEVEN CARTER, DEPARTMENT OF RADIOLOGY, UNIVERSITY OF WASHINGTON MEDICAL CENTER, SCHOOL OF MEDICINE, SEATTLE, WA; DAVE THISTLE, NATIONAL COORDINATOR, INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS (IBEW), PT PHONE HOME, INC., CASTLE POINT, NY; AND MARILYN CADE, DIRECTOR, TECHNOLOGY/INFRASTRUCTURE, COMPUTER PRODUCTS AND SERVICES, AT&T, GOVERNMENT AFFAIRS, WASHINGTON, DC

STATEMENT OF JIM ELIAS

Mr. ELIAS. Thank you, Mr. Chairman, and members of the committee.

I am Jim Elias, Executive Director of Technology Assessment, US West Communications, and I appreciate the opportunity to be here today to address the issue of telemedicine.

If we think of communications networks as transportation systems for the senses and of medical practice as the application of senses to solve medical problems, then it is clear that as networks are able to carry more information and higher quality information we edge closer to engaging more of the problem-solving capabilities of the medical expert.

The evolution of multimedia capabilities allows network infrastructure to transport more information faster in a format where the user is able not only to involve more senses, but also to enhance those senses, and here I am referring to what is called asynchronous transfer mode switching where we now are verging on handling voice, data, image and full motion video on the same networks, where in the past they were on specialized, separate networks. Now, we are drawing those together and, of course, transmitting it on fiber, which gives us an enormous transport capability.

Our first experience with this actually began when we approached the VA Medical Center at Fort Snelling, in Minnesota, and the University of Minnesota to propose the creation of a distance learning trial that would allow the university to provide two-way interactive lectures on radiology with the Department of Veterans Affairs. At the same time, US West had the opportunity to experiment with emerging ATM technology in a demanding telemedicine application. The parties agreed and a unique collaborative effort was launched.

In this trial, interns from the University of Minnesota Medical School attended mandatory lectures while at the VA Hospital location using two-way interactive, as I mentioned, ATM and fiber transport networks provided by US West.

The lecturers used 35-millimeter slides and radiology images projected in a side-by-side format allowing students to compare images and provide their diagnosis.

In Seattle, US West is undertaking an effort, still in its formative stages, to use a PC-based platform to send and receive images between the University of Washington Medical School, several Department of Defense medical facilities, the VA Hospital in Seattle, and the VA Hospital in American Lake.

Dr. Steven Carter, who is with me, is a clinical assistant professor of radiology and working on telemedicine projects at the University of Washington Medical School. He may elaborate on this during the questions and answers.

This is called project Seahawk and the partnership will create telemedicine outreach programs centered at Madigan Hospital using a US West fiber ring to connect project locations, Bremerton Naval Hospital, American Lake, as I mentioned, the Seattle VA hospital at McCord Air Force Base and others will be able to share medical information.

Images will be transmitted over the US West network at speeds up to 45 megabits growing to as much as 2½ billion bits a second. Representative Norm Dicks continues to champion Project Seahawk on behalf of those on active duty as well as veterans.

Each of these examples represents an island of telemedicine activity, one in Minnesota, another in Puget Sound, and the usefulness is somewhat limited by the lack of connectivity. The University of Washington's Medical School would really like to collaborate with the University of Minnesota.

US West feels a bit constrained by current regulation from leveraging these lessons and these testbeds to provide benefits to the medical community as a whole, and the VA in particular.

To be really effective, these things need to be interconnected with distant locations, and collaboration in doing this is difficult enough without another layer of complication and excessive regulation slowing this deployment.

We still rely to a large extent to moving people, a patient or the doctor, to treat an illness or injury. But as we have heard, the opportunity exists to move only the information. And the benefits of this you have heard this morning and will hear more of, I am sure. And you have seen that veterans do not have to leave their home to receive treatment.

I would like to emphasize that US West is now bringing multimedia networks to the home in six of the cities it serves. We will pass 1,400,000 homes with multimedia networks. We intend to announce another 14 by year-end. We are working with Time-Warner outside of our 14-State territory, and of course, just bought cable franchises in Atlanta.

The reason I mention this is that the networks we are developing will have enormous content carrying capacity, roughly 250,000 times the amount of information that can be carried today on the wire networks. So, as you look at telemedicine to the home, I think you can expand what it is that you want to accomplish over those networks. And I think this is fairly typical of a lot of communications companies. The scene is changing rapidly.

The VA's effort to expand its use of telemedicine to solve problems can be enhanced by partnering with companies like US West in testbed situations like those in Minneapolis and Seattle to work in live situations to identify what really works and what is not effective.

Funding for testbeds is problematic. US West was encouraged by the language in the Senate finance bill which designated 20 million in grant money for telemedicine demonstration projects as well as Representative Larry LaRocco's House Resolution 3070, rural telemedicine bill.

While the cost of the networks is not insignificant, the cost of the medical equipment in many cases exceeds the expense of connectivity. The present VA hospital system is an ideal candidate for expanded telecommunications applications because of its geographical distribution and being under single management. We have the opportunity to build a solid, shared foundation of experience inasmuch as the ATM standards are still not totally settled. It would be beneficial to create more testbeds of medical applications to influence the development of technology in a manner that strongly supports telemedicine.

With this approach, together we can be in charge of our future and can design even more useful medical applications. US West is ready to work with the VA to ensure the promise of technology is realized and telemedicine applications that will provide the best care to veterans.

Thank you very much for your attention.

[The prepared statement of Mr. Elias appears at p. 102.]

Mr. EVANS. Thank you, Jim. We appreciate your testimony.

Dave, and please speak directly into the microphone, if you will.

STATEMENT OF DAVE THISTLE

Mr. THISTLE. Thank you, Mr. Chairman, and committee members.

PT Phone Home, Incorporated is a nonprofit effort that began with volunteers at the Castle Point VA Hospital in Beacon, NY in 1990. Frank Dosio, a New York Telephone Company technician and Vietnam veteran, who also volunteered at the hospital, had recognized a need. Frank spearheaded the effort with the help of Communication Workers of America and New York Telephone, and in no time they were joined by the VFW, American Legion, Telephone Pioneers, the International Brotherhood of Electrical Workers, and many other organizations.

Against all odds, a group of more than 70 volunteers achieved what they had been told was impossible. Union and management working together toward a common goal had the determination and perseverance to install the first complete bedside phone system in VA hospital history.

Since that time PT Phone Home, Incorporated has developed into a national effort. At this time, 31 hospitals have been completed by PT Phone Home and an additional 15 patient systems have been installed by the VA.

International Labor Union Presidents, J.J. Barry from the IBEW, and Morty Bahr from the CWA, have sent written statements of support for PT Phone Home to their entire memberships.

The NYNEX Corporation has loaned Frank Dosio from the CWA in New York and myself, Dave Thistle from the IBEW in Boston to PT Phone Home on a full-time basis to complete the national effort. All of the other Baby Bells have followed with their expertise and personnel when PT Phone Home came to their areas.

The Governors of eight States have issued PT Phone Home Day proclamations. The AFL-CIO has issued a national statement of support, as have the VFW, Vietnam Veterans of America, Telephone Pioneers of America, American Legion, Paralyzed Veterans of America, and many other organizations.

In a May 29, 1993 broadcast from the Oval Office, President Clinton referred to PT Phone Home as a "stunning example of what Americans can do together at the grassroots level." Frank Dosio has also received the President's Volunteer Service Award from President Clinton.

On May 16, 1992, Jim Sherwin, a quadriplegic patient at the Castle Point Hospital, received his bachelor's degree in psychology. This has been made possible with the use of special equipment donated through the PT Phone Home program.

On May 28, 1992, David Dickinson became the first paralyzed cadet to graduate from West Point. Without the phone system and equipment at Castle Point, he would have received a medical discharge in his senior year.

A GAO study done in July of 1991 indicated that bedside phones in a VA hospital saved 1,800 to 2,000 man/hours annually, or the equivalent of adding another nurse to the staff.

Patient morale improved, and one hospital reported a 50 percent reduction in nighttime medication after the installation of the patient phones. Morale improved among the staff as well, including the administrative levels.

PT Phone Home, Incorporated, provides patient telephones, jacks and wiring through fundraising done by the various organizations that support the project. Labor is donated by local unions and other volunteers. Local telephone service is provided through the individual hospital's phone system at no cost to the veteran.

Upgrades to the phone systems, if needed to handle additional volume, is paid for by the VA's Central Office. Long distance or toll calls are the responsibility of each veteran. They may call collect, use a credit card, or a debit card. Indigent patients are provided for with a separate fund developed by the local PT Phone Home Steering Committee or hospital voluntary services organization. These funds ensure that all patients can make emergency calls and holiday calls to their families and loved ones.

These veterans are the men and women who have been willing to place themselves in harm's way to protect and preserve freedom at home and abroad. Surely we can provide them with the simple freedom of a telephone at their hospital bedside.

The primary purpose of PT Phone Home is to provide much needed telephone service at the lowest possible cost to our veterans. The added benefit of what President Clinton referred to as "a stunning example of what Americans can do," is that this is also being done at the lowest possible cost to the taxpayer.

Thank you for your time.

[The prepared statement of Mr. Thistle appears on p. 113.]

Mr. EVANS. Thank you, Dave. We appreciate your testimony.

I want to tell you that Congressman Jack Quinn is busy with another Committee markup. He told me yesterday he very much appreciated what the project has been doing at the Buffalo VAMC. He appreciates your work, as I do. One person can make a difference. Everyone that has been involved in that coalition continues to be involved, the IBEW in particular. We know that this may be a more basic or lower end type of technology, but it is very important to helping individuals when they are patients. We also know it is going to be important for the VA if they are going to be competitive to provide phone service in the rooms of veterans. It is really a quality of life issue for patients. We appreciate your program and efforts very much.

After I recognize Marilyn I am going to turn the gavel over to Congressman Gutierrez because of a markup in another committee on which I serve.

Marilyn, you may proceed at this point.

STATEMENT OF MARILYN CADE

Ms. CADE. Thank you, Mr. Chairman.

As a leading corporation involved in building and operating key aspects of the national and global information infrastructure, AT&T appreciates the opportunity to discuss the NII and the role that it can play in supporting the delivery of health care information and services to our veterans and to all Americans.

My written testimony provides greater detail, but today my comments will briefly define the NII, highlight some of the examples of the use of telemedicine today at the VA and other places, and close with some suggested areas for how this committee may help to ensure that the VA continues to work with the private sector to evolve the standards and interoperability issues so vital to ensuring that health care information is accessible via the NII.

The NII, also known inside the beltway as the "information superhighway," we think of as an interrelated and interconnected set of four elements beginning with information appliances, everything from a telephone to a laptop computer to a desktop computer to a mainframe, but also including fax machines, television sets, radios, pagers, and all the kinds of devices that we are so accustomed to in accessing and manipulating information.

The second area of the National Information Infrastructure are the communications networks that so often get thought of first as the information superhighway, and the information that transmits over those communication networks we think of as the third element of the NII, everything from large electronic databases to centralized software applications but also to entertainment.

The final and fourth element and one which is perhaps the most important is people, all of us using the NII for a wide variety of uses in our daily lives, in our business lives, in our communities, entertainment, sales, education, research, the arts, health care, intelligent manufacturing, transportation, and banking. The NII of the future will ensure that information is exchanged as easily and readily, as securely and as affordably as today's voice telephone call. The potential that we see for the NII in helping us to improve our quality of life, to improve access to health care, and to lower the cost is tremendous, and our Nation's health care systems must be among the early users of this enhanced NII, using it to bring information to decisionmakers, whether they are doctors or nurses or managers and administrators of health care or patients and their family.

Clearly, the need for change in our health care system is recognized not only by policy makers here in Congress and in the Administration but to American business and, more importantly, to all of us as citizens. Expanding the reach of the care giver to the patient and extending the care giver's access to knowledge sources has become a critical part of improving access and lowering cost, and to make meaningful and sustainable change we must also change how information is gathered, managed, and delivered throughout the present health care system.

We believe the NII can help to deliver an environment where every health care professional and every patient and consumer has access to the kind of information that helps them to make more informed decisions. This certainly represents a dramatic change in how we deliver and manage health care, regardless of the form of health care reform finally approved by Congress. We think the need for this change will continue to be a major challenge. But one where we think significant progress has been made. We have seen some of it today. We have talked about it today with other witnesses. The use of telemedicine in bringing health care to the patients, wherever they are, does offer dramatic potential.

We think of telemedicine as the combination of telephony, computers, imaging, and video communications to support clinical medical decisions but also to support continuing medical information and medical consultation with experts.

To briefly highlight an additional example that the VA is engaged in, they are using videoteleconferencing technology to bring enhanced health care to veterans located in rural northern Wisconsin in a biweekly physical rehabilitation consultation clinic, linking Twin Ports where patients are located with a practitioner in Minneapolis. Nurses or physicians' assistants assist the patient, acting as the hands of a remote physician to perform any necessary manipulation during the tele-examination. Prescriptions and physical therapy plans are transmitted, and upcoming appointments are scheduled. Residents and physicians located in that remote clinic participate in the same training as their counterparts in Minneapolis.

A second non-VA example I would like to mention also addresses the rural area. At the University of West Virginia, the Robert C. Byrd Health Sciences Center at Morgantown uses an interactive audio and video communications network to support 24-hour medical consultation, emergency assistance, and continuing education to reach health professionals in six rural hospitals and also to reach the community, patients, and their families in those hospitals. Continuing medical education is provided not only to the health care professionals but wellness clinics are conducted for residents of the local communities who can come in and talk to a health care practitioner about the wellness and nutrition concerns that they have.

There are certainly policy barriers and other kinds of barriers that we need to address to ensure that telemedicine can be more ubiquitously available and more affordably available. The use of test beds, which previous witnesses have addressed, we think is very critical, and AT&T is participating very actively in a number of test beds, some of which are jointly funded with industry and Government, some are entirely industry led and funded by a consortium of industry, but the collaboration between Government and industry in the area of test beds we think is very critical to ensure that we address the areas of emerging standards development and adoption, the areas of reimbursements for the use of teleconsultation, and telecommunications.

Another issue which remains before us is extending the HPCC program from the precompetitive research and development agenda into test bed and demonstration projects. Pending legislation, H.R. 1757, and its companion in the Senate (S. 4, Title 6) can play a critical and needed role in this area. This legislation will be in conference soon, and we hope it will be speedily approved.

As industry participates in these test bed projects, it makes great sense to us that the VA and other Government agencies partner with industry in these areas so that we can move forward together in addressing some of these critical areas.

I will be happy to answer any questions.

[The prepared statement of Ms. Cade appears at p. 115.]

Mr. GUTIERREZ [presiding]. Thank you very much for your testimony here this morning.

I guess I would like to hear Dr. Carter maybe comment on—I know you don't have prepared text, but please feel free to talk to us about and comment on the other people and what your view of the telemedicine is.

Dr. CARTER. Thank you for having me here, and I will be glad to comment.

I am kind of piggybacking on some of Mr. Elias's references to some test beds and projects that we are doing at the University of Washington. I can touch briefly on those.

We have kind of a unique test area in the university because we have what is called the WAMI program. For those of you who aren't familiar with it, it is Washington, Alaska, Montana, and Idaho. We are the only medical school in that four-State area, and it actually makes up a little more than a quarter of the entire United States land mass and yet we only have 2.6 percent of the U.S. population. So we have a lot of rural and remote areas, and particularly up in Alaska we will have patients referred down from islands that have to get here from seaplanes, sometimes multiple planes, very expensive trips.

One thing we are hoping to do with extending the telemedicine in the WAMI area is to decrease costs that we are not seeing reflected just in the patient billing but costs for the patient and their family to make trips down as well as the mental duress of coming down to, say, Seattle to see a medical problem.

The University of Washington selects medical students from the four-State area. We also run the residency programs in the area, and we coordinate with the health clinics throughout this area. We also are involved in continuing medical education as well, and we also work with the VA hospitals that are throughout this area as well. In fact, the one in Seattle is part of the university system. It is very tightly integrated. It is a rotation with all of our medical students and residents.

Last year we had what is called the Medcon. It is a medical consultation by telephone in this area, and we received over 28,000 phone calls on consultation with specialists, and this was all done at no charge, and what we hope to do now is to expand upon this with these modalities, getting images and patient information in and greatly expand rather than just using the telephone.

I can just briefly allude to a couple of projects, demonstrations that we are doing, and I don't want to go on too much longer. One that is kind of interesting—it is a little bit timely today with the 25th anniversary of the moon walk—is that we are doing an interesting project with NASA involving JPL, NASA, Cal Tech, and the University of Washington with the ACTS satellite that was launched September 12, this last fall, and it is a very interesting project that JPL has developed a portable satellite transmission link. The actual antenna is about the size of a bicycle seat, and in a portable van, and we are going to be going out in our remote areas and actually sending back telemedicine, radiology, all different types of images using this satellite. We can actually even transmit while the vehicle is moving. So we have a tremendous portable capability, and we can go into areas that don't have this type of telecommunications available and use a higher band width, and we are also going to link in with phone systems and existing communication and try to test some of the different types of hybrid systems for getting these images back to the University of Washington.

We are going to send all types of images back. Some of the types you saw today as well as CT images, MRI, (magnetic resonance images), and the nice thing is that most of our newer radiology images are already digitized so we will be able to send these images back totally intact as the same image that we are seeing out in the field, and we will be able to evaluate these images on both ends just to see how well these are being received.

We are also going to coordinate with mobile vans. I am sure you have seen the mobile vans that go around with CT MRI type scanners, and we are going to be able to link and do patients and get them back to the University of Washington while the patients are being scanned, and we are going to try to do quality control as well as have subspecialists look at the examinations. This is one big advantage we have in a medical center like the University of Washington, is we have—even though we are going to a broader based emphasis in our health care system to get more primary care physicians out, we still have a strong need for subspecialists, and even radiology is divided up into multiple subspecialty areas nowadays, so we can have a neuro radiologist look at something that is a particular neuro problem and coordinate it with unusual cases or research that is going on.

So we are going to be sending cases back and having them reviewed by subspecialists, and there is also what is called a Media Station 5,000. It is an inexpensive way to look at videos, so we can send patients' ultrasound back, and for those of you who have seen ultrasound, particularly with obstetrical where you are looking at an early fetus, we are going to send these back over the satellite, and we are going to be able to look at ultrasound as it is being scanned on the video.

So this is another demonstration of video other than what we have seen today, and it may prove to be very useful in terms of saving patients travel and that sort of expense.

I am not going to go on any longer. Right now I can refer back, but we are working on some other projects too. We are doing a telemed project with ARPA for battlefield deployment to bring telemedicine back, and we are working on interfaces through the Human Interface Technology Laboratory where we are able to use some of the visors and some of the virtual reality connections with telemedicine, so we are set up to be a test bed.

We aren't as far along as Dr. Sanders is where he has actually up and operating. We have projects that are under way and will be coming—be more developed within the next year.

Mr. GUTIERREZ. Dr. Carter, are you working with the VA with Washington University? Are they connected to this project?

Dr. CARTER. Yes, we are working with the VA, and the VA is actually part of our rotation. It is one of our integral hospitals. I was actually on the faculty there full time, a number of years ago, back in the early seventies, and it is one of the rotations for all of our staff and residents. So we are very closely integrated with the VA.

We are actually forming a link this summer where we are going to have a—basically a T-1, a 1.5 roughly megabit data line where we are going to be covering call for the residents and staff, so that right now if we have Harbor View, which is the trauma center, tie us up, then we have the actual medical school with a large hospital, and then we try to cover the VA, and the problem is, you will have a gunshot wound downtown, they will need you to do a myelogram or a CT, and somebody also will have an emergency at the VA.

So we are going to be linking this through telemedicine and trying to cover particularly the call on the unusual cases that way.

Mr. GUTIERREZ. I guess one of the things that comes to mind with telemedicine and communication and not having the doctor present is, do you think that we should be concerned or measures we can take to ensure that the relationship doesn't break down between patient and doctor? And this question is to you, and Mr. Elias also might want to respond, just in terms of them not being in the same room and getting this so computerized so it is depersonalized.

I don't know, it seems to work for me that someone who kind of has a soft voice and kind of says he cares too gives me a little confidence to take the medicine later on, that it is actually going to do better. I don't know. Maybe they just gave me some sugar pills.

Dr. CARTER. I agree with you fully. In radiology—and I think Dr. Sanders will probably elaborate on this in a more clinical aspect—as radiologists, we are basically looking at images, although for those of you who have seen radiologists, we do procedures on patients a good part of our day as well, just from simple routine upper GI exams and that sort of thing, and that will have to be done with a radiologist present.

The place we will be able to help, and I think it will actually improve contact for the patients, is, we are going to be able to get images around to the subspecialists almost immediately, most of our orders come from the referring primary physician. So we will be able to look at the radiograph with the primary physician while he is with a patient, or she is with a patient, and discuss it at the time, and I think what may be very helpful is at that point we should be able to decide with the patient and the patient's referring physician what the next appropriate test might be rather than this expense now where we say, well, let's get an MRI, let's get a CT. I am hoping that it will actually get us closer to the patient in the interaction with the primary physician.

Mr. ELIAS. The only comment I might make is that I think we have to look at it in terms of the alternatives. Some of the territory we serve, people have to travel, you know, 400 miles, and while I am sure they like more the sense of presence, the speed probably becomes very important too as an offsetting factor, and the networks that are developing are going to create a far greater sense of presence because of the quality.

Dr. CARTER. You know, one other thing, if I may interject also, is that a number of outlying clinics and small hospitals in rural areas don't have radiologists. So what happens is, they will take films and they will sit there sometimes for one or two or even three days, and they will have a circuit rider, someone that might cover five or six small towns, they may not get there for two or three days, and at that point you can pick up something that should have been picked up acutely.

So I think an advantage for the patient is going to be, these are going to be sent out right after they are obtained, and they will be read by the radiologist at the time. So I think that will be a big advantage for the patient.

Mr. GUTIERREZ. I just want to comment to Mr. Thistle that I think the program that you are involved in is very important because I have a funny feeling that patients are feeling better just having that ability to communicate. Maybe—I don't know if you have any information or data, but it seems that if we could link or you could link improvement in the health of the patient and that ability to communicate so that there is some direct correlation in terms of—I know what it does for him humanly. I mean he has got to feel better being able to talk to people, but does it actually make him get healthier?

Mr. THISTLE. I think we probably already have some documentation to that effect. We have letters from the families of veterans that indicate that kind of thing. But my firsthand experience—I am a patient of the VA hospitals as well, and my firsthand experience is that having the telephone and the opportunity to contact your family can make the difference between whether or not you have the will to live.

Isolation in a VA hospital, no matter how good the care is, if you are completely isolated from the people outside of there that you care about, your spirit and your will deteriorate, and I am sure that can be documented.

Mr. GUTIERREZ. Thank you.

I want to wrap up and ask Marilyn maybe if she can tell us what is going on in terms of, are you doing with the VA? Are you doing anything with Government right now in terms of AT&T and the private sector? Just maybe give us a little broader understanding of what is going on out there right now.

Ms. CADE. AT&T provides a significant portion of the FTS 2,000 Network which, of course, is used by VA, and we are working with them in a number of settings. We are also, as you know, very active participants in a number of test beds.

Besides providing infrastructure components to the VA, we also try to work very closely with the VA as well as with other Government agencies to understand their uses of information technology and to represent those needs into the standards work that we do. Over 700 people at AT&T work in domestic and international standard setting bodies to try to accelerate the development of industry-led standards and then to get those standards accepted not only domestically but also globally.

We are working as well in a consortium called the National Information Infrastructure Test Bed that a number of Government agencies are involved in, and we are hoping that we might be able to link the VA into that.

The NIIT is an effort to accelerate interoperability across diverse systems, and we are using real applications to test for interoperability among the different technologies that are provided and ensure that the end user in the application really achieves the benefit of the technology.

We talk a lot about the use of standards and that that is the effective way to achieve interoperability, but to an end user, all our customers care about, all we in our daily lives care about, is that the information is easily passed from one point to another, that it is received securely with privacy, if that is what we are looking for, and that it can be done affordably, and we are trying to accelerate that process through working collaboratively in some of these test beds.

We are also participating as a member in the Trauma Arbitronic Care TAC (ARPA) which was awarded last year to a consortium of companies, helping to accelerate the development of standards and technology in the wireless area.

One of the things that all of us, I think, look forward to in our lives is being tetherless, being able to have information, whether it is voice information or text information, reach us wherever we are and not having to go to a phone or go to a computer terminal, and some of the work that ARPA and some of the other Government programs are funding in precompetitive areas, collaboratively with industry, is helping to accelerate how we begin to miniaturize batteries so that we will be able to have portable devices that are usable over longer periods of time, are more sustainable so that if we drop our—the wrist watch, the Dick Tracy watch that Dr. Silva referenced, if you drop it, you don't have to worry about whether or not it is going to break.

Some of the precompetitive research that is going on in these areas is, again, shared by Government and industry and is helping to accelerate some of that technology.

Mr. GUTIERREZ. Thank you so much.

Congresswoman Brown, do you have any questions of this panel?

Ms. BROWN. No, thank you, Mr. Chairman.

Mr. GUTIERREZ. Thank you.

Thank you so much for being here this morning with us.

Mr. GUTIERREZ. The members of our final panel are Michael McDonald, Dr. Jay Sanders, Neal Neuberger, and Duffy Soto.

Michael is Senior Advisor, Health and Telecommunications at the C. Everett Koop Institute, Berkeley, CA. Dr. Sanders is President, Interactive Telemedicine Systems of Coral Gables, FL, and Director of the Telemedicine Center, Medical College of Georgia, Augusta, GA. Neal is a Senior Partner with the Center for Public Service Communications, Arlington, VA. Neal and the Center have been very helpful to the subcommittee as it has prepared for this hearing, and their assistance and contributions are greatly appreciated.

The chair is now especially pleased to recognize our colleague from Florida, Corrine Brown, who will introduce Mr. Soto.

Ms. BROWN. Thank you, Mr. Chairman, and thank you for holding today's hearing on VA health care and information technology and for providing Lake City Community College, which is my district, with the opportunity to tell this subcommittee about their innovative proposals to establish a partnership with Lake City VA Medical Center to provide rural veterans with greater access to health care through the use of its unique technical communications delivery concept. The proposal will be explained in greater detail by Mr. Duffy Soto, Chairman of the Division of Telecommunications and Advanced Technology at Lake City Community College. Mr. Soto is recognized for his creation of the multipurpose single infrastructure telecommunications concept. It is my pleasure to introduce Mr. Soto.

Mr. GUTIERREZ. Thank you very much.

Michael, please proceed whenever you are ready.

STATEMENTS OF MICHAEL D. MCDONALD, SENIOR ADVISOR, HEALTH AND TELECOMMUNICATIONS, C. EVERETT KOOP INSTITUTE, BERKELEY, CA; JAY H. SANDERS, M.D., PRESIDENT, INTERACTIVE TELEMEDICINE SYSTEMS, CORAL GABLES, FL, AND PROFESSOR OF MEDICINE AND SURGERY, DIRECTOR, TELEMEDICINE CENTER, MEDICAL COLLEGE OF GEORGIA, AUGUSTA, GA; NEAL NEUBERGER, SENIOR PARTNER, CENTER FOR PUBLIC SERVICE COMMUNICATIONS, ARLINGTON, VA; AND DUFFY SOTO, CHAIRMAN, DIVISION OF TELECOMMUNICATIONS AND ADVANCED TECHNOLOGY, LAKE CITY COMMUNITY COLLEGE, LAKE CITY, FL

STATEMENT OF MICHAEL D. MCDONALD

Mr. MCDONALD. Yes, thank you very much.

Mr. Chairman and members of the subcommittee my name is Michael McDonald. I am senior advisor on health and telecommunications at the C. Everett Koop Institute.

The Vice President has requested the former Surgeon General, Dr. Koop, and the Koop Institute to help develop the leadership necessary in the private sector to build an optimal health component for the National Information Infrastructure. We have been working with key private sector players over the past 10 months to identify and build this leadership.

Veterans, in our opinion, are a very important subpopulation of the American citizenship. They have special health concerns that we have to address. The Health Information Infrastructure and telemedicine have significant potential benefits for veterans and for the VA's ability to manage quality and access of care in a period which will require containing, if not reducing, medical costs.

In my brief comments to you today I am going to provide an overview of the health component of the National Information Infrastructure and also talk about the special opportunities health informatics provides the VA and veterans. Since many of my colleagues have focused on the clinical information systems in telemedicine as well as the administrative information systems, I am going to direct my comments more toward personal health information systems, information systems that go directly to the general public, population databases and community networks. I will also address some special challenges that these technologies may help the VA with, some of which are not well understood within the medical system.

We are at the convergence of two significant societal revolutions in America today, health care reform and the National Information Infrastructure. Together they may represent as significant a change in the patterns of disease and health in our populations as the change from the agricultural age to the industrial age.

These changes in veterans health will come partly from improved health-oriented communications and computer applications like telemedicine. They will also result from changes toward an information-based economy which a large portion of veterans are still ill prepared to participate in. Part of the challenge for the VA will be to employ health applications in VA hospitals and clinics. Yet perhaps the larger task will be to help veterans participate and thrive in an American society which has an increasingly dominant information-based economy. Personal health information systems and VA-sponsored community networks will be key portals or doorways for veterans to enter the information age.

As the American health system moves continually upstream toward managed care and the management of risks before they manifest in clinical problems, the VA could benefit from employing a broad health informatics strategy. To optimize the health of veterans while controlling costs, the VA should consider deploying a VA health information infrastructure with seven elements: First, administrative information systems; second, educational information systems; third, clinical information systems; fourth, telemedicine; fifth, personal health information systems; sixth, population databases and system coordination; and, seventh, community networks.

The health component of the NII, or the National Information Infrastructure, will be referred to here as the Health Information Infrastructure. I assume and suggest that the VA Health Information Infrastructure will be fully integrated and interoperable with the NII, the National Information Infrastructure and health care reform initiatives. In fact, if the VA system continues to innovate with the HII, the VA is likely to make substantive contributions to the health component of the NII as well as to the informatics elements of health care reform.

The VA, with proper direction and funding, could be a key test bed for the National Health Information Infrastructure and in so doing provide information-enhanced services to veterans early on.

Now I will give an overview of the Health Information Infrastructure; first, the administrative information systems, many of us are acquainted with these. This is crucial to administrative simplification in the health care reform process. It has to be with unifying claims through an electronic form and electronic data interchange.

Often we refer to the administrative information systems as being a mechanism for cutting cost. It represents about $6 billion per year of medical savings. This is very small relative to other elements of the infrastructure. Clinical information systems represents maybe $15 billion worth of savings per year; telemedicine perhaps $15 to $20 billion; personal health information systems more likely $40 to $60 billion per year by around the year 2000; population databases perhaps around $20 billion; community networks, it is very hard for us to estimate yet what the cost savings might be.

Given the short time available today, let me mention a key challenge that the VA is going to have to face. In 1966 about 300,000 Project 1,000 veterans were accepted into the military, and what we find is that that population has about 150 percent to 200 percent higher costs than the veteran population as a whole. If we extrapolate that into the data we are getting out of the 1990 census, we are seeing that veterans between the age of 25 and 40 are homeless at a rate of about 200 to 300 percent of the nonveterans. We are seeing institutionalization for mental health reasons at about 20 to 30 percent higher in ages of 30 to 40 and incarceration in correctional facilities about 80 percent higher. So there are significant problems in veterans being assimilated back into society, especially in the information-based economy.

So I would recommend that the VA build a very broad Health Information Infrastructure. I suggest that it become a test bed so these information enhanced services can reach veterans early. The VA should pay special attention to these veteran populations early on in the process and try to develop services like personal health information systems and community networks which will be doorways for their participation in the information age.

Thank you.

[The prepared statement of Mr. McDonald appears at p. 127.]

Mr. GUTIERREZ. Thank you very much.

Mr. Soto, you may proceed with your testimony and welcome.

STATEMENT OF DUFFY SOTO

Mr. SOTO. Thank you very much, Mr. Chairman, and thank you, Congresswoman Brown, for her continued support and confidence in Lake City Community College.

I have made available to the members of the committee a brochure that briefly describes Lake City Community College's multipurpose telecommunications concept and one that we, along with officials of the VA Medical Center in Lake City, believe would be extremely advantageous in the delivery of some veterans services and go along quite well with Mr. McDonald's description of the community-based information.

Basically, we reside in a rural area and we feel that this information system could be of extreme advantage to veterans that live in the rural areas throughout the United States. Basically, the system we refer to as MPSI stands for "multipurpose single infrastructure" and uses existing technology to deliver two-way interactive communications in a dependable and cost-effective manner.

Now the basic advantages of our concept are:

One, it makes extensive use of existing infrastructure and expertise and technology, saving millions of dollars in construction costs.

Two, it can deliver two-way interactive capabilities directly to the veteran household using ordinary and available television services; no special equipment at all is needed for this.

Three, it can deliver health care information and a myriad of other services directly to the household of the veteran who resides in the rural areas of our country.

Operational costs are extremely low, making this system one of the most cost effective information delivery systems available.

Five, it can interface and easily is upgradeable to new technology and interfacing with other communication systems that may come on line. Most importantly, especially if you are a veteran, this concept can be employed now.

There are thousands of ITFS systems like ours located throughout the United States, most, like ours, underutilized. Using the MPSI concept, these systems can be used much as we propose here, giving millions of veterans access to their local or regional VA service provider. I am here today to try to explain how this system can be of great advantage in improving services to our veterans and doing it now.

One, this idea addresses a number of the House Veterans Affairs Subcommittee on Oversight and Investigations interests, including the use of communications and information technologies to enhance health care for veterans; two, it demonstrates a cooperative effort between Federal and non-Federal agencies or organizations to enhance health care for veterans; and, three, it provides a demonstration of cost-effective use of communication and information technologies to reach veterans who otherwise may not be able to have access to timely and current information regarding health care services and benefits.

The college operates an extensive system in an area that is extremely rural. It is five counties. The district is twice the size of Rhode Island. Inside that district reside 12,030 veterans served by the VA Medical Center in Lake City.

Early in the year we had a meeting with officials of the VA who proposed a way that they may be able to directly access their veterans in order to provide information, medical information, policy change information, even triage on a one-to-one basis.

We proposed that a cooperative agreement between our groups be formed whereas the VA hospital, VA Medical Center, would use our telecommunications system and link it with an STL, or studio to transmitter link, located at the veterans hospital in Lake City to where we could then, directly from the Department of Veterans Affairs facility, deliver whatever information that they may deem possible directly to the household of the veterans in this five-county district.

There is a severe lack of public transportation. Unlike this area here, there are virtually no buses, virtually no taxis in that area. Therefore, the veteran has to travel sometimes a distance of 80 miles round trip. Keeping in mind that the average income in these areas is 50 percent of the national average, so them having to make two or three trips a month or a week to the VA facility in Lake City can tax whatever resources they have available.

Using our system, the officials at the VA hospital can effect live, two-way interactive communications that start at the VA facility. They can hold teleconferences and go directly into the veterans' homes as long as they are attached to the cable television system in those areas. The veteran, in the privacy of his home, can pick up the telephone and communicate back with the officials directly at the VA facility. Sixty percent of the infrastructure needed to carry out this is already in place and can begin to be used.

The system has a myriad of versatility attached to it. It can be used to deliver health care information; it can be used to deliver policy changes, availability, and other areas of information that the veteran needs to have access to on a regular basis but, because of his distance or resources, may not have time to do or access to.

Hospital officials have expressed a desire to become more responsive and are very excited about the possibility of using our partnership with Lake City Community College in order to reach the veterans. We have long shared a common interest, we have long been partners in other areas, because Lake City Community College has an allied health facility in which the VA hospital participates in the training of our people.

In closing, I would like to say thanks to the committee for this opportunity to come before you to hear about this proposal. It is not often that a small community college located in a rural area finds itself in such a flattering position. But please allow me to reaffirm how strongly I believe that this cooperative effort between the VA hospital in Lake City and Lake City Community College can help the veterans in the rural areas, one, by taking advantage of the existing resources that are there, and by combining them with a good dose of creativity and vision coupled with the cooperative spirit of these institutions. We can together effect positive change while at the same time setting into motion a cost-effective example that can be used as a model for others who operate these thousands of systems that exist in the United States of how technology and telecommunications can positively and cost effectively be used to affect thousands of lives, no matter how far in the woods you might live.

Thank you very much.

[The prepared statement of Mr. Soto appears at p. 134.]

Mr. GUTIERREZ. Thank you very much.

Dr. Sanders, we are very interested in what you are doing and looking forward to your testimony this morning.

STATEMENT OF JAY H. SANDERS, M.D.

Dr. SANDERS. Thank you very much.

I have been involved in telemedicine for 27 years, so I guess you can understand how much I appreciate finally getting an invitation to talk about it.

I think the other thing I should caution the committee about is that I guess someone who has worked on something for 27 years probably is not the most objective person in the world and probably has a bit of stubbornness in him.

The system in the State of Georgia, associated with the Medical College of Georgia, began in November of 1991 with a single hookup from the academic medical center to a hospital 130 miles southwest of Augusta, GA, where the medical college is. By September of this year that system will have expanded to 60 sites within the State and in effect, based upon the system functionality, a patient any place in the State of Georgia will be able to be examined by a physician any place in the State of Georgia.

The structural and functional network includes two academic tertiary care centers, those being the Medical College of Georgia and Emory. Those two academic medical centers will be networked with nine comprehensive community hospitals strategically located in the State in terms of their being a resource for underserved facilities in that part of the State. From each of the hubs, the tertiary hubs as well as the secondary hubs, there will be three to four satellite facilities that network with them.

The communication infrastructure, however, is such that a patient, for instance, in southwestern Georgia who has a particular problem, if they access their secondary community hospital and that secondary community hospital expertise cannot handle the particular medical problem that the patient has, that patient will be able to be examined by any physician within the State of Georgia.

Now let me give you some idea of the functionality of the system, but first let me tell you that all of the technology is off-the-shelf technology. The technology and the systems were put together based upon assessing the end users' needs. We didn't go in with a system and say, "Here is your system, use it as you see fit." We first went to the end user, made a determination as to what their referral base needs were, and configured the system to meet those needs.

The system is open architecture, it is modular, it has approximately 15 major components, and when one of the components reaches its technological half life, we just unplug it and plug in the new component, we don't have to throw the entire system away.

The system allows the cardiologist, as an example, to listen to that patient's heart and lung sounds, review the chest x ray, electrocardiogram and cardiac ultrasound, and that cardiac ultrasound can be done in real time. It is a totally interactive system.

The gastroenterologist, as an example, can actually look in the patient's stomach even though that gastroenterologist is a hundred or a thousand miles away. The orthopedist can look in the joint space of the patient a hundred miles away. The ear, nose, and throat specialist, utilizing a very simple off-the-shelf camera, can actually look in the middle ear of the patient and our opthalmologist can look at the retina of the patient.

In essence, what we have done is to create an electronic umbilical cord between the academic medical center and the remote rural community hospital.

In addition to the rural hospitals that are now networked with the system, we are also networked with public health facilities and freestanding ambulatory care facilities, and within the next 30 days we are going to hook our system up with over a hundred distance learning sites within the State of Georgia, K-12 classrooms, and with our Department of Pediatrics in a two-phase program, the first phase being a preventive health care program, we are going to talk to our children about safe sex and cigarette smoking and Mexican food and popcorn. We don't know what is going to be next that is not going to be nutritious.

In addition to that, one of the biggest problems that we have in K-12 classrooms today is the fact that when a child gets sick, they get sent home, and they get sent home to an empty home. The parents are working, and when the parents come home at 6 or 7 o'clock at night and they realize that the child needs to be seen by a physician, where do they take that child? They take that child to a hospital emergency room, totally inappropriately. We are going to begin to introduce episodic care with the school nurse with our Department of Pediatrics.

Now what I have told you up to this point in time is really the beginning of the story because the next network that we are deploying within the next 3 months is something similar to what some of the other witnesses this morning have discussed, and that is the electronic house call. We are going to convert the black bag house call to an electronic house call, and it turns out that many homes in the United States have today the communication network in their home that will support the same type of telemedicine consultations that we now have between hospitals.

With a very simple reverse amplifier attached to the coaxial cable that brings you CNN and HBO and Cinemax, I can bring you your physician, totally interactively, in the same way you and I are talking and seeing each other at the present time, but in addition we will be adding what we call a smart box, and the smart box will contain an electronic stethoscope and electrocardiogram, a Doppler, a digital blood pressure cuff and pulse meter, and a pulse oximeter to assess blood oxygen levels.

In addition, in a little drawer underneath that, your TV, there will be a $20 device called a peak expiratory flow rate meter which will assess airway flow, airway resistance, and in addition a system called the Istat system which allows me, with a single drop of blood similar to what a diabetic now does at home to assess his blood sugar, we will be able to assess blood electrolytes, hemoglobin, hematocrit, and blood gases.

We are going to deploy this system in 25 homes in the greater Augusta area within the next 3 months. The patients will have been selected based upon the fact that we now consider them to be so-called revolving door patients, patients who have chronic illnesses with frequent acute exacerbations.

The child that ends up in my ER this evening with status asthmasticus respiratory failure, intubated, and in the intensive care unit, if I had taken that child's peak expiratory flow rate 2 weeks ago and watched him or her do it over the telemedicine system and listened to their lungs with the electronic stethoscope and noted the beginning of some wheezes in the lungs, I could have started that child on a very simple medication called an aerosolized steroid, and that child would not be in my emergency department this evening.

So from our standpoint, the electronic house call will be a critical factor in the health care delivery system that we are developing.

Finally, let me give you some statistics that we have. Since the introduction of the telemedicine system, 85 percent of the patients who previously had to be transferred out of the rural community to a secondary and tertiary care center have been kept in the rural community. When you consider the fact that if I put you in a rural hospital bed today in Georgia, your per average day cost is $800 a day, but if I transfer you to see a dermatologist or a cardiologist at the Medical College of Georgia, your per average day cost is $1,300 a day, you can see the economic impact of keeping 85 percent of the people in the rural community. You are keeping the revenue stream in the rural site with the rural hospital, and supporting the rural hospital in essence means supporting that entire community because the rural hospital ends up being the major employer in most rural communities. You keep the revenue stream with the primary care physician in that rural site, and yet you decrease the overall costs of health care to the patient or whoever is paying that patient's insurance bill.

From a continuing medical education standpoint and from my standpoint, one of the greatest values of the system is the fact that there is an on-line interactive communication between the primary care physician and the subspecialist, and although the data is, at this point in time, anecdotal, to me it is probably the most important data, of the comments made by the primary care physicians at these remote rural hospitals, saying that, gee, for the first time in years we feel like colleagues again, we feel like we are back at the medical center, because we interact with them on a daily basis, we see them and talk to them, and perhaps one of the other things which is quite sensitive, but I will be very candid about, is the fact that there is not only professional isolation in the rural community, there is professional isolation in the academic community as to what is going on in the rural community.

I have spent my entire life professionally in academic medicine as a teacher. That is ironic, because I have never been in the real world. I have a very special type of patient, a very special type of practice. If tomorrow I had to go out into the real world, I would not have the slightest idea what I would need to do to open up a practice, and yet the irony is that I am the one that is educating the physician that eventually goes out to the rural community.

So one of the nice things that we have found is that it is getting rid of the professional isolation on both sides of the coin.

Thank you very much.

[The prepared statement of Dr. Sanders, with attachments, appears at p. 141.]

Mr. GUTIERREZ. Thank you, Dr. Sanders, and we will hear last from Neal Neuberger, Senior Partner, Center for Public Service Communications.

STATEMENT OF NEAL NEUBERGER

Mr. NEUBERGER. Thank you, Mr. Chairman, and for your earlier remarks. It has been a pleasure working with both the committee and all of the staff on this issue.

I just want to start by saying, though, that I happen to know that Dr. Sanders is lying just a little bit when he says that he never gets invitations to speak. He is widely respected and speaks widely and knowledgeably on this subject.

CPSC was established to support public sector applications of communications and information management technologies in health care and humanitarian assistance. Since it was established in 1990 we have seen a tremendous proliferation of interest in the whole issue of both telemedicine and health care informatics. There is a heightened and growing awareness, that communications and information technologies can be valuable tools in the organization, delivery, and financial management of health care services, and we have seen a lot of that today.

Over time, we think that one of the tests is going to be whether or not we can, in fact, maintain community standards of care, and this issue is going to be of significant interest to administrators, payers, including benefits managers, Governments of all types, insurers, and patients.

In addition to many of the clinical benefits which were pointed out today, as Mike and others on this panel have suggested, there are a lot of added benefits to be gained from the use of these communications technologies in the area of community health, home health care, prevention, economic development, as an issue in rural areas, and yet we think that these voices have been somewhat soft-er than at least some of the clinical applications that are only now beginning to emerge.

We also think that over time community alliances of users—that is, education, agriculture, economic development, and health care interests—are going to have to get together because of the installation and upkeep costs of maintaining the information infrastructure, and so it is going to require a base of public support.

In terms of a survey, just real quickly—and much of this was mentioned—there are more than a dozen Federal agencies with responsibilities with regard to this field. Each brings to the debate a unique orientation or specialized view. The Department of Agriculture, through REA, is interested in public utility. The Department of Commerce is concerned with technology development and radio spectrum allocations, the Department of Defense is interested in field support operations, military medicine, and patient records, NASA develops and tests technology and provides remote health care on space missions, the Department of Health and Human Services approaches telemedicine and information technology from a public health policy and financing perspective, and DVA, as we have seen, has responsibilities, as we know, for veterans health care and patients records kinds of activities in one of the largest health care systems in the country.

As you have begun to glimpse, many of the agencies have significant grant or other available funding programs. Others, including DVA, conduct significant important intramural research which stands to substantially benefit both the constituencies that they serve but also, I think, over time in a changing health reform environment, all of the other emerging health care systems that could stand to benefit.

At CPSC, we routinely track these many efforts, and this information is contained in a document that is sponsored in part by NASA called "Telemedicine Information Technologies and Health Care, Project Tracking Document." I will make copies available to the committee and ask with your permission, Mr. Chairman, that they may be entered into the record.

Mr. GUTIERREZ. So ordered.

(See pp. 145 to 192.)

Mr. NEUBERGER. There are, as has been mentioned today, I think, many organizing efforts under way within the Government. It might be useful just to recap a couple of those. The Information Infrastructure Task Force comprised of representatives of the many different agencies and chaired by Secretary Brown, and its working group on health care which is chaired by Dr. Silva, who was on the program, is clearly a lead agency, a lead organization among the agencies in terms of being able to help put all of the disparate efforts together.

Dr. Lindberg's HPCC effort is another coordinating effort, more on the informatics side, and there are several other interagency working agreements under way, as we have seen.

There have been more than 20 bills introduced into the House and Senate in the last year. Just to mention a couple, Representative LaRocco would establish grant programs to encourage the further development of telemedicine networks in rural areas; Representative Condit, H.R. 4077, would establish uniform Federal rules governing the treatment of individually identifiable health information; Representative Schroeder has circulated a discussion draft of legislation which would create a presidential commission on telemedicine; and at CPSC we help to support the workings of the House-Senate Ad Hoc Steering Committee on Telemedicine Informatics which is headed by Senators Rockefeller and Kent Conrad, Mike Synar and Larry LaRocco. On that committee are several of the people that testified here today including Dr. Dayhoff, Drs. Lindberg and Smits, Dr. Silva, and Marilyn Cade from AT&T. There are, therefore, clearly some organized efforts going on.

There are a number of private sector initiatives which I won't get into. There are many more of those outlined in addition to the ones discussed in the tracking document, and what I would just like to do for a second is talk about a couple of the overarching principles that we see as important in this whole debate and then maybe mention a couple of possible legislative provisions.

We think that the first tenet in all of this is, to quote a phrase by President Clinton, "It is the application, stupid." As important as NII is to health care, its development and implementation must be in support of well-conceived applications in an applications-driven kind of way, and we think that that is first and foremost consideration and much of what was talked about today clearly points that out.

The second thing that we think is important is that technology, per se, should not be legislated. Technologies and delivery modes should not be legislated, and NII should not be seen as a means to promote one particular mode of delivery over another.

We also think that there should be a broad spectrum of service promoted, that it all should not be high end technologies. We have heard several of the lower end technologies using phone and e-mail discussed here, and we think that there has to be substantial community involvement on the part of industry and health care providers and the end users.

To close, let me just say that we have a series of legislative recommendations that I will also include in my written testimony. The framework exists for coordination within the IITF on the part of the administration, and the framework is, I think, also there within some of the congressional organizations that already exist to weed through the many issues that yet have to be resolved with respect to liability, confidentiality of patient records, financing, community and practitioner acceptability, ubiquitousness of service, scaleability of services, standards, and a whole range of other issues, and so we encourage the efforts of the VA.

The VA is a leader in the field clearly, and I thank you for the opportunity to testify and look forward to answering any questions.

Thank you.

[The prepared statement of Mr. Neuberger appears at p. 193.]

Mr. GUTIERREZ. Thank you so much.

Let me just start out first for Mr. McDonald.

You said we could save about $70 to a $100 billion a year in different areas of health care delivery.

Mr. MCDONALD. Yes.

Mr. GUTIERREZ. How much do we have to invest in the infrastructure, the new infrastructure, in order to save that money? What is the front end cost?

Mr. MCDONALD. I noticed that Dr. Silva wriggled out of that pretty graciously. I will comment on costs with the disclaimer.

Our concern is that it probably will cost about $200 to $300 billion for the health component of the NII, if built alone. It may be $400 billion to build the whole National Information Infrastructure, at least in its first phase over the next 15 years. However, the costs in health care can be amortized over many sectors. So it is not advisable to build the health information infrastructure separately nor does it make sense to lump all of the $200 to $300 billion on to health care. Probably the best approach is to amortize the health sector cost over time and into other sectors, and that is a little difficult to lay out in a few minutes.

Mr. GUTIERREZ. When you compare that to the kinds of applications that Mr. Soto gave us today and Dr. Sanders gave us today, how does it compare?

Mr. MCDONALD. In terms of what I think is most important or——

Mr. GUTIERREZ. You can answer on that and in terms of relationships in terms of costs.

Mr. MCDONALD. Okay. The administrative information systems will use present technology, and that is why it is being implemented and accepted into the health care reform debate so readily.

The clinical information systems actually are much more complex. There are elements of them that can be done with present technology, but there are also significant portions of them that cannot. But it is not only a technology question, it is also about human infrastructure. Perhaps the greatest costs are the human infrastructure costs which are not yet planned into the equation.

We are very concerned that telemedicine efforts are developing all over the country, and they don't seem to understand that these programs have to be grown, they can't be developed from outside alone, you have to have people who are knowledgeable about how to integrate them into the rest of the community efforts.

Mr. GUTIERREZ. Does anybody on the panel have any comment they would like to add?

Dr. SANDERS. Mr. Chairman, I can tell you what the cost for the State of Georgia network was. It was $8 million for a 60-site system that covers the entire State, and, in addition, there is a communication infrastructure which at least jumps one of the hurdles that exist in terms of implementing telemedicine, and I am talking about telemedicine in the broadest base, and that is that we now have a cost structure across ladder boundaries which is basically distance insensitive.

It used to be that to go from Augusta, GA, to this single hospital 130 miles away over the T–1 band width was approximately $4,000 a month in communication costs. That is basically because it was a toll booth every 10 feet along that communications superhighway. We have now gotten that infrastructure to be $1,500 a month any place in the State. Now that is still a lot of money for a rural hospital, but those costs are coming down dramatically.

However, when you flip the coin, let me indicate to you what the revenue stream is for a rural hospital by keeping a single additional patient in that hospital. If I change the bed census of one of the Georgia rural hospitals from 20 patients per day per year to 21 patients per day per year, that is a net revenue stream to that rural hospital of $150,000 a year. That single patient not only pays for the telemedicine technology at the site, it pays for their communications costs. Anything over and above that one patient makes telemedicine for a rural hospital basically a profit center, but at the same time we are decreasing the cost of care to the patient.

Mr. GUTIERREZ. Mr. Soto, so you need to have the—the veteran needs to have a cable at his home?

Mr. SOTO. Yes, sir. The infrastructure that we have is cable driven. We transmit over the year to all cable systems in the five counties that we operate in.

However, with the advent of wireless cable television coming on line, we have already made provisions to have a channel available off of each of those providers for which the individuals in the rural areas will likely get that cable television and be able to use it in the same manner.

The College is also in the process of building individual sites within the areas down there for distance learning purposes, which is why we talked about the multipurpose advantage of it. When we are not carrying teleconferences for the Department of Veterans Affairs, for example, we can carry interactive teleconferences on education. At nine o'clock at night you can have interactive teleconferences on other things.

As the advent of wireless and, of course, digital communications comes on line, we are prepared to adapt our system to take advantage of those so that more people can get the services that we offer, because the main telecommunications infrastructure is already in place, it is just a matter of adding, and to piggyback on some of the things that have been said in terms of cost today, you can add STL's, those studio-to-transmitter links, for as little as $25,000 to $35,000 apiece, and that would allow you to put STL's at all community hospitals and transmit back and forth across and in an interactive manner.

Our biggest problem is, in several of these areas and why we are concerned in our area in particular is because the patient-to-doctor ratio—or I should say the doctor-to-patient ratio is as high as 5,000 to one. In the five counties that we operate, there are only two hospitals, period. So we have to find a way to get health care information and provisions to those individuals where no hospitals are, and that is the basis for this particular infrastructure and this particular design.

Mr. GUTIERREZ. So what I do, I am a veteran out in Florida, and I call up and turn on my TV set?

Mr. SOTO. The basic system will allow us to say, okay, the VA in Lake City or the VA medical center is going to hold a conference at 9 o'clock every Wednesday night. When they want to do it, they get advanced notice of that.

That veteran simply turns his television on and picks up that telecast as it emanates live and in real time from the VA hospital. The VA then has the option of putting up the numbers to, say, call for different things. That veteran can be right there by his telephone watching on his everyday television and talk directly with an official, whatever type of official, whether it be admissions officer, triage, whatever, at that particular time.

Also, the sites—we have location sites. We are in the process of providing location sites much as we were talking about area hospitals, but we don't have the hospitals, so we are putting electronic sites where, in fact, two-way interactive television communications can take place. So simply if there was going to be a focus group or a town meeting, if you will, of veterans in a rural area 50 miles away, they could congregate at, say, a school classroom and do video and audio, but they can do real time audio coupled with the real time video transmissions from the VA hospital as we speak now simply by adding a simple STL hospital. We would make that operational, and those folks that have cable in those areas could immediately begin to participate.

Mr. NEUBERGER. Mr. Chairman, on the issue of cost, also I think we need, as Dr. Smits indicated, considerably more information in terms of cost-benefit analyses of what works and what doesn't.

It has always been a difficult time in medicine and in health care to determine what kinds of technologies or interventions are, in fact, cost effective, and that goes to the heart of the debate on health care reform right now in terms of outcomes measures, and effectiveness, and evaluations.

There have been efforts made to determine what the potential trended out savings might be, and Arthur D. Little has, in a widely reported study, suggested that telemedicine could, in all of its different applications, save something on the order of $36 billion over 5 years. The Working Group on Electronic Data Interchange has projected that standardization of information used in informatics could, in addition, save something like $40 billion.

But until the costs are borne out by a multiplicity of users in small or rural communities or in inner city urban areas, it is going to be a long time before much of this technology, even though costs are coming down, will be driven into those communities, and that is, I think, a major public policy concern. The question is how long before fiber goes the last mile into every rural hospital in this country.

Mr. GUTIERREZ. To anyone on the panel—we will start with Dr. Sanders. How about insurance companies? How are they responding to telecommunications, given their growing—how would we say, their growing interaction between the patient and the doctor and their meddling between the patient and the doctor? It seems like every patient has got to call the doctor, and then the doctor has got to call the insurance company, because they don't want to bankrupt the patient; at the same time, they want to save the patient's life. So what about insurance companies in this telecommunication?

Dr. SANDERS. Well, I guess I can probably only predominantly talk about the experience that we have had in Georgia. We have been quite lucky—I probably just should leave it at that—relative to both Medicare and Medicaid.

We get Medicare and Medicaid reimbursement in Georgia for telemedicine consultations. We also get Blue Cross/Blue Shield reimbursements for this.

The feeling in the managed health care sector—and this is only informal comment. I have given two talks to the Group Health Association of America, and it is particularly in the area of the electronic house calls that they are very, very interested. Actual informal comments have been that the patient will never have to pay for the telemedicine system at home.

The insurance companies cannot afford not to pay for the system. When you think about the fact that, if I avoid a single hospitalization, that child with asthma or the elderly gentleman with congestive heart failure who had a little bit too much salt 2 weeks ago and comes into my emergency department this evening in pulmonary edema, if I had examined that patient the day after that meal, I could have started him off on appropriate medication.

If I avoid a single hospitalization, that is an average savings of $25,000 for the system. So if you are talking about managed health care where patients are going to be capitated or if you talk about a fee-for-service environment, someone is paying that bill, and if I can avoid that hospitalization, if I can keep the patient in the low-cost environment in the rural hospital at $800 a day instead of the Medical College of Georgia at $1,300 a day, that is something that I need to pay attention to.

Mr. GUTIERREZ. Mr. McDonald.

Mr. MCDONALD. Yes, I met with one of the CEO's of one of the largest health plans in the country a few weeks ago, and we were talking about collaboration with the health information infrastructure of the various players—computer companies, communications companies, health plans, et cetera. He laid out his thoughts on how the next 2 to 3 years would go in terms of cost.

His concern was that we would probably not have health care reform or that it would be significantly muddled and we would drop into what he called the mid-game. In the mid-game, we would drop from 220 beds per 1,000 to about 160 beds per 1,000. The 1,500 or so plans that we see today would drop down to under 100 perhaps, and that there would be significant quality sacrifices in going through that kind of cost reduction. In this environment, it is unlikely that competitors fighting for their institutional survival would collaborate effectively together.

What I would put out to you is that the VA may have a key role to play in bringing together private sector players in the health sector—computer companies, communications companies, cable companies, et cetera—to work collaboratively in a way that they would not do in the commercial marketplace during the mid-game. It is my belief that there may be solutions that come through that collaboration in the VA that can migrate to the private sector marketplace and therefore make a crucial contribution to the reform of the Nation's health system.

Mr. GUTIERREZ. Does anyone else want to comment?

Thank you.

Well, let me just say that as a person here in Washington, sometimes three days here lately—they are keeping us here more and more every week because we have to do this health care reform, I guess, and finish that one up before we get to leave here in October—I can't wait for it to happen, because actually I live in Chicago. Chicago is my home, Chicago is where my doctor is at, and so when I feel ill on Tuesday, which it always seems, as soon as I leave Chicago I feel a little worse, and I have to wait until Saturday to see my doctor. So I hope to be here hopefully when you have developed the system, and then I can feel well immediately and don't have to wait five days to see my doctor for the acid indigestion I usually get from being around here so long.

Thank you all so much, really. It has been very informative. We want to thank all the participants in today's hearing for their testimony and contributions.

Additional questions may be submitted to witnesses following the conclusion of this hearing. Those questions and the responses to them will also be made a part of the hearing record, without objection.

Thank you.

[Whereupon, at 12 o'clock, the hearing was adjourned.]

APPENDIX

HONORABLE LUIS V. GUTIERREZ

Opening Statement:

CHAIRMAN EVANS, YOU KNOW AS WELL AS I DO THAT FAR TOO OFTEN IN WASHINGTON WE HAVE TO ATTEND CONGRESSIONAL HEARINGS WHERE THE SUBJECT MATTER IS THE PAST...WHERE WE HAVE TO GO AND HEAR ABOUT WHO DID WHAT, AND WHEN DID THEY KNOW IT.

THAT IS WHY IT IS REFRESHING TO TAKE PART IN A HEARING LIKE TODAY'S-- WHERE THE SUBJECT MATTER IS THE FUTURE.

TODAY'S HEARING IS ONE WHERE WE DON'T HAVE TO ASK "WHAT WENT WRONG?"-- BUT, INSTEAD, WHAT WE CAN DO TO MAKE SURE THAT THINGS TURN OUT RIGHT....WHERE WE DON'T HAVE TO TALK ABOUT PROBLEMS BUT ABOUT POSSIBILITIES.

THIS IS ALL VERY EXCITING, AND NOT JUST BECAUSE OF

THE FUTURISTIC, EYE-CATCHING, COMPUTERIZED TECHNOLOGY WE ARE SEEING. IT'S EXCITING BECAUSE IT COULD GIVE US THE CHANCE TO REACH SOME GOALS THAT WE ALL SHARE.

AND JUST BECAUSE SOME OF THE TECHNOLOGY AND TERMINOLOGY IS NEW TO US-- OR, AT LEAST TO ME-- THOSE GOALS THAT THEY CAN HELP US ACHIEVE SHOULD BE VERY FAMILIAR TO US.

IT GIVES US THE CHANCE TO SAY THAT <u>MAYBE</u> WE CAN ACHIEVE SOME OF THE BASIC GOALS IMPORTANT TO ALL OF US WHO ARE ADVOCATES OF VETERANS' ISSUES.

<u>MAYBE</u>-- JUST MAYBE-- WE CAN MAKE THE VA INTO A HEALTH CARE SYSTEM THAT IS NOT ANTIQUATED AND BEHIND THE CURVE BUT IS ON THE CUTTING EDGE.

MAYBE-- JUST MAYBE-- WE CAN FORGE PRIVATE SECTOR-PUBLIC SECTOR PARTNERSHIPS, LIKE THE ONES WE WILL HEAR ABOUT TODAY, WHERE BUSINESSES AND THE GOVERNMENT HELP SERVE THOSE WHO HAVE SERVED US.

AND, FINALLY, MAYBE-- JUST MAYBE-- WE CAN ACHIEVE WHAT HAS ALWAYS BEEN OUR GOAL IN ANY AREA: MAKING SURE THAT WHATEVER IS AVAILABLE TO THE POPULATION AS A WHOLE IS ALSO AVAILABLE TO VETERANS.

THAT SHOULD BE OUR GOAL IN PROVIDING HEALTH SERVICES TO VETERANS-- MOST OF THE MEMBERS OF THIS COMMITTEE BELIEVE THAT VETERANS SHOULD NOT HAVE FEWER BENEFITS THAN ANYONE ELSE UNDER HEALTH CARE REFORM, BUT MORE ON THAT TOMORROW. AND IT SHOULD BE OUR GOAL WHEN WE ARE DISCUSSING THE TECHNOLOGY OF THE FUTURE.

# # #

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CORRINE BROWN
3D DISTRICT, FLORIDA

REPLY TO:
WASHINGTON OFFICE:
☐ 1037 Longworth Building
Washington, DC 20515
(202) 225-0123
FAX (202) 225-2256
DISTRICT OFFICES:
☐ 815 South Main Street
IBM Building, Suite 275
Jacksonville, FL 32207
(904) 398-8567
FAX (904) 398-8812
☐ 75 Ivanhoe Boulevard
Chamber of Commerce
Orlando, FL 32804
(407) 872-0656
FAX (407) 872-5763
☐ 401 SE First Avenue
Room 316
Gainesville, FL 32601
(904) 375-6003
FAX (904) 375-6008
☐ 250 North Beach Street
Room 80-1
Daytona Beach, FL 32114
(904) 254-4622
FAX (904) 254-4659

Representative Corrine Brown
July 20, 1994

Subcommittee on Oversight and Investigations

Statement

Mr. Chairman, thank you for holding today's hearing on "VA Health Care: Communication and Information Technologies and Related Issues" and for providing Lake City Community College with an opportunity to tell the committee about their innovative proposal for a proposed partnership with Lake City's VA Medical Center to provide rural veterans greater access to health care through the use of its unique telecommunications delivery concept. This partnership is a ready example of the value which can be gained by adapting existing telecommunications technology to new purposes. It will help veterans in North Florida overcome the obstacles to care faced by all rural communities - lack of public transportation, lack of information, and low personal income. This partnership is an excellent example of the cost effective sharing of resources and the improved delivery of health care information and services. I believe that the VA should support this proposal.

This proposal will be explained in greater detail by Mr. Duffy Soto, Chairman of the Division of Telecommunications and Advanced Technology at Lake City Community College. Mr. Soto is recognized for his creation of the Multi-Purpose Single Infrastructure telecommunications concept, a technology application which adapts, common, and existing telecommunications infrastructures to address problems faced by veterans, the elderly, the low-income, and the under educated in rural communities.

It is my pleasure to introduce Mr. Soto.

OPENING STATEMENT
REP. TERRY EVERETT

HOUSE COMMITTEE ON VETERANS AFFAIRS
SUBCOMMITTEE ON OVERSIGHT & INVESTIGATIONS

JULY 20, 1994

Thank you, Chairman Evans, and the Ranking Member, Mr. Ridge, for your leadership in holding this hearing on the issue of improving the VA's delivery of health care services through the use of advances in telecommunications/information systems technology. This issue is one of great interest to me personally. As many of you may know, I was in the newspaper business before coming to Congress and we found the targeted application of technology useful in improving overall efficiency and productivity for the organization. With a focused vision and strategy, I think veterans can continue to benefit from the implementation of these emerging technologies within the VA health care system.

As the VA contemplates new strategies for improving efficiency and response capabilities through the use of technology, two of my chief concerns relate to the need for a cohesive strategy for connecting existing telemedicine facilities and to ensure that proper security & privacy precautions are employed. First, I think it is imperative that the VA devise standards that will encourage systemwide integration so that a common network can be achieved, rather than a host of connected subgroups. Secondly, the VA must also make sure that adequate privacy and security measures are an integral part of any system that will be used to transfer confidential diagnostic and/or other medical data.

Thank you again, Mr. Chairman, and Mr. Ridge, the Ranking Member, for your leadership on this issue. I also want to thank our witnesses for being here today and we look forward to your testimony.

STATEMENT OF
ROBERT M. KOLODNER, M.D.
DIRECTOR, MEDICAL IRM OFFICE
VETERANS HEALTH ADMINISTRATION
DEPARTMENT OF VETERANS AFFAIRS
BEFORE THE
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HOUSE COMMITTEE ON VETERANS' AFFAIRS

VA USE OF TELEMEDICINE IN PROVIDING CARE TO VETERANS
JULY 20, 1994

Mr. Chairman and members of the Committee,

Thank you for the opportunity to appear before you today to present testimony on and demonstrate how the Department of Veterans Affairs (VA) is using telemedicine in the care of our veteran patients. VA makes extensive use of telecommunications in the practice of medicine. For the purposes of this hearing, we will be describing a range of VA activities and plans that touch on the practice of health care delivery, diagnosis, consultation, treatment, and transfer of clinical, administrative and educational data using audio, visual and data communications among facilities.

The use of telemedicine is having a major impact on the VA approach to health care. A patient away from home can now be sure that his or her doctor has access to all the information necessary to provide quality care. A patient with an atypical or complex case can obtain the services of the best specialist in the field, even if that patient is in a rural area. Today, the focus of health care delivery is changing from the individual care provider to integrated health care delivery networks. Telemedicine is the key to making this transition. Telemedicine techniques can even allow us to go into the patient's home, something VA has been doing with Cardiac Pacemaker monitoring for over ten years.

Introduced in 1982, the Cardiac Pacemaker Surveillance System was one of the first uses of telemedicine in VA. This system has provided a valuable service to our veteran patients, allowing them to dial in to two Surveillance Centers from their home telephone and transmit their pacemaker tracings for analysis. Today, the Centers actively monitor more than 10,000 patients. This information is systematically collected and used to detect problems and define patient risk and frequency of followup calls. This method of following patients has been confirmed by the absence of any preventable pacemaker problems in our treated veterans. There has never been a pacemaker generator failure in the duration of the Centers.

Today, VA medical centers use a broad spectrum of telemedicine techniques, showing tremendous innovation at the facility level. VA medical centers have found many uses for "low-tech" telemedicine applications such as patients using the telephone to contact staff or automated response systems. The relatively low cost and the enthusiastic acceptance by patients and staff have led to many sites using these technologies. Higher technology applications, such as the transmission of radiological images and electrocardiogram readings for diagnostic interpretation by staff located at another VA facility, are the most frequent use of telemedicine in VA. New and innovative techniques, some of which are being developed in VA, are being piloted and researched to determine how they can best be used in VA health care setting. Examples of these innovative techniques are networked imaging and videoteleconferencing.

Mr. Chairman, I would like to describe some of the general benefits attributable to telemedicine, and place telemedicine activities in the context of changes coming under health care reform. Next, I will talk about VA's role in several multi-agency initiatives currently underway, and VA's current strategy for developing and encouraging the use of telemedicine. Finally, I will demonstrate several specific examples of current uses of telemedicine.

Telemedicine provides many benefits to VA patients. The clinical information available at the time of treatment is greatly increased. This expansion of the provider's information base reduces the number of repeat studies required for referral patients, greatly adding to the comfort of the patient, reducing costs, and improving timeliness.

There are many benefits associated with using telemedicine over VA's national and local networks. We will be able to assemble a treatment team to provide the best care for the patient, without regard to patient or provider location. Having specialty consultation available at any location within the VA system and affiliates will significantly reduce patient travel time and expense incurred by repeat visits and travel to obtain specialty tests and treatment. Centralized locations within the VA can provide off-hours coverage when needed for specialties such as radiology and nuclear medicine. The patient receives greater continuity of care and is able to get the best in specialty treatment without limitations to provider location.

Telemedicine shows great promise of benefits in the areas of patient and provider education, as well as clinical consultation. It allows us to better serve our veterans in rural areas. VA is sponsoring initiatives that encourage sharing information, educational, and scarce health professional resources to meet the needs of health care professionals located in isolated rural communities. Telemedicine brings the remote provider in closer touch with the broader medical community. Using these techniques to provide expert advice can also enable physicians' assistants and nurses to provide a greater range of care at remote sites. Telemedicine may allow us to extend health care benefits to the veteran in the home and decrease or eliminate the need for travel to a VA medical center.

Telemedicine experience is one of the competitive advantages VA brings to Health Care Reform. The future under Health Care Reform will not be in free-standing health care institutions, but in integrated health care delivery networks, which cover the entire continuum of care from in-home services to tertiary care. VA must position itself to share integrated patient information within its own environment, as well as across service providers. In whatever setting care is given, we must be able to collect and store administrative and clinical patient information, and give access to appropriate health care providers. Patient information should be captured at the time of the first encounter, be it the doctor's office, outpatient clinic, or the patient's home, and then communicated across providers and geographic boundaries.

VA has begun the process of creating networks to exchange health care information among VA facilities and other providers. These networks include local Community Hospital Information Networks, as well as a nationwide network. VA has also developed a standard method of exchanging patient data among all VA health care facilities.

Telemedicine will also greatly enhance our ability to exchange data with networks of health care providers under the Health Care Reform model. The VA medical center, the community-based clinic, the affiliated medical school, the specialist with the needed expertise for the task at hand, the medical record, and most important, the patient -- all can be brought together at the point of need. As health care providers cooperate and search for cost-effective solutions, telemedicine will play a vital role in facilitating data exchange and integration to provide a complete, clinically-relevant picture. VA has an advantage in implementing telemedicine technologies because it is the largest health care network in the country with ten years of experience in exchanging data among hundreds of medical facilities and central data repositories.

Mr. Chairman, the National Information Infrastructure will mean that facilities outside the VA will be available for VA consultation, just as easily as VA sites are today. Communications will be faster and better, more data can be sent, and higher resolution images, and perhaps video images, may also be included in the information shared among sites.

VA is in an ideal position to serve as a testbed for telemedicine activities for the National Information Infrastructure due to a strong communications infrastructure, experience in transferring data among facilities , and an enthusiastic, innovative staff. The foundation of VA's communication is the electronic mail system at every VA medical center. VA-wide these electronic mail systems have over 100,000 users. The VA has established a standards-based electronic network that connects all VA medical facilities. Secretary Brown uses this network to send a daily message to all employees. Traffic on this network is approximately 75 billion characters per month (approximately 150 million pages of text). Through this network, VA has established a connection with Internet for mail, and will soon be able to transfer files as well. This feature enables clinicians and researchers to confer electronically with colleagues in federal agencies, medical facilities, and academic settings across the nation and around the world. VA also has an electronic teleconferencing resource with 36,000 active users and 16,000 sign-ons per day.

VA has extensive experience in the transfer of data, both in administrative and clinical areas. For example, procurement can be accomplished electronically by any VA user from order through delivery to receipt and vendor payment. We also exchange a large volume of clinical data, including patient care information, diagnostic medical imaging, and multimedia data, among VA health care providers. VA is presently testing frame relay technology at several VA medical centers. This technology will greatly increase the speed at which medical images can be transferred, and may have a large impact in videoteleconferencing in the future.

VA has been a forerunner in the development of standards-based links between systems. About one year ago, at the Baltimore VA Medical Center, we installed a link between the Siemens-Loral commercial radiology imaging system and VA's hospital information system, the Decentralized Hospital Computer Program. This link was specified and created by VA working with Siemens-Loral. This is the first link in the world that uses health care standards to exchange text and image information between a hospital information system and a Picture Archiving and Computing System (PACS), and marks the first time these standards have been mapped to each other. This link overcomes a major obstacle to telemedicine information exchange on the information superhighway.

The general pattern we have seen in VA telemedicine implementation is for two VA facilities to establish a telemedicine link. After that link stabilizes, the network begins to extend outward, adding other VA facilities, satellite care facilities, or medical school affiliates. VA has an installed base of computer hardware and software in a wide variety of clinical settings, large and small, primary and tertiary care hospitals located in urban and rural settings. Downlink satellite dishes at each of the 171 medical centers currently serve as distribution points for educational video programs and time-critical administrative communications and may have other telemedical uses in the future.

VA is discussing the cooperative use of telemedicine with Federal agencies, including the Department of Defense (DoD) and the Indian Health Service. VA is working with DoD to create a common connection between our respective health care information systems and those offered commercially. We are developing plans to provide a link between VA Medical Center American Lake, WA and the DoD Medical Digital Imaging System at Madigan Army Medical Center, WA. This same initiative will be used to link the DoD Composite Health Care System to the Medical Digital Imaging System (the commercial radiology system manufactured by Siemens-Loral). DoD has contracted with VA to supply a copy of the VA link at all of DoD's Medical Digital Imaging System sites.

VA is currently active in many Federal decision-making and policy groups:

- VA is a member of Health Care Applications and the Health Applications' Telemedicine subgroup under the Committee for Applications and Technology, under Vice President Gore's Information Infrastructure Task Force.
- VA is an observing member of the High Performance Computing and Communications Information Technology committee under the Executive Office of the President, and is working towards becoming a full member.
- VA serves on the National Library of Medicine's Board of Regents. This provides an opportunity for cooperation and sharing of information concerning telemedicine, development of the computerized patient record, and advances in the delivery of health sciences information.
- VA is assisting other agencies such as DoD's Advanced Research Projects Agency and the Department of Commerce in their health care grant review process which fosters cooperation between VA and other Federal agencies in the field of telemedicine.

Currently, VA has cooperative telemedicine projects with many non-Federal agencies and organizations, both in this country and abroad. These include local initiatives with affiliated medical schools, and the States of West Virginia and Washington.. West Virginia Consult is a cooperative project between VA and the State of West Virginia. The State has installed VA's Decentralized Hospital Computer Program at a central location, with VA support. Health care providers, including doctors and midwives, can use VA electronic mail and the VA communications network to keep in touch with each other. The State has developed a number of applications using VA tools, such as pharmacy alerts and literature searches, and training schedules, which help to bring the West Virginia rural health care system together. We are in the initial stages of connecting the VA Medical Center Clarksburg, West Virginia with the West Virginia Mountaineer Doctors Television program. Mountaineer Doctors Television is a two-way interactive audio and video network that links rural hospitals for telemedicine and educational purposes.

VA and the State of Washington are planning for the five Washington State VA medical centers to band together to form their own health plan network. Sites will be able to freely exchange patient information. Private providers will be able to access this data through dial-in capabilities and receive health summary, scheduling, and other clinical data.

VA has many opportunities for expanded sharing of telemedicine initiatives with Federal and non-Federal partners. There are a great number of other telemedical applications where centralized reading and interpretation of clinical results could benefit remote clinics or medical center consortiums that are being formed to meet the medical needs of today. VA's transmission of prescriptions to a centralized location for remote processing, called Central Mail-Out Pharmacy, will result in economies of scale and streamlined service to the patient.

Telemedicine implementation costs are quite variable, and highly dependent on the complexity and volume of usage. The cost for a basic voice response system may be as little as $25,000, while setting up a regional teleradiology network could cost $500,000 or more. We believe that the benefits telemedicine offers will far outweigh the costs when the right technologies are matched to the right needs.

Several obstacles remain to the further use of telemedicine today. In order to fully realize the benefits of telemedicine, standards for connecting different systems must be developed and used. Without standards and a directed effort to create a common network for telemedicine, hospitals will divide into small groups that can teleconsult with each other but not with those outside their group. This would represent a tremendous loss for U.S. medicine, as each group would be dependent on the vendor of their non-standard system and patients would not benefit from the wider availability of specialists and competition in the marketplace.

Another obstacle is that the technology itself continues to change rapidly, and today has some restrictive limitations (such as bandwidth). There is also a need for greater partnering between VA and private industry. Reducing the complexity of contracting out and establishing a private-Federal partnership would allow us to work together with industry in pursuit of standards and solutions to these highly technical problems.

VA has established priorities that will not only support expanded use of telemedicine, but will result in the creation of a quality information environment at all levels. The first step in this process is to accelerate the upgrading of equipment and high capacity networking at VA medical centers. A mechanism for adding network connections must be developed that will keep pace with the demand and fill the unique requirements of each VA medical center. Two key factors are developing standards for connecting systems and exchanging information, and matching the telemedicine technology to the needs of each site. This second factor is an important consideration, since telemedicine costs can be scaled down by using slower technology to meet smaller needs, for instance, at a site where only twelve radiographs must be transmitted per day for reading at another site. In order to match the technology with medical center needs, we must make it a priority to establish a network which is able to accommodate different transmission technology between sites in the system. VA must also take an active role in Federal and private groups involved in setting standards which have an impact on telecommunications.

Mr. Chairman, this concludes my formal statement. Attached to my statement is a fact sheet about telemedicine applications currently being pursued by VA. A live demonstration will also provide you with a better understanding of how various telemedicine technologies are used together in the care of VA patients. We will be happy to answer any questions you may have during or after the demonstration.

Current Uses of Telemedicine in the VA

VA is currently using telemedicine in many areas. These include:

- Cardiac Pacemaker monitoring and evaluation
- Electrocardiogram interpretation
- Nuclear Medicine interpretation
- Teleradiology
- Patient Data Exchange
- Networked E-mail
- Videoteleconferencing
- Missing Patient Registry
- Continuing Medical Education
- Telephone care by health care providers
- Nurse tele-triage systems
- Patient dial-up access to scheduling and pharmacy information
- Rural Health Initiatives
- Multi-media patient data
- Remote system access
- Hospital inquiry to national Veterans Benefits Administration eligibility data base
- On-line inquiry to identify locations providing prior VA treatment.

Cardiac Pacemaker monitoring and evaluation. Since 1982, the Pacemaker Surveillance Centers have monitored pacemaker function of veterans by telephone. The system allows a patient to remain at home and place a telephone type transmitter over his or her pacemaker, transmit the sensing, pacing and battery status information to a centralized unit for evaluation. For monitoring purposes, the Centers initiate a call to the patient at a scheduled time. The Centers actively monitor more than 10,000 persons. A database, now containing over 45,000 patients, is maintained to serve clinical needs, as well as registry and research needs. Over the past 10 years, information from this database has been provided to private industry, the Justice Department, and the Food and Drug Administration. This information is systematically collected and used to detect problems and define patient risk based on the total group. Every three months, survival statistics are analyzed based on the specific type of pacemaker equipment used by the patient. This information is translated into the frequency of follow-up calls necessary to assure that every patient is monitored correctly. No other health care system uses its own internal database to monitor the failure rate of its components. This method of following patients has been confirmed by the absence of any preventable pacemaker problems in our treated veterans. There has never been a pacemaker generator failure in the duration of the Centers.

Electrocardiogram. ECG waveforms are routinely transmitted to tertiary VA medical centers for interpretation and consultation over telephone lines via modems from VA outpatient clinics and VA medical centers without cardiologists on staff. Systems of this type have been accepted and widely used for over 15 years.

Nuclear Medicine. VA has had networks for the transfer of nuclear medicine diagnostic images for several years. Primarily, these are used by remote or hard-to-staff sites to receive interpretation and consultation from nuclear medicine physicians at a larger tertiary care medical center.

Teleradiology. Teleradiology is the transmission of x-ray images, including Computer Aided Tomography and Magnetic Resonance Imaging studies, from the site where they are taken to a remote site where they may be interpreted by a radiologist, or where they are transmitted to another health care provider for consultation or follow-up treatment. If interpreted, the written interpretation may be sent back to the originating facility. At least 50 sites are participating in teleradiology.

Patient Data Exchange. Key patient information, such as demographic and billing information, and clinical information summarizing a patient's medical treatment and status can be exchanged electronically between VA medical centers.

Networked E-mail. Over 100,000 users of VA systems at medical centers across the country are now able to communicate with each other via the VA mail system. In turn, this networked electronic mail system is connected to the Internet.

Videoteleconferencing. A growing number of VA medical centers which have remote outpatient clinics have acquired videoteleconferencing systems. Applications include both one-way satellite videoteleconferencing for educational purposes, and two-way videoteleconferencing for a variety of purposes, including expert consultation between two clinicians or a doctor and a patient; clinical rounds where specific patient data and clinical topics are reviewed; sharing educational courses; and service and committee level staff meetings.

Missing Patient Registry. Patients with an uncompleted course of treatment are entered into a corporate system by each VA medical facility. If the patient presents for treatment at any location within the VA system, an electronic message is relayed back to the facility that reported the patient missing. This application is in beta testing, and is expected to be available nationwide by the end of this year.

Continuing Medical Education. VA supports the use of educational and telecommunications technology to improve access to continuing and professional education, and to enhance learning and patient care through two-way communication. Remote consultative and educational services will improve VA's effectiveness in the type of environment envisioned with health care reform. Educational videoteleconferencing is currently available from a central site to all 171 medical centers via downlink satellite dishes for the distribution of educational programs and time critical administrative information.

Telephone care by health care providers. One VA study demonstrated that clinician-initiated telephone follow-up in addition to routine revisits resulted in less frequent visits, reduced medication use, lower costs per patient, and shorter hospitalizations. A randomized, multi-site study has been designed to compare costs and health status between patients treated in customary face-to-face ambulatory care settings with patients whose visits were less frequent, but were augmented with scheduled physician-initiated telephone follow-ups.

Nurse Tele-triage. Portland VA Medical Center was the first VA facility to establish a nurse triage system. Patients dial in and talk with a nurse regarding symptoms, questions, and medication refills. The nurse can resolve many of these questions, schedule an appointment or instruct the patient to report to the hospital for further evaluation and care. The system allows the veteran to resolve his or her problems without having to making a trip to the facility. Because this will result in a decrease in the number of unscheduled visits, facility staff time can be more efficiently used.

Patient dial-up access to scheduling and pharmacy information. Without disrupting patient or staff schedules, patients can use their telephone 24 hours a day to obtain appointment and confirmation data, as well as pharmacy refill information. Approximately 20 sites are now using a commercial voice response system that allows veterans to access VA's Decentralized Hospital Computer System information to answer their questions or meet other needs.

Rural Health Initiatives. VA sponsors telemedicine initiatives which encourage sharing of information, educational, and scarce health professional resources to meet the needs of health care professionals and community members, including VA medical centers, medical schools and local health professional resources located in isolated rural areas. VA medical centers are joining established community networks, such as the Mountaineer Doctor Television program, which is a two-way complete interactive videoteleconferencing network that links rural hospitals to a hub site for telemedicine and educational purposes.

Another initiative proposes providing telemedicine to the primary care access points in rural Missouri and Kansas by establishing a two-way interactive televideo system between the eight primary care access sites in the region and four VA medical centers. The system will enable immediate and on-site interpretation of radiology films and electrocardiograms, eliminating the need for return visits by the patient.

Multi-media patient data. We are testing multi-media mail between Washington, DC and Baltimore VA Medical Centers to allow transfer of non-text information, such as image, voice and waveforms, in addition to current capability of text.

Remote system access. Staff and health care providers can access the Decentralized Hospital Computer Program system remotely, through either wireless connections or dedicated telephone lines between different divisions of a facility or by dialing into the system by means of a modem. This provides ready access to administrative or patient-related information at remote sites. They can also access the system via an 800 telephone number into the VA data communications network, as needed.

Hospital inquiry to national Veterans Benefits Administration eligibility data base. For almost 10 years, VA Decentralized Hospital Computer Program systems have had a feature that allows staff at the medical center to access the VA Benefits Delivery Network, a national database of veteran information, and request patient demographic, military service and VA benefit eligibility. In ten to fifteen minutes a veteran's eligibility status and service-connected conditions can be confirmed.

On-line inquiry to identify locations providing prior VA treatment. VA medical centers can seek information contained in the national inpatient database currently located at the Hines, Illinois VA Information Systems Center. For example, when the patient presents for treatment, a health care provider can query this corporate database. Within 10 to 15 minutes, results are returned, both on line and by printer. Providers can receive a profile of the patient for the last 18 months, including other VA facilities where the patient has been seen, medical procedure codes associated with treatments, hospital admissions, and the diagnosis at discharge. Using the Patient Data Exchange utility, staff can then request health summaries from those sites where the patient had received treatment. This greatly increases the clinical knowledge available to the health care provider at the time of treatment and facilitates better continuity of patient care from visit to visit.

STATEMENT OF

JOHN SILVA
PROGRAM MANAGER

ADVANCED RESEARCH PROJECTS AGENCY
DEPARTMENT OF DEFENSE

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS

COMMITTEE ON VETERANS' AFFAIRS

JULY 20, 1994

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Mr. Chairman and members of the Subcommittee, I am John Silva, Program Manager, Advanced Research Projects Agency (ARPA). I am here today because of my responsibilities as the program manager of ARPA's Health Information Infrastructure Program and my role as the chair of the Health Information and Application Working Group, a working group within the Committee on Applications and Technology of the Administration's Information Infrastructure Task Force (IITF). The IITF, its committees and working groups were created to foster the development of the National Information Infrastructure (NII).

Information is essential to effective health care reform. There is substantial agreement across the current legislative proposals to develop a national framework for the health information system. Key aspects of the framework include: need for national standards for reporting and exchange of information; the support for a national electronic network - a system of systems; strong privacy and security protections; and access to the system by all parties, including those in rural areas.

Such a framework is needed to provide **all** participants of the health care system with accurate, comparable, and timely health information. This is of benefit to consumers in making choices about their health care. It enables health care professionals to coordinate care and make better treatment decisions with their patients. It supports research in medical outcomes to identify what works best and how to provide care more efficiently. It provides information to protect the public against disease, injury, and disability. It enables more effective detection and prosecution of fraud and abuse. And it facilitates assessments of access to care, health status, utilization, quality, and costs of care, enabling all participants of the health care system to fine-tune their performance.

A national framework for health information is also essential if we are to reduce the excessive paperwork that is drowning health care professionals and consumers today. Currently, the health care system is collecting enormous volumes of data. But because the same information is reported in hundreds of different ways and local information systems cannot communicate with one another, the administrative burden is great and the information that is generated is not as useful as it could be. To the extent that forms can be standardized -- for example, having a uniform claim format -- and to the extent that enrollment and encounter data generated in the course of operating the system and providing care can be used for other health-related purposes, the health care system can achieve substantial administrative simplification as well as substantial savings.

Federal health information systems must address the same challenges to improve the efficiency of information collection and use. In addition, there are efforts underway to facilitate sharing of patient information between the VA and DoD. For example, ARPA has initiated a five-year program primarily focused on battlefield combat casualty care and a synergistic research development effort for a health care information infrastructure. Our efforts in battlefield combat casualty care will enable remote diagnostic and imaging capabilities, telesurgical-mentoring and remote telepresence surgery, and the exploitation of virtual reality and computer generated human body simulators to allow combat surgeons, medics, and others the opportunity to "train and practice" combat casualty care. Our efforts in health care information infrastructure are designed to enable the transfer of information in the battlefield through the development of a clinical associate and are designed to connect proactively to medical and health knowledge bases to support its users. These efforts, while focused on battlefield and military medicine, are inherently dual-use and promote scalable, interoperable and affordable commercial solutions for DoD that will be immediately usable to assist and facilitate delivery of health care in rural environments.

Reaping the benefits of better health information does not require a big-government approach. The framework calls for flexible, community-based solutions to meet unique needs. Most of what we need already exists in both the public and private sectors. We can go a long way by facilitating linkages among these existing systems and by establishing a national network of local health information systems that speak a common language.

With respect to information technology, the Administration's Agenda for Action, released September 15, 1993, identified principles and goals to guide government action. One of the fundamental premises is that the private sector has the lead in designing, building, owning and operating the NII. The Federal government's role is as a catalyst and facilitator by establishing the legal and policy framework.

Accordingly, the mission of the Health Information and Applications Working Group is to foster the development, deployment and use of the NII to improve the health of all Americans. The group will identify and make recommendations on policy and technical issues that affect the design, development, and use of the NII for health, including the following:

- commonality issues with other NII national challenge applications;
- inter-operability standards and technology for the exchange of clinical, administrative, personal, and public health data;
- barriers and incentive to the development and use of the NII for health;
- the roles of the public and private sectors.

The Working Group serves to facilitate collaboration among the different Federal agencies that are funding the development, use, and evaluation of health applications of the NII. The Working Group also addresses improvement in health information and applications from multiple angles, including government-funded health programs, rural health, services supporting health care, and the changes necessary to enable continuous quality improvement in the marketplace.

Members of the Working Group are representatives from Federal agencies, departments, and organizations with extensive interest and activities in health applications of the NII. To date, the group has had participation from the Department of Agriculture (Extension Service), the Department of Commerce (National Institute of Standards and Technology, National Telecommunications and Information Administration), the Department of Defense (Advanced Research Projects Agency), the Department of Education, the Department of Health and Human Services (Office of the Secretary, Health Care Financing Administration, the Public Heath Service and its agencies), the Department of Veterans Affairs (Veterans Health Administration), the National Aeronautics and Space Administration, the National Security Agency, and the Office of Management and Budget. The Working Group works closely with other working groups and committees of the IITF and with related interagency organizations, such as the National Science and Technology Council's High Performance Computing and Communications Program.

The Working Group plans a number of specific activities. Planned activities including:

- producing white papers on specific policy and technical issues;
- developing a vision of how using the NII can help to contain healthcare costs, improve the quality of health services, increase access to health care, and improve the Nation's health;
- facilitating interagency collaboration on:
    - large scale demonstration projects requiring the integration of multiple components
    - associated Federal research and development activities
    - establishing model evaluation criteria and general guidelines for the funding and approval of demonstration projects
- identifying ways to promote technology transfer;
- maintaining the health component of the IITF's applications inventory.

The Working Group recently formed a sub-group to address issues specific to Telemedicine. The Telemedicine Sub-Group is establishing an organizational framework in which various agencies across the Federal government can share information and, where appropriate, enter into cooperative ventures to enhance the benefits gained from Federal telemedicine initiatives.

The Sub-group is composed of individuals experienced in telemedicine or related programs from throughout the Executive Branch, including the Departments of Health and Human Services, Commerce, Veteran's Affairs, Defense, Agriculture, and the National Aeronautics and Space Administration. The Sub-group is co-chaired by Dr. Dena Puskin of the Office of Rural Health Policy, Health Resources and Services Administration, in the Department of Health and Human Services and Ms. Lisa Leidig of the National Technology and Information Agency in the Department of Commerce.

Although still in the early stages of its activities, the Sub-group has already achieved some notable successes. Perhaps the most valuable has been the role of the Sub-group in promoting the sharing of information. The Sub-group has developed an inventory of Federal telemedicine grant activities that will be maintained by NTIA. Sharing information on "who's doing what" in telemedicine, both inside and outside the government, has contributed significantly to the efficiency of various agency's grant award activities this year. In just the last two months, members of the Sub-group have participated in each others grant funding and to maximize the benefits to be gained from limited grant dollars and limited staff resources to administer these dollars.

Membership in the Sub-group has facilitated the coordination of telemedicine program evaluation activities among agencies. While specific measures of success will vary by agency priorities and telemedicine project objectives, the Sub-group plans to develop a set generic criteria by which agencies could begin to evaluate the merits of various telemedicine that can be used as a benchmark and expedite development of cooperative activities across Federal agencies and with the private sector.

The Working Group supported a series of successful briefings on telemedicine for Members and their staff, prompting the Working Group to sponsor a Working Conference on "Telemedicine Policy and the NII" that will be held in August, 1994. Stakeholders from the private sector, Congress and the Federal Government will convene to address many of the issues identified in your invitation to testify. They will develop recommendations for overcoming the barriers to the effective use of telemedicine in this nation. Staff from a number of agencies, including the VA, participated in the planning sessions and will attend the Working Conference.

It is our intent to release the working conference report, with its policy recommendations, in September at the Council on Competitiveness and IITF applications conference entitled "Breaking the Barriers to the National Information Infrastructure." This conference will explore the range of applications being developed for the NII with a special focus on obstacles faced by both developers and end users of such products. There will be a number of demonstrations that display the use of NII for telemedicine.

I would like to conclude with a brief description of our telemedicine demonstrations, conducted with the Department of the Army, and an overview of ARPA's Medical Technology Program. I believe our Medical Program will have a positive impact on the development of an affordable, scalable, interoperable solution for the collection, analysis, display, storage, retrieval and sharing of multimedia patient records. It will enhance the provision of clinical services across the spectrum of care delivery - from the remote battlefield or isolated rural settings to tertiary care centers and may save up to 50% of casualties that are now killed in action.

In June 1993, the 18th Field Hospital, a reserve medical unit from Virginia, participated in ARPA's battlefield telemedicine demonstration. In this demonstration vital signs of wounded soldiers were transmitted from the soldier to medical personnel in a simulated MASH unit and to combat medics. Battlefield physicians in the MASH transmitted patient information (vital signs and X-rays) to specialists located at Walter Reed Army Medical Center and at the University of Virginia Medical Center over 45 megabit communication lines. This technology demonstration also presented the prototype of remote telepresence surgery— that is, surgery performed in the far-forward battlefield by surgeons located remotely from the battlefield

A key ARPA strategy for the Medical Technology Program is to demonstrate the dual-use application of the advanced health information and application technologies being developed under two program components:

- The Advanced Biomedical Technology Program (ABMT)
- The Health Information Infrastructure Program (HIIP)

Both new programs leverage previous ARPA successes in Global Communication and Surveillance (the information highway or Global Grid), High Performance Computing and Communication (HPCC), the National Information Infrastructure (NII), and the Simulation Network for military training (SIMNET). While the focus for development will be battlefield and combat casualty care, these healthcare technologies are inherently "dual-use", and will actively transfer technology into the civilian sector.

The ABMT will develop technologies in advanced diagnostics, advanced therapeutic intervention, and education and training. Examples of advanced diagnostics are: 1.) remote sensing by a personnel status monitor (PSM), worn by the individual soldier, to determine location (using global positioning satellite) and health status (monitoring vital signs) - when a soldier is wounded, the precise location and extent of injury will be known and relayed to the medic. 2.) portable direct digital X-ray imaging devices, 3.) portable non-invasive blood chemistry analyses, and 4.) the Critical Care Pod, a "smart stretcher" which will be able to monitor the health of the soldier, administer life-saving medications, and provide closed shelter from the environment during medical evacuation. In advanced therapeutic intervention, immediate satellite teleconsultation from specialists to the forward hospitals is being implemented, and explorative efforts are beginning in remote "telepresence" (or robotic) surgery to the far-forward battlefield. Education and training will use the new technology of virtual reality and the SIMNET for two purposes: 1.) to provide a "virtual" or imaginary computer generated cadaver which will allow physicians and medics to practice surgical operations on simulated battlefield wounds and 2.) to create virtual battlefields with real terrain data and monitor the performance of individual soldiers as they "fight" within these SIMNET battlefields. Because of the power of computers from the HPCC and the high bandwidth networking of the Global Grid, all of these technologies will be integrated into a single interoperable system.

The HIIP will demonstrate new concepts for developing complex software systems through user-driven systems engineering, evolutionary software development and best commercial practices. The resultant intelligent information system will provide doctors and nurses with transparent access to up-to-date patient information - from the battlefield to the largest hospital. The intelligent systems architecture is designed to scale from the medic's hands-free battlefield unit to high-end clinical workstations supporting telementoring and telepresence surgery. These smart devices 1) acquire patient information as during care delivery then produce all required forms and documentation as a by-product; 2) improve healthcare users' capabilities to complete complex tasks quickly and with high quality results, whether the task is routine or unique; and, 3) connect proactively to medical and health knowledge bases in supporting its user.

I have tried to provide you what I see as a vision for the future of medicine. It is based upon enhancing the power of the individual physician, through the use of digital technology, to provide higher quality medical care to patients, even at remote locations. Leveraging the enormous investment and scientific advances of DoD over the past two decades can demonstrate in the healthcare field how improving quality while lowering costs can be accomplished.

Thank you for your time this morning, and I will be happy to answer any questions you may have.

"VA Health Care and Communication and Information Technologies"

Hearing of the House Committee on Veterans' Affairs

Subcommittee on
Oversight and Investigations

July 20, 1994

Testimony from Donald A. B. Lindberg, M.D.
Director
National Library of Medicine
and
Director
Executive Office of the President
High Performance Computing and Communications
National Coordination Office

Chairman Evans and members of the Subcommittee.

I appreciate this opportunity to present testimony on the present and proposed activities relating to telemedicine of the Department of Veterans' Affairs.

Telemedicine techniques usually are associated with taking care of patients. In fact, a simple yet serviceable definition is that telemedicine is the use of telecommunications for medical diagnosis and patient care. Telecommunications thus has great applicability to a Federal agency like the VA that has enormous day to day involvement with patient care.

Telemedicine is not new. Twenty years ago the National Library of Medicine was using NASA satellites to allow Public Health Service doctors to "see" patients in remote Alaskan villages. Over the years there have been a number of similar health care delivery experiments and demonstrations, including a number by the VA, using satellite- and land-based telecommunications technology.

Today, the Library continues its involvement with computer and communications technology by operating the world's largest online medical information retrieval system, conducting research into medical informatics (the discipline concerned with applying new technology to health care), and awarding grants and contracts in support of telecommunication and other technology-based medical information projects.

The Library's close involvement in this area was recognized when its director was selected in 1991 by the White House Office of Science and Technology Policy to provide coordination facilities for the new ten High Performance Computing and Communications (HPCC) initiative. It is important to note that the VA maintains close ties with both the Library and the HPCC program. The agency provides an ex officio member on the NLM Board of Regents, a connection that is of great benefit to the Library. As to the interagency HPCC initiative, the VA is now a guest member, with full membership a future possibility. I believe the VA, with its extensive network of facilities and wide area network, could make a major contribution to the HPCC effort. I am hopeful the VA will participate in the HPCC crosscut budget now being prepared for FY 1996.

Today's interest in telemedicine — and the VA is only one center of this renewed interest — is fueled by society's fervor for communications technology and, especially, the "information superhighway." Indeed, much is possible now that wasn't even imaginable 20 years ago. Economical high-speed computers and fiberoptic digital communications technology advances have paved the way for a rich variety of medical services that can be provided in a distance-independent fashion.

To illustrate this point, I divide telemedicine into three areas: aids to decision-making, remote sensing, and collaborative arrangements for the management of patients at a distance.

Aids to decision-making

Medicine is surely one of the most information-intensive professions. So productive is America's research that staying abreast of new life-saving knowledge is extremely difficult for physicians. This is one reason for the rapid growth and widespread popularity of a telecommunications program known as "Grateful Med," developed by the National Library of Medicine. This program allows easy and inexpensive access to the Library's immense databases by members of a network of 75,000 health professionals in the United States and Canada. A recent study of physicians who use these databases revealed that the information gained frequently influences for the better how a doctor diagnoses and treats a patient. The 4,000 member institutions of the National Network of Libraries of Medicine not only promote the use of Grateful Med among health professionals, but also provide access to the full text of journal articles and other medical literature.

Extensive use of the Library's databases, including use of the Grateful Med software, is made by the professional staff of VA hospitals. In addition, VA hospital librarians around the country rely on the National Network of Libraries of Medicine to obtain copies of journal articles, books, and other library materials that are not available locally.

Online databases, however, are only one aspect of telemedicine applied to medical decision-making. For example, there are computer programs that combine knowledge of a particular medical subject with inferencing mechanisms that enable the program to reason about a particular patient's medical problem. Such a program in the area of rheumatology has been developed by the NLM and several university collaborators and has been field tested overseas and in various parts of the U.S. Telemedicine might make an "expert rheumatologist" available for consultation whenever and wherever needed. In the current two-state field trials, primary care physicians describe the patient's findings through selection of words displayed by a computer. The computer and the expert physician consultants who ultimately back-up the system are often led astray because of inappropriate choice of words to describe the patient. Essentially, we found that the problem was not in any failure of the doctor or of the expert consulting program to reason to the correct diagnosis. The problem was in failing to observe and name the actual patient findings correctly. Our future systems will include use of the high speed Internet connections to send images of the patient's abnormalities electronically via high resolution color pictures to the expert physicians — wherever they may be found — for back-up confirmation and naming of the findings.

Remote sensing

A second area of telemedicine is that of remote sensing. One of the earliest successful telemedicine applications was in sensing the patient's electrocardiographic signals and in sending these to a remote computer, interpreting the diagnosis, and in sending this text back to the remote site. The VA was an early and distinguished contributor to this technology. I personally had the pleasure of working with the late Dr. Hubert Pipberger of the Washington VA on these systems in the mid 1960's.

Images, too, are extremely important in the practice of medicine. It is only recently that our long distance telecommunications capabilities have been improved to the point where we can send large and complex clinical images to colleagues across the country. Thus, many of today's state of the art experiments include transmitting Computer Tomography, Magnetic Resonance, photo- micrographs for tissue diagnosis (telepathology), and digitized x-ray images (teleradiology).

As example, the National Library of Medicine has created a digital radiology system that provides access via the Internet for medical expert diagnosticians to 30,000 digital x-rays collected as part of the National Health and Nutrition Examination Survey (NHANES). These images support epidemiologic research into the incidence of bone and arthritic disorders in the U.S. population. I should note here that the NLM scientists who developed the system have consulted with experts at the VA Hospital in Baltimore, one of the first all-digital (or "filmless") radiology centers in the United States.

In another project, NLM is assembling an image database that will comprise a comprehensive collection of 2-D and 3-D images of complete human beings. The Visible Human Project, as it is called, will form the basis of a new generation of knowledge sources for teaching human anatomy and prostheses design and will help to create standards for exchanging clinical images over high-speed networks.

Collaborative patient management

There is great current interest in using telemedicine for the third area I wish to mention– the management of patients. Smooth digital motion pictures are now becoming feasible and systems being developed will test 2-way "workstation video" for interactions between doctors for obtaining specialty consultation. Telemedicine systems also allow physicians to observe and discuss symptoms with patients who are far away. For example, a recent study in Parkinson's disease showed that doctors observing movement disorders of patients via interactive video were able to make adjustments to medication dosage with the same accuracy as physicians who evaluated the patients in person. Some studies show that rather than being alienated by video technology, patients appreciate being able to see and hear their doctor while in the comfort of their home. Of course, technology is but part of what is needed. The actual inter-personal and inter-institutional arrangements to permit collaboration are essential.

When the National Library of Medicine last year announced that it was interested in supporting High Performance Computing and Communications projects in the health sciences, the greatest number of proposals received was for testbed networks and for collaborative arrangements for treatment of patients at a distance. As a result, NLM has funded city-wide networks (Indianapolis, Chicago), area-wide (Western Pennsylvania), state-wide (Iowa and West Virginia), and networks for underserved rural areas (in Oregon and Kansas). The awards total $27 million over 3 years. One of these collaborative projects, which I will describe later, involves the VA.

There is also an NLM program to help large medical institutions devise methods for integrating the many diverse sources of computerized information. The Integrated Advanced Information Management Systems program ("IAIMS") has over the last decade supported a number of successful systems that are able to tie together electronically such disparate data sources as patient records, admissions, x-ray, and pharmacy. Columbia-Presbyterian, Georgetown University, and Baylor University are examples of successful IAIMS Centers. A particularly ambitious IAIMS project, not just for one institution, but to link together 36 schools and other medical institutions statewide (including a VA Medical Center), has just been funded in Louisiana, based on the LSU Medical Center. Other IAIMS projects that involve VA Medical Centers are those at the University of Oregon, University of Washington, and Duke University.

Broad issues facing telemedicine

I would like now to discuss briefly several issues that will ultimately determine to what extent our society will benefit from the promise of telemedicine.

The first is the state of the communications technology infrastructure available to us. This is becoming less and less of a problem. Anyone who scans the daily papers is aware that the information infrastructure grows ever more robust. There we read of commercial proposals to circle the earth with fleets of communications satellites, ever greater bandwidth allowing ever more information to be transmitted ever more rapidly, and of wider access to more people to the Internet. In short, all those things I have discussed that we hope to do in telemedicine are now possible, or very soon likely will be, within the current state of communications technology.

The second issue concerns the social aspects of telemedicine. This is a genuine issue, with problems that need to be addressed. One of these problems is the lack of agreed-on standards for information exchange. The most critical involve terminology for describing patient findings. The VA is collaborating with NLM in experiments to utilize the new Unified Medical Language System for VA purposes. Technical standards are also important problems. Transmission and exchange of electrical versions of medical images are high on the priority list for testbed experimentation.

Another social issue is the concern for privacy and confidentiality of computerized records. This is a subject that the Congress will soon be taking up, since Representative Gary A. Condit (D-CA) earlier this year introduced the Fair Health Information Practices Act of 1994. This bill would establish a uniform Federal code for handling individually identifiable health information that is used in the health treatment and payment processes. Patients will be frank only if we can assure them that we will honor the confidentiality of their records. I should emphasize here that the major problems are not to devise technical encryption systems that will ensure absolute privacy. The problem is to create systems within a real health care environment that will be acceptable to patients, will balance the need to make records readily available — available faster and in more places than now — and yet also will preserve individual privacy.

A problem for telemedicine systems involves licensing health professionals from different states. Differing state licensure and accreditation requirements are an additional complication. I should note that the VA has less of a problem with the lack of portability of accreditation.

The third question is economic — how do the costs of telemedicine compare with the benefits to be gained. It seems quite likely that one could show significant cost savings in the treatment of individual patients by the application of telemedicine systems. Yet, what would be the ultimate financial effect upon the entire health care bill as more such patients were served, isn't known today.

VA Telemedicine Projects

The Department of Veterans' Affairs has in recent years developed a sophisticated information infrastructure of hardware, software, hospital information systems, and a wide area network connecting its many hospital sites to support the exchange of medical data. The VA network, which connects over 600 major facilities, consists of 23,000 miles of fully digital optical fiber network that carries 21 gigabytes of data per month. Teleconsultation — including images, voice, electrocardiogram signals, and patient reports — is undergoing initial testing using the network. The VA reports that it is working to install a high-speed, fiber-based data network in every medical center.

All VA Medical Centers have access to the Internet through a commercial gateway. Additional funding will make it possible to increase the current access line speed of the VA-Internet gateway from 128 kilobits per second to T-1 speed (1.5 megabits/second). The Centers themselves, however, vary widely in their ability to make use of high-speed connections. The Washington and Baltimore VA Medical Centers, for example, make good use of their connection to send text-based medical reports as well as digital medical images back and forth. It is interesting to note that one cannot predict which VA facilities are more advanced in their use of electronic connections — some rural Centers are more sophisticated than their urban counterparts, some smaller Centers more advanced than larger. I should say that this variety of experience is a reflection of the present state of most American institutions vis à vis the yet incomplete National Information Infrastructure.

Any detailed description of individual VA telemedicine projects comes better from officials of that agency. I would, however, like to note especially for the Subcommittee that the first of the ten HPCC-related projects recently funded by the NLM, that I mentioned earlier in my testimony, was for a project in West Virginia titled "Collaborative Technology for Real-Time Treatment of Patients." This project is led by the Concurrent Engineering Research Center of the University of West Virginia. The VA participates in this project by providing funds to the Clarksburg VA Medical Center so that it may join the collaboration.

The objective of this project is to build and evaluate a regional telemedicine system for rural areas of West Virginia. The system will allow rural primary care physicians to consult with remote specialists,, facilitated by computer support for x-ray images, ultrasound, voice-annotations, and other multimedia information. The network will support local community care networks made up of primary care and specialized care providers that collaborate to meet a community's health care needs. In addition, it will be possible for participants to have access to distributed sources of information, including computerized patient records and network-accessible sources of scientific information for clinical decision support.

The VA has installed and been operating over the past year and a half a fiberoptic link between the Tampa and Bay Pines VA Medical Centers in Florida. The network has been used to share a wide variety of programs and data — clinical rounds, guest lectures, and diagnostic evaluations. Another project for similar purposes, involving the Minneapolis VA Medical Center and a remote clinic in Wisconsin, has been operational since early 1994. Both these projects include formal evaluation components that I am hopeful will teach us much about the usefulness of such networks, and whether they provide improved, cost-effective patient care.

There are at least 40 other VA telemedicine projects either planned or under way. They span the Nation and include many aspects of telemedicine — teleradiology, telecardiology, telenuclear medicine, teleconsultation, distance learning, lectures, and grand rounds, for example. In addition, there are several patient surveillance systems that collect data and maintain patient records, such as the system that allows a pacemaker patient to transmit an electrocardiogram over a line to a monitoring center where the data is recorded and evaluated. Not only does the system save lives — a number of critical situations are identified and handled each week — but the aggregated information has proved to be extremely useful in planning follow-up and treatment of patients around the country.

The medical system run by Department of Veterans Affairs is in some senses a microcosm of American medicine broadly. That system affords us a controlled environment to test the many aspects of telemedicine that seem to have so much potential. Mr. Chairman, I applaud those telemedicine projects the Department now has under way and I believe continued support will allow the VA both to improve its communications capabilities and to implement even more sophisticated and valuable networks and systems.

Statement of Helen L. Smits, M.D., Deputy Administrator, Health Care Financing Administration, Department of Health and Human Services

Mr. Chairman and Members of the Subcommittee:

I welcome this opportunity to discuss the emerging technology of telemedicine and its potential to provide access to quality health care in areas that are traditionally underserved. Although its use is by no means widespread, telemedicine as practiced in existing sites has real potential to improve the availability of the services and advice of medical specialists to primary care practitioners and their patients. The technology is in the process of diffusion, and the real questions are not whether we will be including telemedicine in the mainstream of the nation's health care system, but exactly how it will be used.

Medicare currently serves over 36 million beneficiaries; of this number approximately one quarter are veterans. As new technology emerges and medical treatment becomes more sophisticated, Medicare must develop new ways to evaluate each treatment or equipment's value for beneficiaries and determine if it will bring positive results. Telemedicine has great promise but we must adequately study whether it will be cost effective, accessible and accepted by providers, beneficiaries and veterans alike.

In the testimony that follows I will use the term "telemedicine " to refer to two way, interactive video systems over which medical consultation takes place. I am not including the use of telecommunications technology to transport still images, particularly radiologic images, from one site to another. We are quite aware that teleradiology is in common use in many sites, both urban and rural and that Medicare already pays for these services. We are currently exploring the question of quality standards for teleradiology, but do not have questions about the appropriateness of paying for this service when the radiologic image is of sufficient quality.

In the last six months, I have personally visited several active telemedicine demonstration sites. What I saw there made sense from a medical standpoint: telemedicine can be an effective mechanism facilitating the delivery of care. Rural practitioners who regularly seek telemedicine consultation believe their practices are enhanced and their own satisfaction is increased. Consultants providing advice by telemedicine welcome the opportunity to support rural practice and to ensure that patients requiring transfers are appropriately studied and treated at the primary care site. It seems to me that both sides seem to enjoy the consultant/generalist relationship more when telemedicine adds a sense of personal contact.

Telemedicine is a promising means to link rural providers and patients to services not locally available. It also can improve the professional "connectedness" of rural providers and help them keep up with the state of the art of medicine. These features should increase the ability of rural areas to retain rural providers and perhaps even to recruit them. They may also lead to improvement in the appropriateness and quality of care delivered to rural patients.

Another positive aspect of the use of telemedicine is that the television linkages used for consultation can be used to provide continuing education for physicians and nurses as well as degree granting training for a variety of medical personnel. By increasing access to education in rural areas, we can enhance the lives of those who live there and the job satisfaction of practitioners who choose to locate there.

Principles of Coverage for Telemedicine Under Medicare

Although HCFA currently has no explicit national coverage of telemedicine, we do think that the coverage of and payment for telemedical services by Medicare and Medicaid is important for improving access to care and should be explored.

Currently, Medicare covers a physician's services if the physician and patient meet in person in the same room and are "face to face." Under these rules, Medicare cannot cover telemedicine linkages that have the physician on one end and the patient on the other end of the linkage. In order to cover telemedicine consultations, Medicare would have to revise these rules with specific attention as to when and how non face-to-face consultations would be considered to be appropriate care. Since only 2000 total consultations were done in the United States in the past year, we simply do not have the information on which to base such coverage rules.

In the existing sites, telemedicine is facilitated by an efficient organization at the referral site which makes the full spectrum of professional consultation available to the primary care physician twenty-four hours a day and seven days a week. One question which must be answered is whether this type of organization should be required or is an ideal which will be achievable at only a few centers. Clearly not all types of specialties are equally suited to consultation via telemedicine. Patients must also have the choice to make use of a more private means of obtaining consultation when they choose. We also need to evaluate the implications for patient privacy of recording and storing all consultations. Telemedicine raises some complex questions about physician liability and about admitting privileges, the traditional means by which hospitals oversee the quality of care practiced within their walls. We also have concerns about whether direct patient care (doctor to patient) is an effective service and in what circumstances. As telemedicine becomes more widespread, we have concerns, as do many rural physicians, that this technology which ought to support rural practitioners could be used to siphon patients away from rural doctors, thus undercutting one of the principal arguments in favor of the technology. Finally, there are some very experimental types of telemedicine, such as the use of sophisticated computer technology on a non-interactive basis, which deserve evaluation along with the more established face to face systems.

A few of the potential benefits of telemedicine are as follows:

- First, telemedical networks permit the provision of comprehensive, coordinated health care services to rural residents served by the system. These networks use referrals, consultations, and support systems to ensure patient access to a comprehensive set of services.

- Second, telemedical networks can provide the means for rural practitioners to establish ongoing cooperative working relationships with other providers that assure the full range of quality health care services. This infrastructure enables rural practitioners to extend the scope of care they are capable of providing their patients by tapping the expertise of specialists through consultations. It also serves as a means of communication between primary care physicians and specialists, as well as between non-physician primary care practitioners and physicians. For patients who cannot be treated locally, the infrastructure provides referral relationships that include an important feedback loop to the referring rural practitioner. Practitioners using telemedicine argue that networks of care improve practitioner satisfaction as well as patient care.

- Other benefits include increases in the number of patients who can be successfully treated in rural hospitals, and decreases in duplicate testing when patients are transferred out of rural areas for treatment.

On the basis of the information currently available, it appears that telemedicine technology would be most successful if we covered consultations over telemedicine networks that are part of integrated systems of care. Ideally such telemedicine networks would be designed to provide to rural sites a comprehensive range of telecommunication consultations using technology that provides an adequate visual image for communications and diagnosis.

I can envision telemedical networks similar to the active sites at Texas Tech and the Medical College of Georgia that I have recently visited operating in many rural areas. In these networks, the academic health center serves as a hub which makes consultations available on a twenty-four hour basis and has the capacity for follow-up care when necessary. Consultations within the network can also take place between, for example, a primary care practitioner in a remote site and a general surgeon located in a mid-sized town. Primary care physicians, in turn, can use the system to supervise nurse practitioners and physician's assistants.

There is a great deal we need to learn about telemedicine. We encourage those currently using this technology and others who are experimenting with it, both in the public and private sector, to be innovative in bringing efficient and effective care to those in need. At the same time, we need to gather information to help guide those who organize and pay for care--both Medicare and others--as to when this service is best used.

Telemedicine as an Emerging Technology

Even though telemedicine has a history that can be traced back several decades, it is still in many ways in its infancy. While it is clear by now that telemedicine can work technically and medically, we must recognize that we have virtually no experience with this form of delivery of medical services. As federal health programs, such as Medicare and Medicaid, and the private insurance industry examine coverage of telemedical services, we must be cautious that we fully understand both its benefits and its limitations so we can develop appropriate policies regarding when and how we pay for telemedical services and how we safeguard the quality of care.

As HCFA assesses the use of telemedicine, we are keenly aware of our responsibility to assure the quality of care for all who are in the Medicare and Medicaid programs. There must be assurances and specific guidelines in place to provide the same level of quality of care that is present for hands-on consultations and referrals. Use of this technology still does not replace human contact, and we must be sure that the use of telemedicine will not compromise the quality of care for any patient.

Another concern is the whether telemedicine will be accepted and utilized by all providers and by their patients. This type of technology might not be readily supported by physicians or seen as a viable alternative to physically transferring a patient to a tertiary hospital. Particularly once the initial glamour has worn off, patients may be wary of this less private means of communicating. I am sure as use of the technology expands, we will begin to identify circumstances in which its use is less than ideal.

The potential also exists for overuse and inappropriate use of telemedical services. As we develop national policy regarding definitions of the limits of telemedicine, we need to build in appropriate safeguards. We need to construct coverage and payment policies that do not create incentives for practitioners to over-provide services. This is a problem we have experienced with other high technology diagnostic tools such as MRIs and CAT scans. While we welcome the advent of new technology to better serve our beneficiaries, we must be sure that the technology will be used in an appropriate manner that is consistent with medical practice and beneficial to the patient.

Clearly more assessment and pilot testing must be done to quantify the benefits and potential uses of telemedicine. HCFA is ready to support such efforts and would encourage private industry to participate in expanding telemedicine technology and its clinical applications. I very much hope that we can reach cooperative agreements to exchange information about the use of telemedicine with private insurers so that all payors can have the best possible information base on which to make coverage decisions.

Anticipated Efforts Towards Assessing the Efficacy of Telemedicine

We understand that last year there were fewer than 2,000 telemedical consultations in the U.S. and Canada over a dozen networks. At this time HCFA has very limited data on which to base national policy regarding coverage and payment for telemedical services.

Under these circumstances, we are pursuing answers to questions about telemedicine on a pilot basis. We actively encourage the private insurance industry to also initiate projects to explore the potential applicability of telemedicine in clinical care. A set of pilot projects would enable payors to garner experience while we experiment with a number of approaches.

HCFA Demonstration Projects on Telemedicine

Pilot telemedical networks would provide services on an ongoing basis, and they would furnish payors with information for use in evaluation. Depending on what is learned, we can develop broader coverage and payment rules over time.

In Fiscal Year 1994 the HCFA appropriation for research, demonstration, and evaluation activities included over $7 million over the budget request with $5 million of the increase intended for rural telemedicine grants.

In January 1994, HCFA published a notice in the Federal Register soliciting research and demonstration projects in the area of telemedicine. Specifically, we asked for proposals that would demonstrate and evaluate the effectiveness of rural telemedicine systems and in proposals that would develop, pilot test and evaluate payment methodology for telemedicine consultations.

As of July 5th, HCFA has approved four three-year demonstration projects in the States of Michigan, West Virginia, Iowa and North Carolina. Total funding will be approximately $7.5 million over three years starting in the Fall 1994, and is subject to congressional appropriation in future years.

A central issue in the use of telemedicine services is how the program will make payments for the physician consults. As I mentioned earlier, presently payment for physician consultations requires a face-to-face encounter by the consulting physician and the patient. Now, we will test new and different methods to pay for physician services to conduct telemedicine consultations. East Carolina University, West Virginia University and the Mercy Foundation demonstrations all involve the development and testing of payment methodologies for telemedicine services. It is our hope that if the information garnered from these projects assures us that telemedicine is a cost effective and viable tool, a fair and reasonable payment can be developed for telemedicine consultations and be potentially adopted by the Medicare program.

The University of Michigan will be undertaking two tasks. They will develop a detailed methodology for evaluating accessibility, quality and cost effectiveness of telemedicine. In addition, Michigan will evaluate existing telemedicine programs in Georgia and West Virginia using this newly developed methodology.

HCFA is currently working with each approved site to refine its budget and workplans and will provide oversight throughout the life of the demonstration. We have worked consistently with the Office of Rural Health to coordinate HHS funding for telemedicine demonstrations to avoid duplication of effort.

In addition, we are already collecting and reviewing some preliminary information on the use of telemedicine. We have contracted with the Center for Health Policy Research (CHPR) in Denver to conduct a review of state-of-the-art telemedicine. The Center is developing a framework to assess the effectiveness of telemedicine.

HHS Initiatives in Telemedicine

The Office of Rural Health Policy in the Public Health Service currently funds a project in West Virginia and has allocated $4 million for approximately 8-10 additional projects. These projects would "demonstrate and collect information on the feasibility, costs, appropriateness, and acceptability of telemedicine consultations for improving access to health services for rural residents and reducing the isolation of rural practitioners." Grant funds may <u>not</u> be used for the costs of purchasing and installing transmission equipment.

Other Sources of Funding and Research in Government for Telemedicine

Advanced technology and its possible applications has spawned much interest from other government agencies and components.

Exciting projects are being developed to enhance accessibility to this emerging technology and to provide affordable options to rural and other hard-to-reach locations. For example, the Rural Electrification Administration (REA) has allocated $20 million to "encourage, improve and make affordable the use of telecommunications, computer networks and related technology for rural communities to improve access to education and medical and health care". Grants are designed to address some of the following areas: educational and/or medical services which would remain unavailable without advanced technology; technological costs and benefits examining operation, maintenance; evidence of technological and financial need; and potential for "sustainability" when funding terminates. Additionally, in support of the development of a National Information Infrastructure (NTIA), the National Telecommunications and Information Administration of the Department of Commerce administers the Telecommunications and Information Infrastructure Assistance Program. This program will aid numerous social service providers, including rural health clinics, to obtain connections to telecommunications networks. This year Congress has appropriated $26 million for the program, and the Administration has asked for $100 million in FY 1995 and $150 million for FY 1996. Finally, the House has passed an authorization bill which mandates NTIA to serve as an information clearinghouse for telemedicine applications. With these Congressional directives, NTIA expects to help "jumpstart" the National Information Infrastructure (NII) for a broad range of non-profit social service providers.

Conclusion

In closing, I would like to reiterate that telemedicine has substantial potential to improve access to medical expertise not readily available in underserved areas. While I support the use of telemedicine and believe in its effectiveness, I also recognize that it is an emerging and somewhat untested technology. Because of our limited experience with delivery of telemedical services in the real world, we would like to proceed with caution. However, I can say with confidence, that through the use of pilot projects undertaken by both the Government and private industry, we will be able to learn the best approach to provide effective and efficient health care services for our beneficiaries. HCFA envisions accessible health care being provided through the use of telemedicine and other emerging technologies but it must be based on solid data so that the quality of health care provided is not compromised.

I would be pleased to answer any questions you may have.

BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
COMMITTEE ON VETERANS' AFFAIRS

VA HEALTH CARE AND COMMUNICATION AND INFORMATION TECHNOLOGIES

JULY 20, 1994

Mr. James Elias
US WEST Communications

INTRODUCTION

My name is Jim Elias. I'm the Executive Director-Technology Assessment at U S WEST Communications, and I am delighted to be here today to address the issue of telemedicine.

Telemedicine is not really "new"; its current manifestation - the transmission of images from remote locations to a major hospital - has been around for 10 to 15 years. In truth, 'telemedicine' in its broadest definition - gathering information about a patient's condition electronically, rather than physically - had its beginnings with the invention of the telephone which made it possible for the patient to engage the doctor's sense of hearing without being in the doctor's office, simply by speaking into this piece of technology which transmitted the voice to the doctor's ear.

Telemedicine invites us to look at health care from a new angle that reorders the health care resource without damage to any participants, simply by applying emerging network technologies to the problem. And the problem, for the physician and the patient, appears, at a very basic level, to be one of gathering enough information about a patient condition to make a proper diagnosis, order the appropriate tests and care, and to return that patient to a state of health.

U S WEST understood early the critical part that networks play in successful telemedicine efforts and has been actively involved in the identification and development of telemedicine applications. One cannot discuss telemedicine without including the contribution of the public switched network and the role that U S WESTspecifically has played.

When talking about telemedicine and its future, think of communications networks as transportation systems for the senses and of medical practice as the application of senses to solve medical problems. Telecommunications will improve the sensory value of such information as well as increase the speed at which it can be delivered .

The evolution of telecommunications network technologies allows network infrastructures to transport more information faster. In a multi-media format the user is able not only to involve more senses, but also to enhance those senses. With multi-media one can "hear" color and "see" sound.

The evolution of networks from analog to digital signaling parallels the advances in modalities, where information is presented in digital format. This match between output of diagnostic equipment and the digitization of networks simplifies the task of transporting information between locations.

U S WESTis constrained by current regulation from leveraging these emerging technologies to provide benefits to the medical community as a whole and the VA in particular. Telemedicine applications, to be effective, need to be able to connect with distant locations, regardless of the artificial boundaries created by the Modified Final Judgement (MFJ). Telemedicine is not a simple subject and excessive regulation adds yet another layer of complication, effectively slowing widespread deployment of applications that the country needs.

Change is constant as telemedicine becomes more widespread. Partnering with companies like U S WEST allows VA to focus on the development of telemedicine and the delivery of high quality service to veterans while letting U S WEST manage the changes in network technology.

DEPARTMENT OF VETERANS' AFFAIRS PARTICIPATION

The Department of Veterans' Affairs has already entered the world of telemedicine. VA has partnered with U S WEST testing two-way interactive video for distance learning and other telemedicine applications, and is included in the planning for at least two other test beds for telemedicine within the U S WESTregion.

VIDEO AT THE VAMC IN FT. SNELLING

U S WEST has an ongoing interest in the application of leading-edge technology to the increasingly sophisticated needs demanded by telemedicine applications. Asynchronous Transfer Mode (ATM) is designed to handle a highly variable mix of traffic, ranging from continuous bit rate applications like video and voice, to variable bit rate bursty applications like image transfer.

U S WEST approached the University of Minnesota and the VA Medical Center at Ft. Snelling and proposed the creation of a distance learning trial that would allow the University to provide radiology lectures over two-way communications between the locations. At the same time, U S WEST could experiment with the emerging ATM technology. The parties agreed and a unique collaborative effort was launched.

In this two-way interactive video trial, the VAMC Department of Radiology uses telemedicine daily. Interns from the University of Minnesota Medical School attend mandatory lectures from the VA Hospital location using a two-way, interactive ATM fiber link, provided by US WEST, with the University. Guest speakers are frequent, providing one-hour lectures using 35 mm slides and other radiology images during the course of the talk. Projected on dual screens, the side-by-side images allow students to compare X-rays and other medical images, giving them a chance to observe, learn and to make their own diagnoses.

The U S WEST two-way interactive ATM video link makes it possible for the interns to learn and participate without having to leave their duties at the hospital and return to the U of M campus, 10 miles north of the VAMC at Ft. Snelling. Likewise, guest lecturers, and regular staff, do not have to travel either. This trial, which began in the spring of 1993, will continue for 18 months.

This ATM Video trial is one example of a partnering between VA and U S WEST to learn not only about the emerging technology of ATM, but also about the telemedicine application of distance learning.

THE SEATTLE TEST BED

In Seattle, U S WEST is leading an effort, still in its formative stages, to use a PC-based platform to send and receive images between the University, several Department of Defense (DoD) medical facilities, the VA hospital in Seattle, and the VA Hospital in American Lake. Brent K. Stewart, Ph.D., Director of Diagnostic Physics, Department of Radiology and Dr. Stephen J. Carter, Clinical Assistant Professor of Radiology, both from the University of Washington School of Medicine, are working closely with U S WEST and the Army to make this project a reality in the near future.

Called "Project Seahawk", this partnership will create a telemedicine outreach program centered at Madigan Army Hospital will utilize a U S WEST fiber ring to connect project locations. Bremerton Naval Hospital, American Lake Veterans' Hospital, the Seattle VA, and the Hospital at McCord Air Force Base will be able to share medical information.

The advanced imaging, image management and image display capabilities of the Madigan Medical Diagnostic Imaging System (MDIS) form a base of expertise and systems capability to which will be added full-motion, compressed, color video equipment and appropriate medical interface devices. Images will be transmitted over the U S WEST fiber ring at speeds of 45 Mbps initially, migrating to ATM when that service is commercially available in the Seattle area. The network topology of the U S WEST fiber ring also provides dynamic alternative routing capabilities should one network element fail, allowing critical medical information to continue to be transmitted.

Representative Norman Dicks continues to champion "Project Seahawk" on behalf of those in active duty as well as veterans.

OTHER EXAMPLES

In Eastern Montana, U S WEST has partnered with Billings Deaconess Medical Center in another telemedicine test bed. This time, U S WEST used existing technologies to facilitate a two-way interactive video conferencing application to provide outreach services in the areas of consultative medical and mental health services. From Billings Deaconess Medical Center, this telemedicine application reaches into rural eastern Montana, connecting primary care facilities in Miles City, Glendive, Sidney and Culbertson. Additionally this system sends X-ray and other radiology images across the U S WEST network. (TELEMEDICINE: Health Care from a Distance, Eastern Montana Telemedicine Project Program Office, 1993) Discussions are currently underway with the VAMC in Helena to identify potential synergies.

In each of these examples, telemedicine makes it possible to extend the sense of sight by applying advanced networking technology to already existing, sophisticated medical technology. An important point about these last two test bed activities is that they were truly a collaborative effort, with the medical professionals and the communities providing the impetus for the test bed to move forward While U S WEST facilitated the telemedicine applications through test beds of emerging technology or existing facilities, the physicians themselves were the primary driving force behind the trials.

Each of these examples also represents an island of telemedicine activity, its usefulness limited by lack of connectivity with other islands. Current regulation around Local Exchange Carriers (LES) hampers the sharing of lessons learned in each of these separate telemedicine islands. One of the biggest obstacles to wide deployment of telemedicine applications is cost; reduced regulations on the LECs would increase competition for the network connectivity of telemedicine islands, effectively reducing prices of that portion of the telemedicine equation.

OTHER SENSES EXTENDED BY TELEMEDICINE

What does telemedicine hold for the future?

Researchers at McGill University and the University of Auckland have developed a prototype tele-operated microsurgical robot and the associated virtual environment for remote eye surgery.

The Microsurgical Robot is being used as an experimental test bed for studying the effects of feedforward and feedback delays on remote surgery and is used in research on enhancing the accuracy and dexterity of microsurgeons by creating mechanical and visual telepresence. The surgeon wears a helmet that is used to control the orientation of a stereo camera system observing the surgery. Images from this stereo camera are relayed back to the helmet where they are viewed by the surgeon. In each hand the surgeon holds a pseudotool (a shaft shaped like a microsurgical scalpel); movements of the pseudotools cause corresponding movements in the microsurgical tools held by the left and right limbs of the micromotion robot that performs the surgery. The computer system consists of master and slave computers that communicate via an optical fiber connection. As a result the Microsurgical Robot master and slave may be located at different sites, thus making remote robotic microsurgery a reality. (Presence, "A Teleoperated Microsurgical Robot and Associated Virtual Environment for Eye Surgery", Vol. 2, No. 4, Fall, 1993. MIT Press)

While this example of telemedicine is not happening within the U S WEST territory, it very well could. U S WEST fiber networks like the one to be used in the Seattle test bed, provide the kind of highly reliable networks required to make remote robotic microsurgery a reality.

BENEFITS OF TELEMEDICINE

Where we used to rely on moving people - the patient and/or the doctor - in order to gather information to apply to the problem of how to treat an illness or injury, we now can move just the information.

The benefits of this movement of information rather than people are easy to identify and significant.

People, veterans, who do not live close to a medical facility do not now have to physically arrange transport to that facility. Patients, particularly elderly patients, who have difficulty traveling do not have to leave their communities to receive specialized care. Dr. Francis Tedesco, president of the Medical College of Georgia, estimates that up to 88% of patients who need specialized, consultative care are able to receive that care without travel by using a telemedicine infrastructure. (Atlanta Constitution, 6/17/94)

Telemedicine delivery systems (the combination of the public switched network and highly specialized, advanced medical technology) help to control costs while improving patient care. Such systems accomplish this feat by allowing patients to receive the best care in their local health care facilities (Doctor's offices, clinics, local hospitals), avoiding the stress and expense of making a trip to a medical center in a distant city. The VAMC's goal of providing the best possible services to their "customer", the veteran, would be enhanced by employing telemedicine delivery systems more broadly.

Additionally, telemedicine application infrastructure makes a scarce resource - trained medical professionals - more efficient, allowing one person to 'treat' many more patients without the need to travel to other locations. This same infrastructure can also be used to deliver training to medical professionals, thus keeping those professionals apprised of the latest medical advancements.

THE COMMON THREAD

Each of the examples cited illustrates the bringing together of advanced medical machinery and professionals and a network that links participants. Whether telemedicine is dealing with X-rays, CT scans, tissue slides or face-to face consultation between a patient and a physician, the common thread is the network, and more specifically, the public switched network. This network infrastructure is virtually ubiquitous. And it is constantly being upgraded, infused with the best of the emerging, high speed, broadband technologies. This trillion dollar infrastructure is designed to link people through applications like those we have discussed in this testimony.

While the applications can and do change from location to location the network is the constant that enables telemedicine to exist and to deliver its benefits. Carriers invest in this infrastructure, keep it current, helping to develop and refine emerging technologies, so that the Department of Veterans' Affairs does not have to make this investment in a separate network.

One way for the VA to continue its application of telemedicine to solve problems is to partner with companies like U S WEST in test bed situations like those in Minneapolis, Billings and Seattle, to work in live situations, to identify what works most effectively. Other test beds available for participation by VA sites include Portland, Oregon and Boulder, Colorado where various ATM applications are being tested.

LESSONS LEARNED

From participation on various telemedicine trials, U S WEST has identified potential pitfalls to the advancement of telemedicine. These include cost of funding, regulations which impede progress, and lack of acceptance by the medical community and by patients of telemedicine.

Funding is problematic. U S WEST was encouraged by the language in the Senate Finance Bill which designated $20 million in grant money for telemedicine demonstration projects. While the cost of the networks is not insignificant, the cost of the medical equipment far outpaces the expense of connectivity. The question remains, however, "what happens after the demonstration?"

Regulations which discourage competition and which do not permit companies like U S WEST to act as single point of contact for telemedicine networks complicate the process of exploring beneficial applications. Regulations that create artificial boundaries restrict the widespread deployment of beneficial telemedicine applications across these barriers.

U S WEST has found that the more telemedicine test beds that can be implemented, the easier it is to gain widespread support from both the medical and patient communities. Experience counts in telemedicine to raise the comfort level and confidence of all participants.

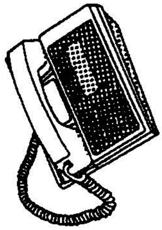
CONCLUSION

Applying network technology to medicine saves time , money, and improves the physician's access to knowledge. The Department of Veterans' Affairs is in a unique position to take advantage of emerging technologies that will continue to provide benefits. The VA's resources include a hospital system equipped with the latest and the best diagnostic and testing equipment available. Another resource for the VA to tap into is its very talented, highly skilled staff of sub-specialist medical professionals.

The VA hospital system is 'dispersed' and yet it is under "single ownership" with a built-in avenue for cooperation and collaboration. Both characteristics make the VA system an ideal candidate for telemedicine applications. Partnering to create test beds of telemedicine provides VA an opportunity to test and identify the most useful applications.

By placing itself at the edge of this emerging world of telemedicine, the VA addresses its most pressing issue: quality of service and care to veterans. In making this concentrated effort to understand telemedicine thoroughly, the VA may very well position solutions beyond the community of veterans which it serves into the general public.

What is required to accelerate the merging of medical needs with communications capabilities is a synergistic effort. Now is the time to build a solid shared foundation of experience. With this knowledge base we can be in charge of our future and can design useful medical applications based on emerging communications technology. U S WEST is ready to work with VA to insure that the promise of technology is realized in telemedicine applications that will provide the best care possible to our veterans.



PT PHONE HOME

P.O. BOX 593
CASTLE POINT, N.Y. 12511

PT PHONE HOME, INC. VOLUNTEERS
BRING BEDSIDE TELEPHONES TO VETERANS

PT Phone Home, Inc. is a non-profit effort that began with volunteers at the Castle Point V.A. Hospital in Beacon, N.Y. in 1990. Frank Dosio, a N.Y. Telephone Company Technician and Vietnam Veteran, who also volunteered at the hospital, had recognized a need. Frank spearheaded the effort with the help of the Communication Workers of America and N.Y. Telephone. In no time they were joined by V.F.W., American Legion, Telephone Pioneers, The International Brotherhood of Electrical Workers and many other organizations.

Against all odds, a group of more than seventy volunteers achieved what they had been told was impossible. Union and Management working together toward a common goal. They had the determination and perseverance to install the first complete bedside phone system in the V.A. Hospital history.

Since that time, PT. Phone Home Inc., has developed into a national effort and at this time, 31 hospitals have been completed by PT. Phone Home and an additional 15 Patient Systems have been installed by the V.A.

International Labor Union Presidents, J.J. Barry, (I.B.E.W.) and Morty Bahr (C.W.A.) have sent written statements of support for PT. Phone Home to their entire memberships.

The NYNEX Corporation has loaned Frank Dosio, from the C.W.A. in New York and David Thistle from the I.B.E.W. in Boston, to PT. Phone Home on a full basis to complete the national effort. All of the other "Baby-Bells" have followed with their expertise and personnel when PT Phone Home came to their area.

The Governors of eight States have issued PT Phone Home Day Proclamations. The A.F of L./C.I.O. has issued a National Statement of Support as have the V.F.W., V.V.A., Telephone Pioneers of America, American Legion, P.V.A., and many other organizations.

In a May 29, 1993 broadcast from the Oval Office, President Clinton referred to PT Phone Home, as a "Stunning example of what Americans can do together at the grassroots level". Frank Dosio has also received the President's Volunteer Service Award from President Clinton.

On May 16, 1992, Jim Sherwin, a quadriplegic patient at the Castle Point Hospital, received his Bachelors Degree in Psychology. This had been made possible with the use of special equipment donated through the PT Phone Home Program. On May 28, 1992, David Dickinson became the first paralyzed cadet to graduate from West Point. Without the phone system and equipment at Castle Point, he would have received a Medical Discharge in his senior year.

A G.A.O. study done in July of 1991, indicated that bedside phones in a VA. Hospital saved 1800 to 2000 man/hours annually, or the equivalent of adding another nurse to the staff. Patient morale improved, and one Hospital reported a 50% reduction in night medication after the installation of the patient phones. Morale improved among the staff as well, including the administrative levels.

PT Phone Home, Inc. provides patient telephones, jacks, and wiring, through fundraising done by the various organizations that support the project. Labor is donated by local Unions and other volunteers. Local telephone service is provided through the individual Hospital's phone system at no cost to the Veteran. Upgrades to the phone systems, if needed to handle additional volume, is paid for by the V.A.'s Central Office. Long distance or toll calls are the responsibility of each veteran. They may call collect, use a credit card, or a debit card. Indigent patients are provided for with a separate fund developed by the local PT Phone Home Steering Committee, or Hospital Voluntary Services Organization. The fund ensures that all patients can make emergency calls and holiday calls to their families and loved ones.

These Veterans are the men and women who have been willing to place themselves in harms way to protect and preserve Freedom, at home and abroad. Surely we can provide them with the simple freedom of a telephone at their hospital bedside.

The primary purpose of PT Phone Home is to provide much needed telephone service at the lowest possible cost to our Veterans. The added benefit of what President Clinton referred to as "A stunning example of what Americans can do", is that this is also being done at the lowest possible cost to the taxpayer.

Testimony of

Marilyn Cade

Director,
Technology/Infrastructure, Computer Products and Services,

AT&T Government Affairs

before the House Subcommittee on Oversight and Investigations,

Committee on Veterans' Affairs

Wednesday, July 20, 1994

Mr. Chairman and Members of the Subcommittee, my name is Marilyn Cade, Director, Technology/Infrastructure, Computer Products and Services, AT&T Government Affairs.

As a leading corporation involved in building and operating the national and global information infrastructure, we applaud the vision and leadership of this Subcommittee in examining the NII and its role in supporting the delivery of health care information and services. As the NII provides enhanced information technology and services, ensuring that the medical services which support our nation's veterans are incorporated into that NII is a critical step to better access and lower costs overall.

What is the NII:

The National Information Infrastructure is composed of four essential and interrelated elements. These four elements need to be seamlessly integrated and individually enhanced by the integration.

- Information appliances
- Interconnected and interoperable communications networks
- Information resources
- Skilled, well-trained people to build, operate and use the above physical elements

Information appliances include computers, from mainframes to laptops, telephone sets – including video and wireless, television sets and radios, fax machines, pages and the like. They are the devices people use to generate process, store, send and receive voice messages, fax, images, data, video and multimedia information – as well as to simply talk with each other.

Communications networks can be segmented into local area networks, local/metropolitan exchange networks and long distance networks. Included in local exchange networks are local exchange telephone providers, cellular carriers, Personal Communications Services (PCS) providers, data carriers, paging systems, and television/radio – both broadcast and cable. Long distance networks include interexchange carriers, data carriers and satellite. The networks are linked through copper, optical fibre, coaxial cable fiber and wireless communications systems that transmit information at speeds from kilobits per second aggregated up to megabits or gigabits per second, depending upon the need and application.

Information resources are the databases and applications offered by information service providers, "enhanced" service providers and other content providers. These "Information Resources" may range from large electronic databases to centralized software applications to entertainment. In the USA today, there are thousands of information service suppliers from large public vendors to small private providers of information for public access. It can be a multimedia message, a movie on demand, or an electronic library accessed by students in separate locations all over the country.

Linking information appliances, communications networks and information resources together are the skilled people who generate, process, transmit, access and manipulate the ever-expanding flow of information, and make use of the information. They are those who use the information infrastructure for a wide variety of applications and needs such as entertainment, sales, education, research, the arts, health care, intelligent manufacturing, transportation, and banking. The people also include those who invent, develop, and implement new technologies, products and services to continually improve the information infrastructure as well as those who maintain, and upgrade the existing infrastructure.

Taken together, these essential components provide an information infrastructure that enables people, through their information appliances, to connect via networks, with other people and with information resources.

The potential is tremendous. This infrastructure can link people, homes, schools, libraries, hospitals, businesses and government offices. It provides access to an amazing variety of public and private information resources. And the range of possible transmissions includes voice, data, facsimile, images, video and mutlimedia.

In short, the NII will ensure that information is exchanged as easily and reliably, and as securely as today's voice telephone call.

In AT&T's vision of the NII, the healthcare systems of today, and those which are evolving will be among the early users of the enhanced NII – we envision a healthcare information infrastructure which is thoroughly integrated into the overall NII, and which takes maximum advantage of the improved systems and communications networks to improve the delivery of healthcare services and to bring information to decision makers, whether they are healthcare practitioners, managers, administrators, or patients and their families.

The Need for Change

As we prepare to enter the 21st century, the delivery and management of healthcare is a significant challenge to both industry and government. Healthcare costs already represent nearly 14% of the GNP, and are expected to reach one trillion dollars early in the next decade. Quality of care and access to care remain substantial concerns, in spite of the amount we spend. The need for change is apparent to both our policy makers, and to American business, and more importantly, to all of us as citizens. Without a change in current spending practices, healthcare expenditures will undoubtedly continue to rise – soon consuming more than 18% of the GNP.

Much of our health infrastructure is already in crisis–or will move into crisis. For instance, our nation's rural hospitals are very vulnerable – many are closing or are experiencing reduced staffing and reduced utilization. We are educating more medical specialists than general practitioners–yet our need for general practitioners is growing. Much of the physical plant of the healthcare system – hospital buildings, clinics, etc. are old and in need of replacement.

It is increasingly difficult to treat conditions that we thought we had eradicated in this country – TB, for instance, is now often treatment resistant, meaning harder and more expensive to treat. We are creating new diseases, or conditions, through the environmental hazards we create inadvertently, and now must struggle to find treatments for environmentally caused, or accelerated cancers. Low birth weight babies also often have other, related health problems associated with this condition, requiring lengthier hospitalization at birth, and often requiring ongoing treatment – when nutritional and prenatal counseling might have prevented these problems.

Extending the reach of the caregiver to the patient has become a critical part of addressing access and lowering cost. We need to increase the extension of services to the patient – into their community, into the local primary care physician's office, into their home.

Efforts such as your hearing will help to ensure that these areas are examined, and understood, and taken into consideration as the reform of our nation's health care system is examined. Unless we change many aspects of the system of delivery and management of healthcare services in our country, we will make no significant change in either the health of our citizens, nor in the continued escalation of costs to both deliver and to manage healthcare.

If we are to make meaningful and sustainable change, we must begin first to change the way that information is gathered, managed, and delivered throughout the present healthcare delivery and management system. Today, we lack access to information that would help us to more clearly know where we can gain greater benefits from spending our healthcare resources. Because of the difficulty millions of doctors, nurses and other healthcare professionals face every day in quickly gaining access to the information they need to care for their patients, we squander the most valuable resources we have in our healthcare system, our human resources, – while needlessly driving up costs.

This is not to say that many segments of our healthcare delivery system are not world class – they are. But overall, the practice of healthcare and its administration are seriously in need of advancement to improve on the value we all receive from the large amount of resources we spend.

For the most part, in the civilian healthcare environment, the systems used for managing, administering, and delivering healthcare are largely not integrated, even in an era where competitive businesses are taking advantage of information technology available today. Although many hospital departments' information management processes are automated, many are unable to communicate with the department down the hall, and the vast majority are still unable to link with their doctors' offices across the street, or with the laboratories, pharmacies, and insurance companies across the state in an integrated fashion. These limitations are even more dramatic when viewed from the referring physician who is back in their office, in need of information now at the hospital in order to provide informed decisions about the care of the patient.

Much of the data needed is still not gathered in digital form. Highly trained professionals rely on hand written notes. Test results are often not available at the time of examination – so a second test may be ordered. Doctors and nurses spend up to 40% of their time on paper work, much of it spent looking for a critical piece of information. Thus do we misuse our most precious medical resources.

To change our model from an "incident treatment" model to a "wellness" model, we need to change how information is provided, both within the healthcare delivery system, and to all of us in our daily lives – and move to an environment where every person in our country has access to the kind of information that helps them to make informed decisions and to participate in their own wellness.

But, in fact, such a system represents a dramatic paradigm shift for our medical community, as well as for us as users and purchasers of healthcare. Regardless of the form of healthcare reform that is finally approved by the Congress, the need to reengineer the healthcare care system into a system of wellness and informed decision making that involves the total system from the patient's perspective will continue as a major challenge if we are to truly create an environment that reduces the cost of healthcare in this country and creates a healthier populace. Beyond the obvious quality of life implications, there are significant economic concerns involved as well. A healthier society consumes less treatment, lowering the cost of delivery, and is also better able to fully participate in the global economic marketplace. As we face increasing global competition, improving our ability to compete on all fronts must be one of our national goals if we are to continue to provide the high quality of life and standard of living that our nation's citizens deserve.

Interest in telemedicine has grown dramatically as we have examined our nation's system of care delivery, and seen the need to bring the benefits of information technology and communications together as part of the framework to address our challenges in delivering affordable healthcare services to Americans, wherever they are. Telemedicine and healthcare informatics are increasingly recognized as critical components in improving access and reducing costs.

Among the many useful initiatives already underway across our nation today are several projects which the VA has initiated, and which form a very useful platform of knowledge which can be shared with the private sector healthcare system. The VA projects described here today are excellent examples.

In fact, the VA system might be viewed as somewhat of a unique test-bed – with 80,000 beds, 2.6 million patients annually, 171 hospitals, over 350 clinics and 128 nursing homes, and a truly distributed patient base; their challenges of reaching and keeping in touch with their patients are obvious. While it is true that the demographics of the patient population are not fully representative in their under representation of women and children, many of the other characteristics can provide a useful framework for understanding patients, their willingness to accept new approaches to care involving technology, and how technology can be used to bring care to the individual, rather than bringing the patient to the care giver, how technology can be used to extend the reach of the medical personnel into the patient's home and community, and how technology can support continuing medical education.

For instance, many veterans would find continued support from the VA system more useful and effective if it did not require them to leave their community, friends, and family. Over 104 medical and dental schools are affiliated with the VA; undoubtedly, the VA will find it easier to attract and retain interns and residents if they are able to offer a rich enhanced experience in the use of emerging technologies which are gaining acceptance in the private sector environment, and which will enhance their skills and knowledge in preparation for practice outside the VA.

Finally, the VA has, as do all medical institutions, a significant challenge to meet both required and elective continuing education needs of their medical personnel. One area which is not well understood in the equation of retaining medical personnel in rural areas, or in inner city areas is the challenge of providing useful and usable approaches to continuing access to medical knowledge and skills advancement. While all of us understand the need for ongoing information in order to do our jobs, few of have mandated requirements built into our continuation of employment, as does the medical profession. In some rural areas, attendance at a particular conference with a 1/2 day seminar on a particular specialty might requires 2 to 2.5 days away from the clinic or office, or hospital due to travel time, leaving that facility without a covering physician or medical professional.

What Is Telemedicine:

Telemedicine is the combination of telephony, computers, imaging and video communications that can support clinical medical decisions, continuing education and medical consultation with experts (laboratory technicians, radiologist, pathologists, physical therapists) and electronic resources such as the National Library's MEDLine, AT&T's RightPages trial with the UCLA's School of Medicine to provide on-line access to medical journal articles, and other relevant information resources that can support decision making by the caregiver or the patient or their family.

Telemedicine's scope and capabilities have changed in the recent timeframe. Telemedicine, today can be both live interaction between two or more decision makers; it could be an interaction between a specialist at one location and a image-based resource at another; it could be a multi-point consultation between a patient and healthcare professional at one location and one or more specialists at one or more other locations. In short, telemedicine reduces the distance and time factors of providing information to support decisions in healthcare. The technologies which support telemedicine today vary significantly, based on the application -- and include low speed dial up lines with computer terminals, fax machines and specialized image viewing devices; and medium to high speed communications networks to support interactive video conferencing or real time image consultation.

The use of open systems, agreed upon business standards, and new uses of today's technology, such as video conferencing, smart cards, wireless technology, ISDN, ATM/Sonet, high performance computing, can make dramatic improvements in what information is provided to caregivers, and to purchasers of care, thus impacting the quality of decisions, and the cost of delivering services.

Some Current Examples of Telemedicine At Use Today

VA Uses of Telemedicine:

The Department of Veterans Affairs has been an early adopter of the uses of telemedicine; the Subcommittee will hear much more today from the VA staff who are here to talk about the various uses of telemedicine. I will only mention three examples of their leadership and innovation in these areas:

- The Minneapolis VA Medical Center (VAMC) has used telemedicine extensively for approximately 18 months between its hospital in Minneapolis and its outpatient clinic in Superior, Wisconsin, in connection with the Academic Affairs pilot.

- The VA has also embraced video conferencing technology to bring enhanced healthcare to veterans located in rural northern Wisconsin. There is a biweekly physical rehabilitation consultation clinic that originates from Twin Ports where several patients are "seen" by a practitioner at the Minneapolis VAMC. Nurses or physician assistants assist the patient, acting as the "hands" of the remote physician to perform necessary manipulation during the examination as necessary during the video consultation. Prescriptions and physical therapy treatment plans are transmitted and upcoming appointments are scheduled. An FTS2000 T1.5 dedicated circuit is used between these sites at speeds of 384 Kbps & 768

Kbps. Near term plans include the installation of FTS2000 switched access enabling dial in and out multipoint capability to Federal and non-Federal Sites, as the VA's need for flexible connections grows in conjunction with healthcare reform.

Residents and physicians located in the remote clinic in Wisconsin are now able to have the same training as their counterparts in the Minneapolis VAMC. For example, weekly medical and psychiatric grand rounds are transmitted to Twin. Ports. Also, a psychiatry course in addictive disorders was recently delivered via video to medical personnel in Twin Ports on a weekly basis, bringing enhanced health care to veterans in the more remote region.

- The DHCP Imaging system that was demonstrated earlier has ISDN BRI communication links provided by AT&T. This desktop system uses Windows-based software that can access full-color zoom external or internal still photo images or radiological images stored on an optical jukebox at the Baltimore VAMC is currently in use between Baltimore and Washington VAMCs and will soon be expanded to other Maryland VA locations, and then to other states. It has the capability to allow import of text (patient records) and utilizes the VA-proprietary mailman E-Mail system to deliver the information securely to physicians at other VA locations. This system is maintained by Washington Information Systems Center.

The AT&T Federal Telecommunications System 2000 (FTS2000) Network is an advanced, cost-effective private network designed to handle both the current and future communications needs of the various agencies of the Federal Government. AT&T's FTS2000 network integrates voice, data, and video services to achieve ease of use, economy, and capabilities for evolving to new all-digital integrated facilities, such as the Integrated Services Digital Network (ISDN) and other new technologies as they are developed.

Mountaineer Doctor Television, West Virginia

The University of West Virginia's Robert C. Byrd Health Sciences Center at Morgantown provides an interactive audio and video communications network to support 24 hour medical consultation, emergency assistance, continuing education to health professionals in rural areas, and student and resident educational programs. The system is using two way compressed video over facilities (T1's accessing Accunet Reserve Service) provided by AT&T, combined with Compression Labs technology, and the local operating company and includes cameras and monitors at each site for transmission of image and high quality audio for use of electronic stethoscopes. Six rural hospitals are linked into two sites: the WVU Morgantown campus and the Charleston Division of the Byrd Center, located at the Charleston Area Medical Center.

The project conducted its initial programs in July of 1993 and became fully operational in August, 1993. Consultations include Dermatology, Neurology, Rheumatology, Adult and Pediatric Cardiology, Emergency Medicine, Infectious Diseases, Neuro-radiology and Forensic Medicine.

The Prudential Health Care System

Pru-Care is building a high-speed, frame relay network using AT&T's InterSpan frame relay service with other networking components from AT&T GIS that will link dozens of locations throughout the southeast United States to give doctors the ability to share video, voice and data in a real-time environment. The network allows doctors to send large amounts of information, including digitized X-rays, fast and cost-effectively over a wide area. In addition, Prudential plans to integrate AT&T's InterSpan ATM service into its network in late 1994 to provide an expanded multimedia support platform for adding in other applications. InterSpan frame relay and ATM services are fully interoperable, enabling a gradual migration as customer requirements dictate.

This network is a fully operational commercial service which Prudential is providing as part of its infrastructure to participating physicians and medical facilities to extend the reach of scarce resources into rural and remote areas in several southern states.

Other Examples of Telemedicine:

AT&T videophones are being used in 200 maternity wards through the Voluntary Hospital Association of America. Videophones also are enhancing communication in bone marrow transplant centers, and video monitoring trials point to improved in-home patient convalescence with medical professionals able to monitor from their office or hospital.

Picasso Still Image Trial:

As part of an extensive ongoing research program in the use of information technology using AT&T's Picasso Still Image Telephone for the first time in surgery, a Memphis eye surgeon recently repaired the severely torn retina of a young girl. He was able to send still video images of the magnified retina to colleagues at Duke University in North Carolina during the surgery. Previous technology had provided poor quality images or was too costly for the average physician.

What Barriers or Public Policy Issues Must be Resolved to Ensure that Telemedicine is affordably and ubiquitously available

It is our view that more needs to be done to speed the acceptance of new critical technologies and to broaden the deployment of integrated version of information technology if we are to achieve the kind of advances needed to educate our citizens about health so that they participate in their own wellness, and to improve access to health and to lower costs.

Any effective healthcare reform plan must be based on a new national health information infrastructure which builds on the ongoing community and industry efforts, and which will make information available to all information end users whenever and wherever needed, both locally and nationwide, to support improved patient care, to reduce administrative and management costs, to improve planning by both government and private sector funders, to provide the data bases needed for medical research, healthcare policy development and review, and day to day healthcare service purchasing decision by consumers and their managed care program sponsors.

While there have been numerous trials and demonstrations projects, to date, there remain significant policy and procedural barriers to adoption of telemedicine on a widespread basis. Some of these can be easily resolved – others require more study and collaborative development of policy resolution to the questions that remain. Among the areas where policy initiatives and joint government/industry action are needed are:

- Technology evolution/Research agenda/Standards

Kbps. Near term plans include the installation of FTS2000 switched access enabling dial in and out multipoint capability to Federal and non-Federal Sites, as the VA's need for flexible connections grows in conjunction with healthcare reform.

Residents and physicians located in the remote clinic in Wisconsin are now able to have the same training as their counterparts in the Minneapolis VAMC. For example, weekly medical and psychiatric grand rounds are transmitted to Twin. Ports. Also, a psychiatry course in addictive disorders was recently delivered via video to medical personnel in Twin Ports on a weekly basis, bringing enhanced health care to veterans in the more remote region.

- The DHCP Imaging system that was demonstrated earlier has ISDN BRI communication links provided by AT&T. This desktop system uses Windows-based software that can access full-color zoom external or internal still photo images or radiological images stored on an optical jukebox at the Baltimore VAMC is currently in use between Baltimore and Washington VAMCs and will soon be expanded to other Maryland VA locations, and then to other states. It has the capability to allow import of text (patient records) and utilizes the VA-proprietary mailman E-Mail system to deliver the information securely to physicians at other VA locations. This system is maintained by Washington Information Systems Center.

The AT&T Federal Telecommunications System 2000 (FTS2000) Network is an advanced, cost-effective private network designed to handle both the current and future communications needs of the various agencies of the Federal Government. AT&T's FTS2000 network integrates voice, data, and video services to achieve ease of use, economy, and capabilities for evolving to new all-digital integrated facilities, such as the Integrated Services Digital Network (ISDN) and other new technologies as they are developed.

Mountaineer Doctor Television, West Virginia

The University of West Virginia's Robert C. Byrd Health Sciences Center at Morgantown provides an interactive audio and video communications network to support 24 hour medical consultation, emergency assistance, continuing education to health professionals in rural areas, and student and resident educational programs. The system is using two way compressed video over facilities (T1's accessing Accunet Reserve Service) provided by AT&T, combined with Compression Labs technology, and the local operating company and includes cameras and monitors at each site for transmission of image and high quality audio for use of electronic stethoscopes. Six rural hospitals are linked into two sites: the WVU Morgantown campus and the Charleston Division of the Byrd Center, located at the Charleston Area Medical Center.

The project conducted its initial programs in July of 1993 and became fully operational in August, 1993. Consultations include Dermatology, Neurology, Rheumatology, Adult and Pediatric Cardiology, Emergency Medicine, Infectious Diseases, Neuro-radiology and Forensic Medicine.

The Prudential Health Care System

Pru-Care is building a high-speed, frame relay network using AT&T's InterSpan frame relay service with other networking components from AT&T GIS that will link dozens of locations throughout the southeast United States to give doctors the ability to share video,

- Reimbursement for use of teleconsultations/telecommunications to support diagnoses/information access
- Licensing
- Affordability/Ubiquitous availability
- Liability

Mr. Chairman, it is true that more needs to be done: But is also true that very visible benefits to the use of telemedicine are apparent and that the work that remains to be done is well underway already through the sponsorship of collaborative efforts of both the various government agencies, healthcare leaders and private industry. I would like to close my comments with a set of recommendations for this committee's consideration.

Technology Evolution/Research Agenda/Standards
Some further research and development are needed to continue to define the most effective and viable uses of telemedine and to speed the adoption of high performance computing and communications capabilities.

A number of federal initiatives are being planned or are underway which can speed the adoption of information technology and telemedicine more rapidly. Some of these include the High Performance Computing and Communications (HPCC) program, the healthcare information technology program of the National Library of Medicine (NLM), and other programs at the National Institute of Standards and Technology (NIST) and the Advanced Research Programs Agency (ARPA) where industry and government are working together in demonstration projects to develop the skills and understanding of how to better incorporate technology into reengineering the delivery and management systems.

We are poised to take the next step – to advance to working more collaboratively through a set of demonstrations projects which will be funded through the programs called for in HR 1757, with the companion legislation in S4, Title VI. This extension of the original HPCCI program provides for the collaborative establishment of testbeds in healthcare, education, agile Manufacturing, and government information/service to citizens. The legislation will be in conference soon, and we are hopeful that it sill be speedily approved, and that we will be able to look forward to its implementation. The benefit to our nation is immense – the legislation provides for the participation

AT&T is an active participant in these initiatives in a number of areas, and I would be happy to elaborate during the Q and A, but I want to address a specific role which I believe the VA is well suited to play in advancing the NII's applicability in healthcare reengineering.

Recommendation: Provide a mechanism which allows the VA to participate with federal and other non-federal agencies, and with the private sector industry led initiatives which are underway in telemedicine. This may require exemptions to existing structures or inclusion of non veteran clinics and locations into demonstrations and trials, or creative agreements in reimbursement for treatment of veterans at non VA sites.

Reimbursement For Use of Teleconsultations/Telecommunications to Support Diagnoses/Information Access:
Though significant, it is not only cost which is preventing the revolution of new system but market uncertainty and lack of agreed upon standards in reimbursement processes that present major barriers. We are aware that HCFA often expresses concern that reimbursement for

telemedicine will result in unnecessary utilization of second or third opinions. Other concerns expressed are whether we are creating unnecessary cost by allowing multiple systems to be installed within a single community.

Numerous trials and demonstrations projects are underway which can be used to effectively demonstrate the usefulness and useability to extend access to medical care through the use of telecommunications. Although approved reimbursement structures are not yet in place, significant data and experience is available to assist in the development of reimbursement recommendations which would support the use of telemedicine.

Further research is both needed, and is underway to identify procedures and conditions where telemedicine is both effective and efficient, and satisfactory to the outcome of the patient's care. As projects are funded by various government agencies, a significant aspect of each trial or demonstration project should be to participate in the modeling of appropriate reimbursement structures to provide guidance to HCFA.

Licensing:
The issue of where the physician is licensed becomes somewhat of an outdated concept when the physician and the patient connect "virtually", rather than physically. It may also be possible for HCFA or HHS to take a leadership role in working with the states and the federal government in developing a legislative proposal to address telemedicine licensing issues.

In fact, physicians are required to take national examinations for licensure and certification. It is important to take a set of proactive steps to identify reasonable solutions, and to implement them. It may, for instance, be possible to address cross-or reciprocal licensing agreements.

Affordability/Ubiquitous Availability:
It is our view that competition prescribes that the healthcare delivery system should be free to select the technology that support the services they are providing to their users/clients. As the NII evolves, and increasingly the local access portion of the costs becomes more affordable, just as long distance costs have benefited significantly from competition, and as options such as ISDN and ATM become ubiquitously available, telemedicine will evolve as one of the information systems of care support infrastructure.

Numerous legislative vehicles are being proposed by Congressional leaders who are concerned that the benefits of telemedicine not pass the rural and special needs areas of our nation by. A number of legislative proposals which would provide telemedicine reimbursement and pilot project funding are pending before this Congress. Such initiatives will help to ensure that the rural and low-income areas are fully able to participate in telemedicine's benefit.

Pending in the Congress is telecommunications legislation reform which will introduce competition into the local exchange. A critical first step to affordability through the infrastructure is the move to a truly competitive mode. We will not get there without thoughtful implementation of a competitive model which recognizes that monopolies are reluctant to relinquish their market advantage, but that to date, the effective competition model has worked best in our society to ensure a full range of options, at affordable prices and with ongoing commitment to innovation and research and development.

Liability:
Malpractice liability may prove to be one of the greatest impediments to the acceptance of telemedicine. However, in all cases, the physician must be free to make the decision about whether the information presented is sufficient to make a diagnosis, and if not, none should be made. Telemedicine systems which provide up to date references to support the medical decision made, combined with the ability to store an electronic version of the information used to support the diagnosis can provide additional supportive record keeping.

Summary

As the Subcommittee is aware, many communities have proceeded to organize into systems of care, or community networks, creating systems to allow the exchange of information about their services, their patients, and their management issues. Some of this has been supported through private foundation or government agency pilot project funding, and as these systems have been established, and published or shared their activities, other communities of care have learned from their example, and experimented with some of the techniques or systems of information sharing that have proven useful. However, no consistent set of policies or approaches has yet emerged which will support the move of the full system of healthcare into an open systems architecture, based on interoperable standards, which will facilitate the sharing of information, to appropriate approved decision makers, in a timely and cost effective manner.

In fact, the VA system, along with these community networks, might be seen as an early pioneer, leading the way in the early exploration of many of these technologies which are available commercially, but which are very slow to be integrated into the commercial healthcare systems. As the success of these technologies are proven in the VA and in other pilot and demonstration areas, they are being rapidly accepted throughout the rest of the healthcare provider community.

We ask this Committee to look critically, and positively at new ways for them to participate, along with other industry participants and non-VA agencies in collaborative efforts where joint funding is advancing the development of both technologies and applications, and speeding the usability of the NII for healthcare delivery – thus ensuring that future telemedicine services will be more ubiquitously, and affordably available.

We hope that a part of the VA's long term strategy will support the incorporation of telemedicine for management, administrative, and clinical practice to extend the reach of the VA into the communities where their patients live.

The VA faces a unique challenge; many of their patients are critical or long term care patients often with limited extended family support or community ties. They may face a unique challenge of integrating the wellness model as Dr. Koop is defining it, where the patient and their family or extended support group are involved in the treatment. Telemedicine may provide the vehicle to ensure that the VA has access to whatever support structure exists back in the community to provide the veteran's treatment and ongoing care.

Thank you, Mr. Chairman and members of the Subcommittee.

THE VETERANS HEALTH ADMINISTRATION HEALTH INFORMATION INFRASTRUCTURE

STATEMENT OF
MICHAEL D. MCDONALD

SENIOR ADVISOR
HEALTH AND TELECOMMUNICATIONS
THE C. EVERETT KOOP INSTITUTE

BEFORE THE
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
OF THE COMMITTEE ON VETERANS AFFAIRS
U.S. HOUSE OF REPRESENTATIVES

JULY 20, 1994

INTRODUCTION

Mr. Chairman and members of this Subcommittee, thank you for inviting me to speak to you today. My name is Michael D. McDonald. I am Senior Advisor on Health and Telecommunications at the C. Everett Koop Institute. Vice President Gore has requested the Koop Institute to help develop the leadership necessary in the private sector to build an optimal health component for the National Information Infrastructure.

Veterans are an important subpopulation of American citizens. They have special health concerns. The health information infrastructure and telemedicine have significant potential benefits for veterans and for the Veteran Health Administration's ability to manage the quality and access of care in a period which will require containing, if not reducing, medical costs.

EXECUTIVE SUMMARY

We are at the convergence of two significant societal revolutions -- health care reform and the national information infrastructure -- which will have profound effects on the health of Americans in general and veterans in particular. These changes in Veteran health will come partly from improved health-oriented communications and computer applications. They will also, however, result from changes toward an information-based economy, which a large proportion of veterans are presently ill-prepared to participate in. Part of the challenge for the VA will be to employ health applications in the VHA hospitals and clinics. However, the larger task will be to help veterans participate and thrive within American society with an increasingly dominant information-based economy.

Health informatics (i.e., the use of information and communications technologies for maintaining and improving health) will likely be a key tool in the Veterans Health Administration's efforts in managing the special health needs of veterans. As the American health system moves continually upstream toward managed care and the management of health risks before they manifest in clinical problems, the VHA could benefit from employing a broad health informatics strategy. To optimize the health of veterans while controlling costs, the Department of Veterans Affairs should consider deploying a Veterans Health Administration health information infrastructure with seven elements: 1) administrative information systems; 2) educational information systems; 3) clinical information systems; 4) telemedicine; 5) personal health information systems; 6) population databases and system coordination; and 7) community networks.

The health component of the National Information Infrastructure (NII) will be referred to here as the Health Information Infrastructure (HII). This paper assumes and suggests that the VHA Health Information Infrastructure will be fully integratable and interoperable with National Information Infrastructure and Health Care Reform initiatives. In fact, if the VHA system continues to innovate with the HII, the VHA may make substantive contributions to the health component of the NII as well as to informatics elements of Health Care Reform.

CEKI'S INVOLVEMENT IN HEALTH INFORMATICS

The C. Everett Koop Institute (CEKI) is assembling some of the country's top experts in health informatics in order to develop the vision and build an implementation strategy for health information infrastructure on local, state, regional, national, and international levels. In addition to its initiatives in redesigning the American medical education system for the 21st century, CEKI is engaged in four major directives in developing the health information infrastructure.

1) HII Consortium (national policy and marketplace development)

2) Pilots (Local, Regional, National, and International)

3) Research and Development

4) Assistance on Network Applications Development

HII CONSORTIUM ACTIVITIES

The Koop Institute will be administering nine activity areas in association with the consortium:

HII Marketplace Model

CEKI is presently mapping existing HII pilots and infrastructure development projects including some of those within DOD and the VHA system. A dynamic model of the HII and its marketplace has been proposed to test the outcomes of different public policy initiatives and the interaction of various private sector contributions. Fitness landscape simulation will explore the dynamics and interactions associated with different levels of investment, government intervention, and development in different parts of the health information infrastructure. Special emphasis will be placed on identifying economic and social enabling factors (e.g., telemedicine service reimbursement schemes, cross-state telemedicine licensure) in the diffusion of key health-oriented telecommunications applications.

Communication with the States, Congress and the Administration

The Consortium will provide white papers and testimony to the Administration and Congress regarding private sector interests, plans, and contributions to the health information infrastructure. It will also track legislation and government initiatives for Consortium members, which may potentially help or hinder the private sector's ability to contribute to the HII.

Private / Public Sector Task Force

A subcommittee of the private sector HII Consortium will be assembled to work with the federal government's HII interagency task force entitled, "Health Information and Application Working Group."

Liaison to the Health Information and Application Working Group

A member of the Consortium will sit on the HII interagency task force as a private sector representative.

Consortium Meetings and Subcommittees

The HII Consortium will meet two to four times per year as decided upon by its members. The Consortium will also convene subcommittees (e.g., HII marketplace, regulations, legislation, standards, privacy, interoperability, quality assurance) to explore key opportunities and barriers to the full implementation of the health information infrastructure.

Colloquium

Each year, the Consortium will sponsor a colloquium convening 100 key decision makers from the public and private sectors to evolve the vision and implementation strategies associated with the HII.

Collaboratories

CEKI will employ state-of-the-art communication systems to provide a collaborative decision-making environment for consortium members. Collaboratories will allow consortium members to meet asynchronously on an ongoing basis to, for example, download and review the latest drafts of pertinent legislation and to participate in debates on consortium issues or engage in subcommittee activities. This is one area where the VHA is already excelling and is an example of how VHA research could be of assistance to CEKI and the evolution of the HII and the NII, in general.

Position papers published through the Koop Institute

The Consortium will publish various position papers representing private sector HII concerns. Consortium member institutions will all receive pre-release versions of Consortium position papers. Two to four position papers will be published each year.

HII Leadership Awards

Each year, the Koop Institute will provide awards to companies making substantive contributions to the development of the Health Information Infrastructure or who have produced and marketed outstanding health informatics applications. The purpose of the HII Awards is two fold: 1) to reward innovation; and 2) to publicize the evolution of the health-oriented telecommunications and computing applications.

ELEMENTS OF THE HEALTH INFORMATION INFRASTRUCTURE

Seven elements of the national health information infrastructure must be enabled in order to optimize the functioning of the American health system, and the VHA system as a subset:

* Administrative Information Systems
* Educational Information Systems
* Clinical Information Systems
* Telemedicine
* Personal Health Information Systems
* Population Databases and System Coordination
* Community Networks

All of these elements must be seamlessly connected and interoperable, while assuring quality, security, and privacy. Standards must be developed and evolve with the progress of the technology, medical knowledge, and the public's expectation. The policy environment must be designed to encourage the full development of the health information marketplace. It must stimulate investment and innovation by the private sector and encourage competition because the private sector will inevitably fund, build, operate, and maintain the vast majority of the health information infrastructure. It is important that the VHA understand and utilize the rapid, cascading developments emerging in the private sector so as to take advantage of a fully functional Health Information Infrastructure.

In addition to enabling a fully competitive marketplace, there is a need to have mechanisms amongst private sector players -- as well as between the public and private sectors -- in order to remove barriers and optimize the health information infrastructure. The VHA could be a key testbed for merging the public/private sector visions and for private sector players, who are often direct competitors, to work on issues of common benefit. A high degree of collaboration on issues of common concern will be a prerequisite for success in the health information infrastructure because of the need for an ever increasing degree of integration in the era of the intelligent network ahead.

NATIONAL HEALTH INFORMATION INFRASTRUCTURE

Health-oriented telecommunications (HOT) applications have the potential for making substantial positive contributions to the health of veterans over the next few decades. The nature and speed with which HOT applications emerge will be strongly influenced by the actions of this Congress and Administration through the National Information Infrastructure initiative and Health Care Reform.

During the 1992 and 1993 American Public Health Association annual meetings in Washington D.C. and San Francisco, a broad spectrum of approximately 150 leaders from the health sector, aware of communications and computing issues and developments, were convened at two consecutive National Health Information Infrastructure Plenaries. The invited experts reviewed the realities of today's health care crisis, and reflected on the crucial role information technologies play in its resolution, while considering that landmark legislation is now being drafted to modernize the national information infrastructure and reform the health care system. The overall conclusion of the Plenaries was that the health information infrastructure can be designed to substantially decrease the cost of health care while still improving access, service outcomes -- and, most importantly, further elevating the overall health status of Americans, especially those at highest risk.

1992 Plenary Policy Recommendations

In addition to discussing the key elements of the health information infrastructure as outlined above, the 1992 Plenary participants also developed the following core policy recommendations to support the evolution of the infrastructure.

Privacy and Confidentiality

The privacy and confidentiality of all health records must be maintained. Strong precedents and methods (e.g., traditional confidentiality regarding medical claims, encryption strategies, census data privacy protection) exist that can be used to formulate policy in this area, but policies and standards must be agreed upon and made into law. Without the ability to ensure the privacy and confidentiality of electronic health and medical information, the full potential of health information systems will not be realized.

Several factors must be considered when drafting privacy guidelines. First, information must be accessible for outcomes research and surveillance without personal identifiers or any threat to confidentiality. Second, individuals must be able to control access to their records. Third, information must be available for emergency care. Finally, guidelines should be constructed with the help of both government and professional associations to diminish errors and liability for those adhering to nationally accepted guidelines. For example, strategies exist for the segmentation of records, but a single approach, or set of approaches, has yet to be endorsed on a national basis.

Universal Access

Just as the United States now has universal phone service, the principles for universal access within interactive multimedia must also be established. This is absolutely essential if we are to bring health information services to the economically disadvantaged. These populations generally have greater problems with their health and are in greatest need of information services. The cost of providing medical care for the disadvantaged is in the hundreds of billions per year and yet there are still large numbers of people improperly cared for. A fraction of the cost now spent on medical services could be used to build the infrastructure to save not only dollars, but lives.

Universal access to interactive multimedia must include not only two-way imaging transfer to and from professional offices and hospitals, but also two-way, digital, switched, broad band capability into homes. The greatest medical savings will result from empowering the public to take better care of their own health by providing interactive health information and decision support. An additional benefit of developing the infrastructure to provide universal access to health information is that the same infrastructure would support library, educational, entertainment, telecommuting and other information services. Veterans may greatly benefit from universal access initiatives, in that veterans have traditional been less apt to use information services and are less connected to the information-based economy.

Coordination and Standardization

A properly designed and interconnected national health information infrastructure would immediately improve coordination of services. This might start with coordination among agencies, but would also help overcome discontinuities in services and coverage throughout the health system. Data set standardization is essential. The communication industry must also set standards for ease of use and connectivity. Coordination and standards efforts should extend to system content as well as to services used in conjunction with the information systems.

Quality Assurance

Data integrity (i.e., information accuracy, currency, and reliability) is critical to the health information infrastructure. If quality standards for health records are set, outcomes research will blossom, yielding valuable information having direct impact on the quality of health care. It will also help us evaluate and refine health reform efforts.

Ideally, core life- and health-critical data for the personal health information systems would be established at the highest level of scientific authority. For example, the Institute of Medicine might oversee the disbursement of SBIR grants to develop a standard set of core health information for the personal health information system. This would not only ensure the quality of the health- and life-critical data delivered directly to the general public, but it would also simultaneously diminish the liability of such information by having it created and certified as correct and up-to-date by the world's experts.

The core information, if sponsored by government or private foundation funds, could be put into the public domain. This would catalyze the growth of a wide variety of information providers to create further health information content to expand upon the life- and health-critical core information. Given that there are substantial standards- setting activities already underway, government should make an effort to aid this process and be careful not to supersede efforts that would otherwise accomplish the same end with broader consensus.

Focused Demonstrations and Clearinghouse

Focused demonstrations would bring attention to the potentials of health information services, test their viability, and catalyze their growth. A clearinghouse of health information services and technologies (e.g., Department of Health and Human Services' National Health Information Center) would coordinate information regarding these projects and act as an incubator for other public and privately funded projects. The VHA is likely to have a key role in piloting aspects of the health information infrastructure.

1993 Plenary Issue Areas

The 1993 Plenary participants developed issues and recommendations to be used as background for policy on the National Health Information Infrastructure. A highly abbreviated description of the 1993 Plenary's working groups issue areas are discussed below.

- **Administrative Information Systems**

By switching to an electronic unified claims form and other forms of electronic data interchange and electronic transaction services for health care administrative transactions and inventorying, approximately $6 billion could be saved per year.

- **Clinical Information Systems**

A system for accessing, storing, and transmitting medical information would allow records to be accessed instantaneously anywhere in the country by authorized personnel. Clinical practice and decision-making could be greatly enhanced with improvements in clinical information systems. An Arthur D. Little study estimates that $15 billion a year would be saved by implementing ubiquitously available clinical information systems.

- **Telemedicine**

Telemedicine greatly enhances inter-health facility consultation and resource sharing. Most likely, the greatest benefit of these services will be in the rural areas. It is thought that telemedicine can help rural hospitals retain 40% of its patients that are now lost to urban areas due to the lack of expertise and technology in the rural areas. As a result, it is thought that the trend to close rural community hospitals due to unfavorable economic conditions can be reversed.

Perhaps, even greater savings can be achieved in the longer run from home-based telemedicine. Home-based telemedicine would allow health professionals to monitor and interact with patients remotely via a system that merges the computer, video and telephone. This should include telemetry, network functionality, two-way video applications, and data aggregation and analysis. Approximate savings of $15 to $20 billion a year would result from reductions in clinical visits and hospital stays.

- **Personal Health Information Systems**

These interactive systems would make personalized health information available to Americans 24 hours a day, 7 days a week so that system users could make appropriate decisions about their health. They should support functions such as self-triage, self-care, prevention, and health promotion accessible directly by the public via multimedia. Concomitant savings would result from (1) reductions in unnecessary professional care and (2) increases in health promotion and disease; these measures are estimated to save approximately $40 to $60 billion a year.

- **Population Data Structures and System Coördination**

This feature would enable researchers to instantaneously, reliably and systematically aggregate data -- without personal identifiers -- from medical records and personal health information systems with protection of privacy and confidentiality. The resulting improvements in population sampling and data accuracy would improve outcomes research and surveillance of epidemics and endemic disease patterns. Use of this structure to better prevent and control of diseases, as well as coordinate the provision of care is undetermined, but might save $20 billion or more per year.

- **Community Networks**

Community Networks will play a crucial role in the design, implementation, and evaluation of health care reform, as well as in broader issues of public access and participation in improving community conditions impacting health and human prosperity. All aspects of the health information infrastructure will benefit from strong local infrastructure and participation. Community networks, more than any other element of the health information infrastructure, will help involve the public, professionals, and policy-makers in issues of social ecology and management of the commons. Greater emphasis must be made on establishing a common core data set and common principles of interoperability and interconnectivity, so that data can be collected at the local level and be aggregated and disaggregated from the neighborhood to the city, the city to the national level, and the national level to a global level. As a result, data-rich geographic information systems and simulation systems can be developed to monitor and avert social and health crises in vulnerable communities and regional areas.

• **Educational Information Systems**

A seventh element, Educational Information Systems, has been added over the past year. This element will be very influential in shaping the intelligent human resources necessary for building and maintaining the future health care system. This element is particularly important within the VHA given the VHA's key role in the clinical training of so many practitioners.

CONCLUSION

A national information infrastructure with high performance computing and high speed networking capacity, if properly designed, directed, and expanded, will catalyze the rapid growth of a diverse and fruitful information-based economy -- including within the health sector. Our government can not take on the task of building the entire intelligent network by itself. Nor should it involve itself in activities that free enterprise can appropriately address. It should, however, encourage key developments and nurture leadership within the private sector by helping to direct its gaze toward the future market opportunities. The VHA system will be a key testbed for encouraging the development of the Health Information Infrastructure, especially in the areas of interoperability and collaboration. As the VHA system becomes a testbed for health informatics, it will also make a substantive contribution in shaping the Health Information Infrastructure as a whole and better understand how to engage veterans in the emerging information-based economy.

Presently, health care reform legislation is strongly emphasizing administrative information systems. Clearly this application area can make substantive, immediate contributions to medical care cost reduction within the VHA system. However, the greatest contribution to lowering medical costs lies not in administrative simplification or high tech clinical applications, but rather in building a balanced approach to the seven application areas that are key elements of the health information infrastructure (i.e., electronic data interchange and electronic claims processing, educational information systems, computerized patient record and clinical system, inter-facility and home-based telemedicine, the personal health information system, population data structures and system coordination, and community networking).

Once implemented, a balanced national health information infrastructure could save at least $70 billion to $100 billion per year. Proportional savings can be reaped within the VHA system. A large portion of the cost savings will result by accomplishing three goals: 1) delivering health services with proven benefits to improving health status based in outcomes research and effective clinical management; 2) empowering veterans to take better care of themselves and make wiser choices about their utilization of health services; and 3) helping chronically ill and aging veterans to receive appropriate medical services and supervision while living better and fuller lives in the comfort of their own homes, surrounded by their family and friends. In order to accomplish these goals, greater emphasis should be given to telemedicine, personal health information systems, population databases and system coordination, and community networks than is emphasized in present Health Care Reform and National Health Information Infrastructure proposals.

TESTIMONY FROM LAKE CITY COMMUNITY COLLEGE

Presented to the House Veteran's Affairs Subcommittee on Oversight and Investigations
United States Congress
Washington, D.C.

Presented by: Duffy Soto, Chairman of the Division of Telecommunications and Advanced Technology, Lake City Community College, Lake City, Florida.

Mr. Chairman, and honored members of the committee, it is my pleasure to present to you what I feel is a formidable plan for using technology to significantly improve communications between veterans living in the rural areas of north central Florida, and officials of the Veterans Administration hospital, located in Lake City. Lake City Community College proposes a unique plan that makes extensive use of its existing ITFS infrastructure and expertise, and shares them with the VA hospital in a cooperative venture. Those specialists who have reviewed our proposal, including top administrative officials at the Lake City VA facility, feel that this explanation, or idea if you will, adequately addresses many of the objectives for which members of House Veteran's Affairs Subcommittee on Oversight and Investigations have demonstrated particular interest, including:

1. Current use of communications and information technologies to enhance health care for veterans;
2. A demonstration of a cooperative effort between federal and non-federal agencies and/or organizations to enhance health care for veterans;
3. Demonstration of cost effective use of communication and information technologies to reach veterans who otherwise might not have access to timely and current information regarding health care services and benefits;

We feel that this proposal is of particular significance, not only because of its ability to realistically address the those items, but also because much of the resources including equipment, technology, and expertise needed to carry out those functions are already in place.

Lake City Community College operates an extensive ITFS television system charged with the primary responsibility of delivering educational programming to cable households residing in the five counties that comprise the LCCC service district. That district covers a geographic area nearly twice the size of the State of Rhode Island, and whose population have a median household income less than 50% of the national average. There is virtually no public transportation. Residing within those same 5 counties are 12,030 veterans served by the Lake City VA Facility.

Earlier this year, a meeting was held between top Lake City VA hospital administrative officials, and officials of the College's telecommunications and technology division. The purpose of the meeting was to explore the feasibility of using the college's existing television infrastructure in a cooperative effort with the VA hospital to deliver real-time communications and information to the more than 12,000 veterans who live in the areas served by the system. The hospital expressed an interest in being able to communicate directly with veterans who reside in those rural area's, but whose distance, lack of sufficient resources, or other inopportunities, often hinder them getting timely and accurate information regarding health care options, policy updates, triage, general information, and other vital topics. Aside from the rural nature of the area, the sheer number of veterans needing access to the various types of information was taxing the existing resources of the VA hospital itself. Therefore, from those discussions came the assessment of real need.

1. The VA's veteran database includes more than 12,000 who resided within the five-county district served

by Lake City Community College of whom more than 7,000 lived outside the home county of the VA hospital.

2. Because of the lack of public transportation, coupled with personal financial restrictions, for many veterans, a trip to the hospital for basic consultation or information purposes taxes the resources needed in order to make the trip. A round trip often exceeds 80 miles.
3. Hospital officials have expressed a desire to become more responsive, and is interested in improving services to its customers in a cost efficient and feasible manner;
4. As part of a solution that would adequately address 2 and 3 above, VA officials saw a distinct advantage in veterans having the ability to directly access VA staff physicians and administrative officials in a real-time interactive manner employing video teleconferencing capabilities. The veterans would be even better served, it was decided, if the VA had the ability to originate such teleconferences from their own facility.
5. If such a system could economically and feasibly be established, the VA could use it to effect live teleconferences with veterans for the purpose of delivering information, policy updates, health care options and programs, triage information and other information services. Veterans would also be able to interact with VA officials in real-time mode regarding those services, as well as participate in real time (audio only) panel discussions, or focus groups.

The College and the VA hospital have long shared a common interest. The college has an outstanding allied health program of which the VA hospital participates. These interests have served as a basis for a long and positive relationship. Today, I can tell you that because such a cooperative relationship exist, the feasability of implementing such a communication system shared by the two institutions is possible.

In order to carry out the basic objectives of providing better access for veterans to the VA facility, and in the interest of using it as a model for other areas wishing to achieve the same objective, Lake City Community College proposes a plan would make extensive use of its existing ITFS infrastructure and delivery system and proposes to share them with the VA hospital. In as simple terms as possible, I will try and explain how the system will work.

1. A transmitter utilizing a private microwave frequency will be located at the VA hospital. The hospital will transmit its program a distance of approximately three miles where it will be intercepted by the college and down-linked to its master control facility. The VA's signal will then be re-broadcast over the college's main transmitter and tower and sent to the cable systems located within the five service counties.
2. Veterans in all five of the counties where cableservice is available could access the VA broadcast over a normal VHS channel using their normal living room television set. No special equipment is required by the veteran in order to be included within this system.
3. At their options, the VA could bring to the screen one, or several, telephone numbers that any veteran watching the broadcast in any of the counties served could access using his normal private telephone. As another option, the VA could also install several studio lines that would allow veterans to teleconference with VA officials, participate in live talk

shows or focus groups, or get personal consultation regarding VA related services and topics, all from the comfort of their own living rooms.

Ordinarily, building a system capable of carrying out the interactive functions, of which have just been described to you, would cost millions of dollars. By our proposing to adapt our existing infrastructure to take advantage of existing physical and technical resources, and share them with the VA hospital of Lake City, we propose to do it for $150,000.

For its part in this joint effort, Lake City Community College has committed to the VA hospital Lake City it's cooperation, the use of its extensive broadcast infrastructure, its five-county television household delivery network, and whatever technical assistance we can provide in making the plan operational and successful. Additionally, the college will require the installation of receiving and conversion equipment to be located at its master studio site and necessary to down-load and convert the VA signal for retransmission over its system. For its part, the VA will need to obtain and install a private microwave system capable of delivering its audio and video signal to the College. Additionally, the VA should acquire and install necessary studio origination equipment required for implementing its TV broadcasts.

In closing, I would once again like to thank the committee for taking the time to hear about this proposal. It's not often that a small community college located in a rural area finds itself with such a flattering opportunity.

Please allow me to reaffirm how strongly I believe that this cooperative effort will result in significantly increasing the access of the VA hospital Lake City and its services to veterans located in the rural areas. By taking advantage of existing resources, and by combining them with a good dose of creativity and vision, coupled with the cooperative spirit of our two institution's, we can, together, effect positive change while at the same time setting into motion a cost effective example that can be used as a model for others, of how technology and telecommunications can positively affect thousands of lives, no matter how far in the woods one may live.

Thank You.

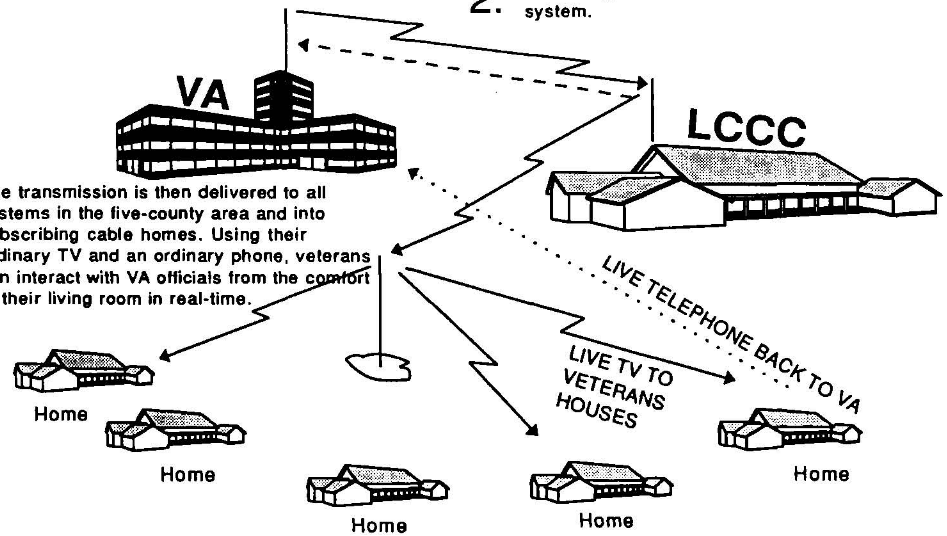
LCCC, VA HOSPITAL VIDEO CONFERENCING DESIGN

A working TV broadcast infrastructure is now in place that allows LCCC access to every cable TV system within its five-county service area. By equipping the VA hospital Lake City with compatible TV equipment, LCCC proposes to adapt its system to allow two-way interactive telecommunications to take place between physicians and staff located at the VA hospital and veterans in the field. The graphic below illustrates how the system will work.

1. Broadcasts originate from Lake City's VA hospital. It is transmitted to Lake City Community College's master control studio.

2. LCCC down-loads, converts, and retransmits the VA signal to its main transmitter and tower system.

3. The transmission is then delivered to all systems in the five-county area and into subscribing cable homes. Using their ordinary TV and an ordinary phone, veterans can interact with VA officials from the comfort of their living room in real-time.



MEDICAL COLLEGE OF GEORGIA

ORGANIZATIONAL PLAN
FOR
TELEMEDICINE NETWORK

Submitted by
Francis J. Tedesco, M.D.
President

and

Jay H. Sanders, M.D.
Professor of Medicine and Surgery
Director, Telemedicine Center

July 1994

Medical College of Georgia

**Organizational Plan
for
Telemedicine Network**

To build a statewide telemedicine system which will allow physicians at tertiary care facilities to electronically transport clinical expertise to multiple satellite sites such as community hospitals, ambulatory healthcare facilities, correctional facilities, nursing homes, etc. The underlying principle of this concept is the provision of primary and subspecialty care to areas where these clinical services are not readily available.

The goals of the Georgia telemedicine system are:

1. **To improve access to medical care for patients who are geographically or socioeconomically isolated.**

2. **To enhance the quality, continuity and affordability of medical care.**

3. **To help secure the financial stability of the rural hospitals and allow patients to obtain medical consultation in their own community, thus avoiding unnecessary travel to secondary or tertiary care centers as well as maintaining the patient's current physician to patient relationship.**

4. **To enhance continuing medical education and support for rural based physicians and remove the obstacle of professional isolation.**

5. **To secure the integrity of the health care system in underserved areas by providing support for the socioeconomic fabric of the community.**

6. **To effectively utilize the State's medical resources by creating an integrated statewide network of primary, secondary and tertiary care for the citizens of Georgia.**

7. **To enhance the educational, patient care and health services research components of the State's public and private health sciences universities.**

In developing this statewide system, geographic distribution, hospital type, scope of clinical services, patient mix and performance data from the State Health Planning Agency and the Department of Medical Assistance were considered.

Examples of additional data evaluated are:

1. **Emergency room visits**
2. **Outpatient visits**
3. **Medical utilizations rate as well as hospital's total Medicaid charges, inpatient and outpatient**
4. **Whether or not the facility is a disproportionate share hospital**
5. **Designated referral centers**
6. **State owned facility and/or an academic medical center**

Methodology

The organizational plans for the statewide telemedicine network are based on the hub and spoke principle. Each geographic area would have a comprehensive medical care facility as its hub, which in turn would be connected to at least four satellite facilities or spoke sites. Criteria used to select both hubs and spokes include hospital classification (general hospital for hub) as well as owner/control type and the percentage of Medicaid provided as part of the total operation. The designation as a disproportionate share provider will also be considered.

Each hub will have a catchment area (traditionally their primary and secondary service area). Service areas which overlap with other hubs will be

negotiated by MCG in consultation with the competing hubs. The process of hub and spoke selection will be consistent with the legislative intent of SB144 regarding support for "public" programs and services. The integration of private programs into the statewide telemedicine network will be determined on an individual basis by a comprehensive analysis of specific clinical needs and the private facility's commitment to public service. Private programs must be responsible economically for the associated utilization and participation costs.

Agreements

The relationships with MCG and the hub sites will be negotiated and formalized in the form of an agreement of understanding or formal contract or a combination of both. The consultation services available from MCG along with specific fees and support arrangements will be addressed in the context of these agreements/contracts.

It is expected that the working relationship from hub to spokes will be similar to those from the hubs to MCG. MCG should also be the approval authority on any tele-technology needed at hub and spoke locations.

Evaluation

A comprehensive database encompassing a cost-benefit analysis, quality of care assessment, appropriateness of telemedicine consultative utilization, psychological impact, and technology performance will be analyzed.

Training

Training for the telemedicine network is the responsibility of the MCG telemedicine program and its medical director.

TELEMEDICINE: Bringing Medical Care to Isolated Communities

Jay H. Sanders, MD, Francis J. Tedesco, MD

DESPITE ADVANCES in our ability to diagnose and treat both acute and chronic medical conditions, we frequently fail to translate that ability into deliverable services. As a result of geographic and socio-economic constraints, thousands of Georgians, disenfranchised from the health care system, are being denied basic medical services. Providing affordable, quality health care to patients where and when they need it has remained a frustratingly elusive goal. One of the major barriers to health care for patients in isolated or impoverished communities is the inadequate number of physicians who choose to establish or maintain their practice outside of a major metropolitan area. This resulting lack of physicians in Georgia's more isolated communities compromises both quality and continuity of care. Transportation costs also increase as patients must be transferred to distant hospitals. These transfers are deleterious not only to the patient but to the community as well. As a local hospital's bed census declines, its fiscal viability, along with the socio-economic fabric of the community, is threatened.

Clearly, innovative alternatives to the existing health care delivery system must be developed, implemented, and evaluated. Georgia's isolated communities need a health care system that brings together existing professional and technologic resources to meet patients' medical needs. This alternative system needs to have the capacity to disperse and decentralize resources without compromising quality of care or escalating costs.

Using an interactive voice and color video telecommunication system integrated with biomedical telemetry, physicians at a medical hub can examine and treat patients at multiple satellite locations.

Committed to alleviating Georgia's health care delivery crisis, the Medical College of Georgia (MCG) developed and implemented a medical network known as the Telemedicine System. Introduced in November, 1991, and operating at MCG, the Telemedicine System effectively narrows the gap between our medical expertise and our health care delivery system. Using an interactive voice and color video telecommunication system integrated with biomedical telemetry, physicians at a medical hub, such as MCG, can examine and treat patients at multiple satellite locations, e.g., rural hospitals, ambulatory health centers, nursing homes, emergency rooms, correctional institutions, and international health facilities. By electronically transporting the expertise and state of the art technology of a major medical center to an isolated community, the Telemedicine System enhances patient care. When this System is utilized, patients can receive optimum medical care in their local hospital, avoiding both the costs and emotional distress of travel to a distant hospital. By remaining in their community, the patient also benefits from the continuity of care offered by their own physician. In cases of trauma, the Telemedicine System can decrease both morbidity and mortality by bringing immediate, state-of-the-art, trauma care to the injured patient.

By providing consultation, technologic services, and continuing medical education, the Telemedicine System also enhances the capabilities of local physicians. This, in turn, reduces their malpractice exposure and diminishes their sense of professional isolation. These benefits encourage physicians to establish and maintain practices in our smaller, rural communities. An increase in the number of physicians translates not only into better medical care for patients but also into economic growth for

Dr. Sanders is Director of the Telemedicine Center, Medical College of Georgia, and Dr. Tedesco is President of MCG. Send reprint requests to Dr. Sanders at MCG, Augusta, GA 30912-1655.

Using the Telemedicine System, Dr. Marshall B. Allen, Chief of Neurosurgery at the Medical College of Georgia, conducts a consultation with a patient at a satellite location.

hospitals and the communities they serve. When revenues generated in meeting the health care needs of local residents remain in the community, everyone benefits.

The Telemedicine System is effective with virtually any medical specialty. Based on the requirements of the satellite location, any number of diagnostic devices can be integrated into the system. The physician at the medical hub can conduct a complete history and physical examination as if the patient at the satellite location were sitting in his/her office. The remotely controlled examination camera has a powerful zoom-focus capability, enabling a dermatologist to examine minute details of a patient's skin. An electronic stethoscope, in conjunction with real-time digital transmission of an EKG or echocardiogram, enables a cardiologist to conduct a complete cardiac examination.

Specific camera adapters and resolution capabilities, enhanced by remote controlled optics, provide the ophthalmologist a clear view of the retina of a patient who may be miles away. An ENT specialist can observe a laryngoscopic examination. A gastroenterologist can direct an endoscopic procedure. A radiologist can interpret x-ray findings, including MRIs, CAT scans, and ultrasound. A pathologist, utilizing the telemicroscopic adaptor, can examine a frozen section or bone marrow slide. A surgeon or gynecologist can guide a laparoscopic procedure.

In addition to directly examining and treating patients, specialists at a medical hub can also provide assistance and ongoing training to physicians at a satellite location. A thoracic surgeon can guide a local surgeon performing thoracoscopic surgery. A urologist can monitor a cystoscopic procedure; an orthopedist can direct arthroscopic surgery. A trauma surgeon at a medical hub can examine an accident victim at a satellite location and then guide the local medical team as they carry out resuscitative measures and surgical procedures.

At the heart of the Telemedicine System is a computer controlled switching matrix that allows networking between the medical hub and multiple satellite locations. If desired, the video component of the System can tape consultations for record keeping, quality assessment, and teaching purposes. A high speed, plain paper facsimile affords immediate, efficient document transfer of patient records, prescriptions, consultation notes, data base references, etc.

Freeze-frame capability allows any image projected at either the medical hub or satellite location to be "frozen" and sent as a slide to the other facility. With a special menu provided by the control panel, x-rays, EKGs, and slides can be annotated with an electronic pen. An x-ray can be viewed on one video monitor while the patient examination is viewed on a second monitor. And as the specialist at the medical hub and the treating physician at the satellite location can evaluate the patient simultaneously, the latter physician receives

an immediate interactive educational experience that would not otherwise be available.

As a result of these interactive consultations, the expertise of local physicians is enhanced, enabling them to handle increasingly more complex problems. By sharing with physicians in isolated communities the expertise and technology available at major medical hubs, the Telemedicine System ensures that the latest advances in diagnosis and treatment are made available to all Georgians. The goal of The Telemedicine System is to assure that everyone in our state, whether living in the heart of Atlanta or on a south Georgia farm, has immediate access to quality medical care.

When patients are treated in their own community rather than transferred to a regional hospital, their physicians are able to provide continuity of care. In those instances where patient transfer is indicated, the local physician receives continual updates from the medical hub. Then when the patient is ready for discharge, the System provides the local physician with the expertise and technology needed to render follow-up treatment. For the patient, this means they are not further burdened with additional transportation costs of repeated trips back to the medical hub. In addition to saving both time and money, the patient is also able to conserve energy, typically in low reserve after a serious illness or injury.

A major benefit of the Telemedicine System is cost containment. The cost of a consult over the System is comparable to that of an EKG or chest x-ray. However, a decrease in total expenditures occurs due to the decline in patient transfers. This savings results from decreased transportation costs as well as the cost differential between the two types of facilities. Though overall costs are reduced, revenues that are generated remain within the patient's community. Keeping health care dollars in the community encourages physicians to continue practicing in the area. This, in turn, strengthens the revenue base of the community hospital, enhancing quality of care while reducing per-patient costs. And as the health care industry is frequently a major employer in rural areas, the entire community can benefit from economic growth.

The medical hub requires space comparable to the total square footage of a physician's office. Space requirements for the satellite location are equivalent to a physician's examination room. The Telemedicine System is compatible with multiple types of communication systems; telephone, cable, microwave, satellite. The full complement of equipment needed by both the medical hub and its satellite locations can be easily installed and, as the need arises, relocated.

Adaptable to a mobile configuration, the equipment can also be placed in a small van and taken to multiple sites. This flexibility enables a satellite location to have access to specialty equipment on an as needed basis. Another advantage of the Telemedicine System is its almost limitless range. Once hooked up to the System, a cardiologist in Atlanta would be able to examine the heart of a patient across the country or across the street.

Elizabeth Michael, the Telemedicine Coordinator, studies patient test results in the Telemedicine Center.

The impact of the Telemedicine System has been so significant in the Augusta region that the Medical College of Georgia is proposing to Governor Miller that it be replicated statewide. We envision the state being divided into 6-8 regions that parallel existing medical (trauma network) and communication (LATA) boundaries.

Each medical hub would be charged with the responsibility for providing consultation and technologic assistance to all under-served health care facilities in their region. This would include, in addition to isolated hospitals, public health clinics, correctional institutions, and nursing homes. We will propose to the Governor that he charge a designated state agency or a public-private partnership group with the responsibility of establishing the criteria a health care facility would need to meet in order to be included in the network.

We will ask that this designated agency or group also be charged with the responsibility of establishing and maintaining a digital telecommunication system that links each hub to their area health care facilities and to each other. Additional responsibilities that would appropriately fall to the designated agency include purchasing, integrating, and maintaining the system. This would involve assuring system component compatibility, assessing new technologies for system integration and assuring multipoint switching capability. Finally, we will ask the Governor to appoint regional quality assurance committees, composed of physicians, patients, and other community professionals, to monitor the System's quality, accessibility and affordability.

By adopting this System statewide, Georgia has a unique opportunity to enhance medical services while simultaneously lowering costs and advancing economic development in our more isolated areas. By providing immediate access to quality health care services, the System alleviates many of the problems we confront in our efforts to bring technology and expertise to the people we took an oath to care for. The Telemedicine System puts quality medical care within reach of geographically and socio-economically isolated patients. By fostering continuing education, the System also markedly diminishes the sense of professional isolation physicians in rural communities often experience. And when patients are able to remain in their local hospital, they benefit from both the medical and psychologic advantages that continuity of care by one's own physician inherently confers.

The Telemedicine System exemplifies how the introduction of new technology can expand the availability and accessibility of medical care. With increased access to medical services, Georgians can become healthier and the overall burden on our health care system can be subsequently diminished. As local medical facilities become better able to care for patients, more physicians and health care dollars will remain in these smaller, more isolated communities. The Telemedicine System has the capacity to take Georgia's health care delivery system into the 21st century; and in so doing, point the way for the nation.

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* * *

In vain do they talk of happiness who never subdued an impulse in obedience to a principle. He who never sacrificed a present to a future good, or a personal to a general one, can speak of happiness only as the blind speak of color.

— HORACE MANN

Our definition of success is unorthodox. We claim that any man who is honest, fair, tolerant, kindly, charitable of others and well behaved is a success, no matter what his station in life.

— JAY E. HOUSE

What is difficulty? Only a word indicating the degree of strength requisite for accomplishing particular objects, a mere notice of the necessity for exertion; a bugbear to children and fools; only a mere stimulus to men.

— SAMUEL WARREN

Temptation rarely comes in working hours. It is in their leisure time that men are made or marred.

— W. M. TAYLOR

Head knowledge is good, but heart knowledge is indispensable. The training of the hands and feet must be added to make a rounded education. We must all learn these days to become spiritual pioneers if we would save the world from chaos.

— E. V. HAMMOND

The functions of an executive are to create and enforce policies rather than to work out problems resulting from such policies.

— LOUIS F. MUSIL

Gaiety that sweetens existence and makes it wholesome — a sense of humor, a zest of enjoyment — this is the accompaniment of courage which gives it a supreme value. Something of the high laughter of a Cyrano de Bergerac — the world needs it.

— DR. HEBERT HICKEN

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MEDICAL COLLEGE OF GEORGIA

TELEMEDICINE

PATIENT CONSULTATION LOG

06/20/94

TELEMEDICINE PATIENT LOG

# CONSULTS COMPLETED	306
AVERAGE CONSULT TIME	33
# PATIENTS TRANSFERRED	56
% PATIENTS NOT TRANSFERRED	81.70

LEGEND

0:00	CONSULT LENGTH IN MINUTES
TM#	TELEMEDICINE PATIENT #
1	PATIENTS RETAINED IN REMOTE COMMUNITY
R	REFERRAL RECOMMENDED

SPECIALTIES UTILIZED

CARDIOLOGY	45
DERMATOLOGY	31
NEUROSURGERY	21
GI SURGERY	3
RHEUMATOLOGY	20
METABOLIC/ENDOCRINE	17
HEMATOLOGY/ONCOLOGY	20
PULMONARY	13
NEUROLOGY	31
NEPHROLOGY	13
PSYCHIATRY	16
INFECTIOUS DISEASES	18
UROLOGY	2
GENERAL SURGERY	2
ANESTHESIOLOGY	1
ORTHOPEDICS	4
EAR, NOSE, THROAT	4
RADIOLOGY	1
EMERGENCY	1
PEDIATRIC ENDOCRINOLOGY	1
GI MEDICINE	20
PLASTIC SURGERY	2
GYNECOLOGYY	2
THORACIC SURGERY	5
PEDIATRIC PSYCHIATRY	3
SICKLE CELL	2
PAIN MANAGEMENT	1
OBSTETRICS	1
VASCULAR SURGERY	6
INTERNAL MEDICINE	2
PEDIATRIC HEMATOLOGY	1
HYPERTENSION	1
ALLERGY IMMUNOLOGY	1
PSYCHIATRY PHARMACOLOGY	1
GRAND TOTAL	312

PATIENT NAME	0:00	DATE	TM#	HOSP	REMOTE M.D.'s	CONSULTING M.D.'s	PATIENT PROBLEM	I/O	1/R	SPECIALTY REQUESTED
	30	11/07/91	34	DCH	Sinha	W. Quillian	Delusional	OUT	1	PSYCH
	30	11/26/91	5	DCH	Walker	C. Gross	Repeat angiogram	OUT	1	CARD
	30	12/02/91	26	DCH	Walker	D. Dunlap	Thyroid	OUT	1	M/E
	60	12/03/91	16	DCH	Sinha	W. Quillian	Adjust Rx	OUT	1	PSYCH
	30	12/04/91	35	DCH	Sinha	W. Quillian	Depression	OUT	1	PSYCH
	30	12/05/91	25	DCH	Tison	J. Griffin	Ischemic bowel disease	IN	1	GI MED
	45	12/10/91	17	DCH	Moodham	Gallup	Ovarian Carcinoma	IN	1	GYN
	30	12/12/91	33	DCH	Walker	C. Gross	Arteriogram needed	OUT	R	CARD
	45	12/13/91	3	DCH	Tison	B. Chaudhary	Sleep Apnea	IN	R	PULM
	30	12/18/91	6	DCH	Walker	T. Young	Osteoarthritis in Knees	OUT	1	ORTHO
	45	12/19/91	11	DCH	Tison	R. Weinstein	Rib fractures, recurrent	OUT	R	M/E
	30	12/20/91	1	DCH	G. Walker	C. Gross	Dilated Cardiomyopathy	IN	1	CARD
	30	12/20/91	7	DCH	Tison	D. Rahn	Sarcoid liver disease	OUT	1	RHEUM
	30	12/26/91	10	DCH	Walker	C. Wray	Carotid obstruction	IN	1	VAS SURG
	45	12/30/91	36	DCH	Shah	Cox	MVA	OUT	1	ID
	30	01/13/92	18	DCH	Middlebrooks	J. Bowden	Severe epigastric pain	OUT	1	GI SURG
	25	01/14/92	33	DCH	Walker	J. Rubin	S/P CAB in 12/92	OUT	1	T SURG
	30	01/23/92	24	DCH	Tison	P. Rissing	Chronic Sternal Osteo.	IN	1	ID
	50	02/01/92	21	DCH	Walker	C. Wray	Pulmonary Embolus	OUT	R	VAS SURG
	30	02/09/92	32	DCH	Tison	M. Sharon	Cardiology	IN	1	CARD
	30	02/12/92	15	DCH	Tison	S. Sanal	Hematology	OUT	1	H/O
	30	02/12/92	2	DCH	J.Tison	S. Sanal	Multiple Myeloma	OUT	1	H/O
	30	02/12/92	20	DCH	Yoon	W. Speir	Cavitary Pul. disease	OUT	1	PULM
	30	02/14/92	22	DCH	Tison	M. Stachura	Hyponatremia	IN	1	M/E
	45	02/16/92	31	DCH	Sinha	W. Quillian	Bipolar Disorder	IN	1	PSYCH
	30	02/18/92	8	DCH	Tison	J. Lesher	Chronic plaques	OUT	1	DERM
	30	02/18/92	9	DCH	Tison	J. Lesher	Excoriated Papules	OUT	1	DERM
	35	02/18/92	23	DCH	Tison	T. Swift	Metastatic Lesion	OUT	1	NEUROL
	45	02/25/92	19	DCH	Tison	Hardin & Rahn	Skin lesions/Rheum	OUT	1	RHEUM
	30	03/02/92	4	DCH	Walker	P. Milner	Sickle Cell Anemia	OUT	1	H/O
	30	03/02/92	12	DCH	Tison	B. Chaudhary	Sleep Apnea	OUT	R	PULM
	45	03/02/92	14	DCH	Sinha	W. Quillian	Mood Disorder	IN	1	PSYCH
	45	03/11/92	28	DCH	Middlebrooks	J. Bowden	Polyps - pan endoscopy	OUT	1	GI SURG
	30	03/12/92	27	DCH	Middlebrooks	M. Allen	Herniated Disc	OUT	1	NEURO
	30	03/17/92	29	DCH	Middlebrooks	J. Rubin	Aortic sten/mitral regur	IN	1	T SURG
	30	03/19/92	30	DCH	Walker	R. Weinstein	Thyroid	OUT	1	M/E
	30	03/19/92	13	DCH	Tison	C. Gross	Portal Hypertension	IN	1	CARD
	30	03/19/92	39	DCH	Walker	D. Rahn	Arthritis	OUT	1	RHEUM
	45	03/25/92	155	DCH	Tison	E. Bransome	ESRD	OUT	1	M/E

PATIENT NAME	0:00	DATE	TM#	HOSP	REMOTE M.D.'s	CONSULTING M.D.'s	PATIENT PROBLEM	I/O	1/R	SPECIALTY REQUESTED
	30	04/02/92	40	DCH	Walker	A. Swift	Cancer-Prostate	OUT	1	UROL
	30	04/06/92	41	DCH	Walker	J. Houghton	Repeat Arteriogran	OUT	1	CARD
	30	04/06/92	42	DCH	Walker	C. Lutcher	Cancer-Colon	OUT	1	H/O
	DS	04/07/92	45	DCH	Walker	J. Lesher	Dermatitis	OUT	1	DERM
	30	04/07/92	46	DCH	Walker	C. Wray	Aneurysm	OUT	1	VAS SURG
	35	04/09/92	43	DCH	Walker	W. Speir	Probable TB	IN	1	PULM
	30	04/10/92	47	DCH	Yoon	G.Y. Perry	Bradycardia	OUT	1	CARD
	30	04/17/92	44	DCH	Walker	M. Rivner	Left Anterior thigh pain	OUT	1	NEUROL
	30	04/17/92	50	DCH	Walker	J. Houghton	SVT, CHF and DT	IN	R	CARD
	DS	04/24/92	49	DCH	Walker	J. Lesher	Possible Lyme Disease	IN	1	DERM
	30	05/01/92	59	DCH	Tison	J. Lesher	Lesions on hands	OUT	1	DERM
	30	05/05/92	48	DCH	Walker	A. Bowen	f/u Bypass surgery	OUT	1	NEPH
	30	05/07/92	52	DCH	Walker	M. Allen	Osteoarthritis	OUT	1	NEURO
	30	05/14/92	52	DCH	Walker	M. Allen	Xray review	OUT	1	NEURO
	45	05/14/92	53	DCH	Walker	M. Hardin	Polymyositis	OUT	1	RHEUM
	DS	05/15/92	54	DCH	Walker	J. Lesher	Hypopigmented areas	OUT	1	DERM
	30	05/21/92	55	DCH	Walker	M. Holman	Palpitations/dyspnea	IN	R	CARD
	55	05/21/92	56	DCH	Walker	S. Sanal	Concern re: retin	IN	1	H/O
	30	05/25/92	59	DCH	Tison	J. Hardin	Hands -Rheumatology	OUT	1	RHEUM
	45	05/29/92	57	DCH	Tison	J. Lesher	Pruritic plaques	OUT	1	DERM
	30	06/03/92	59	DCH	Tison	J. Hardin	Xray Review	OUT	R	RHEUM
	20	06/07/92	58	DCH	Walker	J.Houghton	Repeat angiogram?	OUT	R	CARD
	30	06/10/92	60	DCH	Tison	T. Young	Hip Replacement	OUT	R	ORTHO
	30	06/12/92	61	DCH	Yoon	P. Dainer	Cancer	OUT	R	H/O
	DS	06/12/92	66	DCH	Tison	Lesher/Hall	Moles	OUT	1	DERM
	DS	06/12/92	70	DCH	Tison	Lesher/Hall	Lesions	OUT	1	DERM
	DS	06/12/92	83	DCH	Tison	Lesher/Hall	Tenia Versicolour	OUT	1	DERM
	DS	06/12/92	82	DCH	Tison	Lesher/Hall	Dermatitis	OUT	1	DERM
	DS	06/12/92	81	DCH	Tison	Lesher/Hall	Dermatitis	OUT	1	DERM
	30	06/12/92	64	DCH	Walker	G. Garrison	Cardiology	OUT	1	CARD
	30	06/16/92	62	DCH	Walker	L. Mulloy	Follow-up/Kidney	OUT	R	NEPH
	30	06/17/92	65	DCH	Tison	G. Perry	Heart Racing	IN	1	CARD
	30	06/18/92	63	DCH	Tison	M. Stachura	Hyperkalemia	IN	1	M/E
	20	06/18/92	69	DCH	Yoon	G. Perry	Chest Pain	OUT	R	CARD
	45	07/09/92	71	DCH	Tison	M. Allen	Neck Pain	OUT	1	NEURO
	30	07/10/92	68	DCH	Tison	J. Lesher	Skin Lesions	IN	1	DERM
	30	07/14/92	72	DCH	Walker	D. Rahn	Chest Pain/Weight Loss	IN	1	RHEUM
	30	07/16/92	73	DCH	Walker	M. Allen	Neck pain, prev. fracture	OUT	1	NEURO
	20	07/22/92	67	DCH	Walker	L. Mulloy	Lupus erythematosus	OUT	R	NEPH

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	20	07/23/92	74	DCH	Walker	McDonald	RT F. Temporal Mass	OUT	R	NEURO
	35	07/27/92	75	DCH	Walker	Porubsky	Loss of Heaing	OUT	R	ENT
	30	07/27/92	85	DCH	Walker	J. Hardin	Joint Pain	OUT	1	RHEUM
	30	07/30/92	78	DCH	Walker	B. Chaudhary	COPD	OUT	1	PULM
	45	07/31/92	80	DCH	Tison	M. Jackson	Pancreatitis	IN	1	GI MED
	15	07/31/92	76	DCH	Tison	J. Lesher	Skin Lesions	OUT	1	DERM
	30	07/31/92	77	DCH	Walker	C. Wray	Left carotid stenosis	OUT	R	VAS SURG
	45	07/31/92	79	DCH	Walker	J. Lesher	Skin Lesions	OUT	1	DERM
	30	08/05/92	84	DCH	Walker	B. Shuman	GI Bleed	OUT	1	GI MED
	20	08/14/92	86	DCH	Middlebrooks	E. Mark	Brain Tumor	IN	R	NEURO
	30	08/18/92	87	DCH	Walker	M. Jackson	Liver Failure	IN	1	GI MED
	30	08/20/92	13	DCH	Tison	J. Griffin	Chronic GI Bleed	IN	1	GI MED
	30	08/21/92	88	DCH	Tison	J. Hardin	SED rate 93	IN	1	RHEUM
	50	08/21/92	89	DCH	Walker	G. Garrison	Valvular disease	OUT	1	CARD
	30	08/27/92	90	DCH	Walker	M. Allen	Stroke	OUT	R	NEURO
	45	09/02/92	91	DCH	Yoon	G. Garrison	Chest Pains	OUT	1	CARD
	60	09/10/92	92	DCH	Walker	Petrea	Acute paranoia	IN	1	PSYCH
	30	09/11/92	97	DCH	Tison	J. Lesher	Dermatology	OUT	1	DERM
	45	09/11/92	98	DCH	Tison	L. LaHatte	Chronic Pancreatitis	IN	R	GI MED
	15	09/11/92	94	DCH	Tison	J. Lesher	Erythematous plaques	OUT	1	DERM
	20	09/11/92	93	DCH	Tison	L. Mulloy	Kidney/rejection	OUT	1	NEPH
	25	09/11/92	95	DCH	Tison	J. Lesher	Pruritic plaques	OUT	1	DERM
	30	09/11/92	96	DCH	Yoon	K. Given	Skin graft/foot	IN	1	PLAS SURG
	40	09/15/92	99	DCH	Middlebrooks	C. Lutcher	Abdominal lymphoma ?	IN	1	H/O
	55	09/15/92	27	DCH	Sinha	R. Kaltenbach	Pain Management	IN	1	PAIN MGMT
	30	09/18/92	102	DCH	Walker	M. Allen	Degenerative Disease	OUT	1	NEURO
	30	09/18/92	101	DCH	Middlebrooks	Toro	Cranial Hemorrhage	IN	R	NEURO
	30	09/18/92	100	DCH	Walker	M. Allen	Back Pain	OUT	1	NEURO
	30	09/18/92	103	DCH	Walker	M. Allen	Back Pain	OUT	1	NEURO
	30	09/23/92	96	DCH	Tison/Yoon	C. Wray	Gangrene Heel	IN	1	VAS SURG
	40	09/23/92	105	DCH	Tison	G. Garrison	Chest Pain	IN	1	CARD
	35	09/23/92	109	DCH	Walker	M. Allen	Herniated Disc	OUT	1	NEURO
	40	09/25/92	107	DCH	Tison	G. Garrison	CHF ? Etiology	OUT	1	CARD
	30	09/25/92	108	DCH	Walker	M. Allen	Herniated Disc Synd.	OUT	1	NEURO
	30	09/25/92	112	DCH	Walker	G. Garrison	Dyspnea/perm pacemaker	OUT	1	CARD
	30	09/28/92	111	DCH	Walker	C. Wray	Lateral Abd. Hernia	OUT	1	GEN SURG
	60	09/29/92	104	DCH	Yoon	G. Garrison	Chest Pain	IN	R	CARD
	30	09/30/92	110	DCH	Walker	L. Mulloy	Bleeding from colon	OUT	R	NEPH
	30	10/02/92	115	DCH	Petrea	Y. Park	Sleep Disorder	IN	1	NEUROL

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	45	10/07/92	114	DCH	Yoon	L. LaHatte	Ascites/liver sclerro.	IN	1	GI MED
	30	10/08/92	113	DCH	Tison	M. Stachura	Abnormal thyroid	OUT	1	M/E
	30	10/16/92	117	DCH	Tison	M. Allen	Back/leg pains	OUT	1	NEURO
	30	10/19/92	116	DCH	Tison	L. Davis	Persistent pruritis	OUT	1	DERM
	30	10/20/92	118	DCH	Walker	R. Weinstein	Hyperparathyroidism	OUT	1	M/E
	30	10/20/92	119	DCH	Walker	L. LaHatte	Cardiac Cirrhosis	OUT	1	GI MED
	45	10/22/92	120	DCH	Walker	D. Rutlen	Chest Pains/V-tach	IN	R	CARD
	45	10/27/92	123	DCH	Walker	J. Rubin	Polymyalgia	OUT	1	T SURG
	45	10/27/92	124	DCH	Tison	D. Rutlen	Tachy-arrhythmia	OUT	1	CARD
	45	10/28/92	121	DCH	Tison	J. Rubin	Bullae in lungs	OUT	R	T SURG
	35	10/28/92	122	DCH	Walker	P. Dainer	Melanoma	IN	1	H/O
	25	11/02/92	125	DCH	Tison	L. Davis	Pigmented patches	OUT	1	DERM
	45	11/04/92	126	DCH	Tison	D. Rahn	Deficiency Anemia	IN	1	RHEUM
	45	11/06/92	127	DCH	Walker	McDonnel	Herniated Disc	OUT	1	NEURO
	30	11/09/92	93	DCH	Tison	L. Mulloy	Kidney/rejection	OUT	1	NEPH
	60	11/10/92	128	DCH	Middlebrooks	Middleton	Liver Disease	IN	1	GI MED
	60	12/02/92	129	DCH	Walker	Sethi	Psychotic disorder	IN	1	NEUROL
	30	12/03/92	131	DCH	Yoon	D. Curtis	ERCP ?	IN	R	GI MED
	25	12/04/92	130	DCH	Walker	T. Swift	Peripheral neuropathy	OUT	1	NEUROL
	40	12/14/92	136	DCH	Tison	M. Rivner	Peripheral neuropathy	OUT	1	NEUROL
	45	12/14/92	134	DCH	Walker	W. Speir	Atelectasis/gunshot	OUT	1	PULM
	30	12/18/92	132	DCH	Petrea	A. Murro	Seizures	OUT	R	NEUROL
	40	12/22/92	133	DCH	Tison	R. Weinstein	Hypercalcemia	OUT	R	M/E
	45	12/28/92	61	DCH	Yoon	P. Dainer	Management	OUT	1	H/O
	45	12/30/92	135	DCH	Walker	L. Mulloy	Renal arterial stenosis	OUT	1	NEPH
	30	01/05/93	142	DCH	Walker	J. Bailey	Osteoarthritis	OUT	1	RHEUM
	45	01/07/93	141	DCH	Tison	M. Stachura	Hyponatremia	IN	1	M/E
	45	01/08/93	139	DCH	Tison	R. Adams	Cerebrovascular accident	IN	1	NEUROL
	25	01/08/93	138	DCH	Tison	G. Perry	Needs Pacemaker	IN	R	CARD
	30	01/08/93	137	DCH	Tison	G. Perry	Bradycardia	IN	R	CARD
	20	01/12/93	140	DCH	Gaines	Thomson	Ingested roach poison	OUT	1	ER
	50	01/19/93	143	DCH	Tison	G. Perry	Hypertension/CHF	OUT	1	CARD
	30	01/22/93	144	DCH	Tison	J. Lesher	Dermatitis	OUT	1	DERM
	25	01/25/93	145	DCH	Walker	R. Adams	COPD	IN	1	NEUROL
	30	01/25/93	146	DCH	Yoon	G. Perry	CHF & Hypoxia	IN	R	M/E
	20	01/27/93	26	DCH	Walker	D. Dunlap	Flu, Thyroid	OUT	1	CARD
	75	02/08/93	138	DCH	Tison	G. Perry	r/o infection pocket	IN	1	RHEUM
	30	02/17/93	147	DCH	Tison	J. Bailey	Raynaud's Disease	OUT	1	PULM
	30	02/22/93	148	DCH	Walker	B. Davis	Pulmonary Disease	OUT	1	PSYCH

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	45	03/01/93	150	DCH	Petra	W. Quillian	Bipolar Illness	IN	1	PSYCH
	37	03/03/93	149	DCH	Tison	Sharon	Ketoacidosis	IN	1	CARD
	30	03/04/93	153	DCH	Yoon	Hoffman	Acromegaly	OUT	1	PED ENDO
	45	03/08/93	151	DCH	Tison	M. Rivner	Morton's neuroma/foot	OUT	1	NEUROL
	30	03/09/93	156	DCH	Walker	C. Lutcher	Hodgkins ?	OUT	1	H/O
	75	03/11/93	146	DCH	Gaines	G. Perry	Pain/pacemaker	OUT	R	CARD
	30	03/12/93	152	DCH	Tison	M. Allen	followup/back surg.	OUT	1	NEURO
	30	03/26/93	154	DCH	Walker	J. Griffin	Esophageal stricture	OUT	R	GI MED
	45	03/30/93	53	DCH	Walker	J. Hardin	Polymyositis	OUT	1	RHEUM
	30	03/31/93	157	DCH	Tison	Sharon	Chest Pains	IN	1	CARD
	30	03/31/93	62	DCH	Walker	L. Mulloy	Transplant follow-up	OUT	1	NEPH
	30	04/02/93	158	DCH	Tison	L. LaHatte	Pancreatic head mass	OUT	R	GI MED
	45	04/30/93	159	DCH	Walker	M. Flowers	Pacemaker?	OUT	R	CARD
	30	05/07/93	160	DCH	Middlebrooks	J. Lesher	Atypical Lesion	OUT	1	DERM
	30	05/07/93	20	DCH	Yoon	W. Speir	Follow-up/RUL	OUT	1	PULM
	30	05/07/93	50	DCH	Tison	Frank/Vaughn	Uncontrolled rhythm	IN	1	CARD
	20	05/10/93	177	ACMI		Rissing/Newman	TB	IN	1	ID
	20	05/10/93	176	ACMI		Rissing/Newman	TB	IN	1	ID
	20	05/10/93	178	ACMI		Rissing/Newman	TB	IN	1	ID
	30	05/12/93	161	DCH	Walker	C. Lutcher	Myelodysplasia	OUT	1	H/O
	60	05/26/93	4	DCH	Petrea	A. Smith	Priapism/urology	OUT	1	UROL
		05/26/93	4			T. Muller	Major depression	OUT	1	PSYCH
		05/26/93	4			P. Milner	Sickle Cell Disease	OUT	1	H/O
		05/26/93	4			S. Hines	SCD/pain mgmt	OUT	1	ANES
	30	06/03/93	162	DCH	Tison	Sethi	Parkinsons?	OUT	1	NEUROL
	30	06/06/93	251	DCH	Yoon	B. Davis	Posterior mass	OUT	R	PULM
	40	06/14/93	163	DCH	Tison	F. Nichols	Pseudo-tumor Cerebri	OUT	1	NEUROL
	20	06/16/93	164	DCH	Tison	Davis/Warren	Non-healing Lesions	OUT	1	DERM
	10	06/16/93	DS	DCH	Middlebrooks	L. Davis	Excoriated skin lesions	OUT	1	DERM
	20	06/16/93	165	DCH	Tison	Davis/Warren	pruritic papules	OUT	1	DERM
	45	06/17/93	167	DCH	Middlebrooks	Murro	Seizure Disorder?	OUT	1	NEUROL
	60	06/24/93	168	DCH	Sinha	W. Quillian	Multi personalities	OUT	1	PSYCH
	45	06/24/93	170	DCH	Walker	N. Flowers	Acute IMI	IN	1	CARD
	30	06/25/93	171	DCH	Tison	A. Mulloy	Thyroid nodules	OUT	1	M/E
	30	06/25/93	172	DCH	Middlebrooks	L. Davis	Vitiligo & mild anemia	OUT	1	DERM
	60	06/28/93	169	DCH	Walker	D. Rutlen	H O Cardiomyopathy	IN	1	CARD
	45	07/01/93	173	DCH	Yoon	P. Dainer	Adeno CA/Site ?	IN	1	H/O
		07/01/93	173			Parkle	Adeno CA/Site ?	IN	1	RADIOL
	30	07/02/93	166	DCH	Petrea	T. Murro	Wide vision	OUT	1	NEUROL

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	60	07/09/93	174	DCH	Sinha	W. Quillian	Personality Disorder	IN	1	PSYCH
	20	07/12/93	179	ACMI		Rissing/Newman	TB	IN	1	ID
	20	07/12/93	180	ACMI		Rissing/Newman	MAI/MAC	IN	1	ID
	30	07/12/93	175	DCH	Middlebrooks	T. Bowden	Stoma follow-up	OUT	1	GI SURG
	20	07/19/93	ER	DCH	Petrea	Flannery	Hx skull fx/headaches	OUT	1	PED
	40	07/19/93	165	DCH	Sinha	Sunde	Hyperactive	OUT	1	PED PSYCH
	30	08/06/93	184	DCH	Middlebrooks	J. Lesher	Cellulitis/rt. thigh/bite	OUT	1	DERM
	45	08/12/93	182	DCH	Tison	Sharon	Chest Pain	IN	1	CARD
	60	08/12/93	182	DCH	Tison	M. Sharon	Triple vessel disease inop	OUT	1	CARD
	35	08/23/93	188	DCH	Middlebrooks	E. Porubsky	Drainage from ear	IN	1	ENT
	30	08/31/93	38	DCH	Tison	T. Swift	Bell's Palsy	OUT	1	NEUROL
	30	09/02/93	186	DCH	Bird	G. Holzman	Polyhydramnios	OUT	1	OB
	9	09/02/93	93	NC	Walker	L. Mulloy	Followup/kid rej/dialysis	OUT	1	NEPH
	90	09/02/93	187	DCH	Walker	Nelson/Sharon	Anemia, swelling undeter.	OUT	1	INT MED
	30	09/09/93	189	DCH	Yoon	Nelson	Hilar lymphhadenopathy	OUT	1	INT MED
	30	09/20/93	191	DCH	Tison	R. Adams	Diplopia	OUT	1	NEUROL
	30	09/20/93	192	DCH	Tison	B. Schuman	Cyst on liver/abd pain	OUT	1	GI MED
	30	09/23/93	190	DCH	Petrea	K. Sethi	Movement disorder	OUT	1	NEUROL
	30	09/23/93	198	SWA	Ray	R. Adams	Persistent headache	OUT	1	NEUROL
	30	09/23/93	197	DCH	Tison	T. Swift	Early dementia?	OUT	1	NEUROL
	9	09/27/93	195	NC	Walker	Sanal	Ca left breast	OUT	1	ONC
	30	09/28/93	199	SWA	Ray	E. Sunde	Hyperactivity	OUT	1	PED PSYCH
	30	09/30/93	152	DCH	Tison	M. Allen	Back pain	OUT	1	NEURO
	30	10/06/93	200	DCH	Tison	A. Kocheril	Probably sinus node dysf	OUT	1	CARD
	45	10/07/93	202	SWA	Porter	M. Messing	Pelvic mass	IN	1	GYN
		10/07/93	202			R. Martindale	Pelvic mass	IN	1	SURG
	30	10/13/93	201	DCH	Walker	G. Garrison	Chest pain & S3 gallop	OUT	1	CARD
	15	10/14/93	152	DCH	Tison	M. Allen	Followup back pain	OUT	1	NEURO
	30	10/22/93	205	DCH	Walker	L. LaHatte	Persistent epigastric pain	OUT	1	GI
	30	10/22/93	204	DCH	Tison	E. Bransome	Thyroiditis?	IN	1	ENDO
	45	10/26/93	208	DCH	Tison	T. Swift	Rt sided weakness	OUT	1	NEUROL
	30	10/27/93	209	DCH	Tison	A. Kocheril	Mitral valve prolapse	OUT	1	CARD
	30	10/28/93	210	DCH	Walker	L. LaHatte	GI bleed, source undeter	IN	1	GI
	45	11/01/93	206	DCH	Petrea	K. Sethi	Movement disorder	OUT	1	NEUROL
	60	11/01/93	207	DCH	Petrea	K. Sethi	Met encephalopathy ?	IN	1	NEUROL
	30	11/02/93	203	DCH	Middlebrookw	B. Wray	Chronic nasal congestion	OUT	1	ALLERGY/IM
	40	11/02/93	193	DCH	Tison	J. Bailey	Rheumatoid arthritis	OUT	1	RHEUM
	30	11/08/93	211	DCH	Tison	R. Lovell	FUO	IN	1	ID
	30	11/09/93	213	DCH	Walker	M. Jackson	FU, previous polyp	OUT	1	GI

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	45	11/09/93	214	SWA	Ray	M. Jackson	Acute pancreatitis	OUT	1	GI
	30	11/16/93	217	DCH	Yoon	L. Callahan	Bloody sputum/pain	OUT	R	PULM
	30	11/16/93	216	WAY	A. Davis	Leatherbury	Heart murmur	OUT	1	PED CARD
	55	11/17/93	215	DCH	Walker	G. Garrison	C/P hypercalcemia	OUT	1	CARD
	30	11/18/93	216	DCH	Walker	J. DuPre	? pulm hypertension	OUT	1	PULM
	45	11/19/93	218	DCH	Tison	M. Jackson	Pancreatitis, ascites	IN	1	GI
	60	11/24/93	219	DCH	Tison	G. Garrison	Bradycardia	IN	R	CARD
	60	11/29/93	220	DCH	Tison	G. Garrison	Valvular heart disease	OUT	1	CARD
	55	12/03/93	223	WAR	English	B. Chaudhary	Sleep apnea	OUT	1	PULM
	45	12/06/93	224	WAR	English	D. Loebl	Arthritis	OUT	1	RHEUM
	15	12/06/93	190	DCH	Petrea	K. Sethi	Fup/movement disorder	OUT	1	NEUROL
	30	12/06/93	222	DCH	Petrea	K. Sethi	Movement disorder	OUT	1	NEUROL
	15	12/09/93	227	WAR	English	A. Carr	Hypertension, uncontrolled	OUT	1	HYPER
	20	12/09/93	228	DCH	Tison	T. Huff	Hyperthyroidism	OUT	1	MET/ENDO
	20	12/13/93	77	DCH	Walker	B. Schuman	Acute pancreatitis	OUT	R	GI
	15	12/13/93	225	DCH	Walker	A. Kocheril	Wolfe-Parkinson-White	OUT	1	CARD
	30	12/13/93	226	DCH	Tison	R. Adams	Chronic back pain	OUT	1	NEUROL
	35	12/15/93	232	SWA	Porter	E. Sunde	Depression/eating disorder	OUT	1	PED PSYCH
	20	12/16/93	230	DCH	Walker	T. Gadacz	Large gallston	OUT	R	GEN SURG
	30	12/17/93	233	DCH	Walker	R. Adams	Severe headaches	IN	1	NEUROL
	30	12/17/93	234	DCH	Walker	Rutlen	ASHD	OUT	R	CARD
	40	12/20/93	221	SWA	Alderman	L. LaHatte	? pancreatitis	OUT	1	GI
	30	01/04/94	236	DCH	Tison	A. Kutlar	Low platelet/high red cells	OUT	1	HEM/ONC
	30	01/10/94	194	ACMI	Peel	J. Rissing	Chronic osteomyelitis	IN	1	ID
	35	01/11/94	235	SWA	Ray	E. Bransome	Hyperthyroidism	OUT	1	MET/ENDO
	35	01/14/94	238	DCH	Yoon	L. Mulloy	R/O nephrotic syndrome	OUT	1	NEPH
	30	01/19/94	241	DCH	Tison	R. Adams	Possible stroke	IN	1	NEUROL
	30	01/21/94	242	DCH	Tison	J. Bailey	Inc ANA, elevated SED rate	OUT	1	RHEUM
	10	01/21/94	243	DCH	Tison	J. Bailey	Inc. ANA	OUT	1	RHEUM
	30	01/26/94	240	DCH	Walker	J. Rubin	Chest mass	OUT	R	THOR SURG
	30	01/31/94	245	WAY	E. Martin	E. Porubsky	Glossitis	OUT	1	ENT
	40	02/01/94	239	WAY	A. Davis	H. Sabio	Evaluation of hemangioma	OUT	1	PED HEM
	50	02/02/94	248	DCH	Walker	L. Callahan	COPD	IN	1	PULM
	10	02/07/94	246	DCH	Tison	R. Saltz	Cellulitis, abdomen	OUT	R	PLAS SURG
	45	02/14/94	253	DCH	J. Tison	G. Garrison	Second degree AV block	IN	1	CARD
	40	02/16/94	254	DCH	M. Griffis	G. Garrison	Shortness of breath, cardiomyopathy	IN	1	CARD
	30	02/21/94	244	SWA	T. Palmer	B. Battles	Depression	OUT	1	PSYCH
	15	03/04/94	258	DCH	J. Tison	J. Lesher	Skin rash	OUT	1	DERM
	15	03/04/94	255	DCH	J. Tison	J. Lesher	Lesions on left hand	OUT	1	DERM

PATIENT NAME	0:00	DATE	TM#	HOSP	REMOTE M.D.'s	CONSULTING M.D.'s	PATIENT PROBLEM	I/O	1/R	SPECIALTY REQUESTED
	30	03/08/94	256	DCH	M. Griffis	L. Mulloy	f/u post renal transplant	OUT	1	NEPH
	40	03/11/94	259	SWA	J. L. Ray	G. Garrison	Chest pain	IN	1	CARD
	30	03/11/94	257	DCH	G. Walker	C. Brophy	Renal arteries stenosis	OUT	1	VAS SURG
	30	03/14/94	244	SWA	T. Palmer	B. Battles	Bipolar depression f/u	OUT	1	PSYCH
	45	03/14/94	260	DCH	Y. Yoon	A. Kutlar	Multiple neck masses	IN	R	HEM/ONC
	100	03/21/94	262	WAY	A. Knowlton, RN	C. Newman	f/u visit, HIV positive	OUT	1	ID
	40	03/23/94	263	WAR	D. English	H. Sullivan, RN	Diabetes	OUT	1	DIABETES EDU
	25	03/25/94	261	DCH	J. Tison	K. Meador	Dementia, abnormal movements	OUT	1	NEUROL
	35	03/25/94	264	DCH	J. Tison	S. Sanal	Anemia, ascites, dementia, splenomegaly	IN	1	HEM/ONC
	35	04/01/94	168	DCH	L. Petrea	R. Borison	Schizophrenia medication	OUT	1	PSYCH PHARM
	25	04/01/94	268	DCH	L. Petrea	R. Borison	Bipolar illness	OUT	1	PSYCH
	30	04/01/94	266	DCH	L. Petrea	K. Meador	Seizures	OUT	1	NEUROL
	30	04/25/94	224	WAR	D. English	D. Loebl	Reactive Arthritis	OUT	1	RHEUM
	90	04/27/94	262	WAY	A. Knowlton, RN	C. Newman	HIV f/u visit	OUT	1	ID
	25	04/27/94	278	DCH	J. Tison	J. Goodrich	Post fracture L-4, pain mgmt	OUT	1	ORTHO
	20	04/26/94	277	DCH	L. Petrea	Y. Park	Anxiety, depression, insomnia	IN	1	NEUROL
	35	04/12/94	271	DCH	G. Walker	T. Swift	Painful diabetic neuropathy	OUT	1	NEUROL
	30	04/19/94	275	DCH	G. Walker	M. Allen	Low back pain	OUT	1	NEUROSURG
	15	04/19/94	273	DCH	M. Griffis	F. Kuhn	Ear pain, left	OUT	R	ENT
	30	04/19/94	274	DCH	M. Griffis	M. Allen	Low back pain	OUT	R	NEUROSURG
	12	04/07/94	270	DCH	J. Tison	R. Moores	Carcinoma left lung	IN	1	HEM/ONC
	45	04/13/94	272	DCH	J. Tison	G. Garrison	Chest Pain	IN	1	CARD
	30	04/01/94	267	DCH	G. Walker	M. Fincher	Renal Failure	IN	1	NEPH
	25	04/11/94	269	DCH	G. Walker	D. Haburchak	Puritis Ani	OUT	1	ID
	30	05/06/94	282	DCH	M. Middlebrooks	J. Lesher	Ulcer to (R) lower leg	IN	1	DERM
	6	05/10/94	282	DCH	M. Middlebrooks	J. Lesher	Ulcer to (R) lower leg	IN	1	DERM
	45	05/10/94	281	SWA	J. Ray	S. Shevitz	Hallucinations	IN	1	PSYCH
	6	05/10/94	283	DCH	M. Middlebrooks	J. Lesher	Rash in forearms and legs	OUT	1	DERM
	30	05/16/94	284	DCH	L. Petrea	K. Sethi	Paranoid schizophrenia	OUT	1	NEUROL
	17	05/10/94	279	DCH	G. Walker	J. Bailey	Tenosynovitis	OUT	1	RHEUM
	35	05/16/94	286	DCH	J. Glenn	C. Newman	Wheezing, emphysema, COPD	IN	1	ID
	15	05/18/94	285	DCH	G. Walker	J. Bailey	Rheumatoid arthritis	OUT	1	RHEUM
	20	05/16/94	287	DCH	J. Tison	E. Bransome	Hyponatremia/Diabetes	IN	1	MET/ENDO
	25	05/27/94	293	DCH	J. Tison	P. Dainer	Tx squamous cell CA lung	IN	1	HEM/ONC
	25	05/31/94	294	DCH	J. Glenn	A. Kutlar	Sickle cell and pain	IN	1	HEM/ONC
	10	05/20/94	290	DCH	J. Tison	L. Mulloy	Kidney transplant; rejection	IN	R	NEPH
	40	05/31/94	292	DCH	J. Tison	D. Loebl	Rheumatic fever vs other etiology	OUT	1	RHEUM

TELEMEDICINE

CHALLENGES TO IMPLEMENTATION

Jay H. Sanders, M.D.

Professor of Medicine
Director, Telemedicine Center
Eminent Scholar of Telemedicine
Medical College of Georgia

Jonathan S. Sanders, Esq.

Presented at the Rural Telemedicine Workshop
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Department of Health and Human Services

It is ironic that despite dramatic advances in our ability to care for patients, our ability to translate that knowledge into an accessible, affordable health care system remains an elusive goal. As a result, millions of people have been unable to obtain even the most basic of health care needs. Socio-economic and geographical barriers for patients, compounded by educational isolation for physicians, underline the problems. Providing a patient health care where and when it is needed with an assurance of quality and an economy of cost clearly must be the objective of any health care delivery system. Since the present system does not satisfy these criteria, alternatives are needed. Telemedicine has been proposed as one of those alternatives. However, if telemedicine is to play a significant role, a number of implementation and operational issues will need to be addressed.

Licensure

It is anticipated that, based on the present individual state licensure system, a physician utilizing telemedicine to provide consultative services to a patient would have to be licensed in every state that the patient resided. Given the often burdensome process involved in obtaining state licensure it is unlikely that many physicians will pursue that avenue and, thus, potentially significantly limit the networking capability that this telecommunication system affords.

A number of potential solutions are proposed:

(1) individual state licensure for telemedicine should be converted to a national licensure similar to the military health care system. In fact, since physicians are required to take national examinations for licensure and certification it seems illogical to have a system of individual state licensure

in the first place. Perhaps, in order to assess the impact of such a change, a "national" license could be provided to those physicians who provide telemedicine consultations to patient populations that have been defined as "underserved";

(2) in the instance of a specialty consultation requested by the primary care physician, the referring physician retains responsibility for the care of that patient, and, therefore any "care" provided over telemedicine by the consulting physician in another state could be viewed as recommendations only;

(3) perhaps the most logical way to deal with state licensure requirements is to determine that the patient is, in fact, being "electronically transported" to the physician rather than the physician being transported to the patient.

Another licensure issue that surfaces when considering telemedicine consultations across state lines is whether the Federal Trade Commission would view this as interstate commerce.

Credentialing

Although issues similar to the licensing debate can be raised with reference to credentialing, it would appear that an opinion provided by the Joint Commission on Accreditation of Healthcare Organizations for the Medical College of Georgia telemedicine system could be uniformly applicable. The JCAHO determined that a physician at MCG who provided a telemedicine consultation of a patient at Dodge County Hospital (a rural hospital 130 miles distant from MCG) would not have to be credentialed at that rural hospital as long as any orders written in the patient's chart were by the referring physician at Dodge County Hospital. The consulting physician is not considered the physician responsible for the care of the patient.

Liability/Malpractice

Malpractice liability may prove to be one of the most vexing problems and could impede the general application of telemedicine. Obviously, any analysis of "what might be" will only gain validity from the outcome of precedent setting cases.

Although, to date, we have no evidence of any malpractice activity having been generated by past and present telemedicine initiatives, one can anticipate that as reimbursement becomes a reality, and as medical centers with "deep pockets" who become networked with remote sites are viewed in an "agency" relationship, more attention will be paid to this area by the legal profession. It also should be recognized that those telemedicine systems that utilize digital compression technology to transmit images will have a very special type of liability exposure, namely, that the "data" being reviewed by the consulting physician is not complete! Finally, the inability, at present, for telemedicine systems to allow for actual "hands on" examination of the patient will serve to foster the perception that a telemedicine consultation is incomplete or inadequate.

Clearly, a preventative approach to liability is the best defense. It must be stressed to the physician that if the visual/audio links do not provide adequate information transfer to allow for appropriate diagnostic interpretation none should be made. Videotaping of the entire consultative exchange will provide excellent record keeping and avoid the common pitfall of lack of documentation. Telemedicine systems that provide access to up-to-date references as well as the expanding library of "practice guidelines" now being introduced by the specialty societies will help to address the issue of whether the care provided by the physician satisfied community standards. Perhaps the doctrine of "sovereign immunity" could be applied to those physicians/medical centers that offer telemedicine consultations to the underserved.

Confidentiality

The transmission of personal and sensitive medical information over communication lines clearly lends itself to electronic intrusion and exposure. Encrypting algorithms will need to be introduced but it is naive to think that even the most sophisticated code could not be broken. Once again legal precedent will determine the standard, but it is likely that if "reasonable and customary" efforts are taken to maintain the security of records this issue will not be difficult to resolve. In fact, if one examines the fairly open access to patient records that prevails in our existing system it can be expected that the electronic transfer of medical information may have more security.

Recordkeeping

As has been noted, videotaping will allow for more accurate, as well as, expanded capture of medical information. However, medical records will exist at both ends of the communication link, thus raising the question as to which record reflects the legal one. How are we going to "edit" the vast amount of information retrieved, and will deletion of "unimportant" components of the patient's history and physical examination be considered record tampering?

Technology - Design/Operation/Maintenance

Today any technology-based system needs to share the following characteristics: (1) adaptability to change; (2) ease of operation, and (3) minimal maintenance requirements.

Changes in communication technology and information processing and management are occurring at a more rapid pace than even the most optimistic predictions. It is essential, therefore, that any multicomponent telemedicine system have an open architecture and modular design that can adapt to upgrades with component replacement rather than system extinction. Technical expertise should be a prerequisite only for the integrator of the system not the people using it. System controls must be user-friendly and incorporated into a single control panel. Every effort should be made to convert the present configuration, in which a separate telemedicine consultative room is utilized, to a more flexible desktop multi-media platform that is accessible to the physician in his/her office. Portability must also be a prerequisite to allow for the deployment of transportable telemedicine units that can service multiple remote facilities on an "as needed basis." System maintenance needs to be the simplest task of all - modularity of system components, telephone dial-up maintenance assessment algorithms, and "strategic" redundancy need to be incorporated into the system design. Most importantly, the design of the system must be dictated by the needs of the end-users not those of the system architect. Functionality must control structure and the technology should have a transparent interface between users.

Operational personnel requirements are minimal. A single FTE at each site can manage system operation, scheduling of the consultations and preventative maintenance responsibilities. If the base station system is situated in proximity to the emergency department, telemedicine consultations can be made available to the remote rural hospital on a 24-hour per day basis.

Technological Compatibility

It is imperative that equipment manufacturers strive for competitive similarities rather than proprietary constructs. Systems that can't "speak" the same language will never integrate with each other, and, thus, will paralyze network development. Witness the minimal use of facsimile machines prior to the introduction of a common language and the explosion in sales when a common alphabet was introduced.

Value/Economics

Telemedicine must be identified as a value added service to maintain its viability, and central to that objective, is that it be cost effective. Preliminary data from the MCG telemedicine system demonstrates that 81% of the patients who are seen over telemedicine have not required transfer to a secondary or tertiary care center. Given an average cost differential of $500 per day between the rural hospital bed ($800) and that at the Medical College of Georgia ($1300), even a 25% decrease in transfers would be a significant cost savings. Add to that the savings in transportation costs, increased productivity, and the decreased hospitalization days resulting from treating a patient at an earlier stage in their disease process, and it is apparent that the potential savings are significant. Consider also that the health care revenue generated is staying at the rural site thus enhancing not only the fiscal stability of that hospital but also the socio-economic fabric of that community. Finally, in contrast to most new medical technology, telemedicine systems do not require major capital investments, and the cost of individual components continue to fall as the technology improves. Despite the relatively low cost, however, it is recommended that rural health care facilities, in order to conserve cash flow, lease the system over a three to five year time frame allowing the revenue generated by the anticipated increase in bed census and ambulatory activity to offset the leasing costs. (The leasing contract should provide for component upgrades so that the system always remains at the cutting edge.) Assuming that the average cost of a satellite site if purchased outright is about $160,000, it should be noted that an increase of a single patient to the average per day bed census represents a net cash flow of $150,000/year to the hospital. However, despite the reduced capital expenditure many rural hospitals will still not have the needed start-up funding. If that is the case, then it is recommended that government (local, state and/or federal) provide a loan to "pump prime" these facilities. As revenue is generated the rural hospital will then be able to assume the monthly leasing costs as well as payback the start-up loan.

Educational Value

Perhaps one of the most important applications of telemedicine that will significantly foster its implementation is its capacity to alter the state of professional isolation that now exists for the rural based physician. Telemedicine addresses each of the necessary characteristics of an effective CME experience namely that the information provided is (1) timely, (2) pertinent to the issue, (3) convenient to obtain, (4) repetitive and (5) up-to-date. By providing immediate access to colleagues at the medical center, telemedicine creates an "electronic umbilical cord" between the two facilities, and allows for a real-time interactive educational experience for the referring physician. As importantly, it helps the academic based consultant to be more aware of, and sensitive to, the needs of the rural-based physician. An added fringe benefit is that, depending on the nature, format and comprehensiveness of the consultative interchange, it is possible to grant category I CME credits to the rural-based physician. The significance of obtaining these credits is underlined by the fact that in many states relicensure is dependent on having accumulated these credits and without this on-site opportunity afforded by telemedicine the process is both inconvenient and expensive.

Communication Costs

Telemedicine systems can interface with a variety of communication modalities (copper wire telephone lines, fiberoptic cable, microwave and satellite) thereby providing maximum flexibility for interconnectivity between sites. One problem with the use of telephone lines, however, is the complex rate structure that exists between LANs that create unrealistic communication costs. Although the introduction of ATM switching and fiberoptic cable will dramatically reduce per use cost, until those technologies are more generally available lower transmission costs for telemedicine will need to be structured to make it economically feasible for rural hospitals to participate.

Motivation for Providers and Patients

It is clear that a number of factors need to be in operation for both physician and patients to use the system, but, perhaps the most fundamental, is for the "users" to recognize a simple paradigm shift. One of the interesting aspects of telemedicine is the perception on the part of both physician and patient that this technology is futuristic. In fact, it incorporates all "off-the-shelf" technology. The telecommunications, cameras, remote control optics and examination devices are utilized on a day-to-day basis by each of us simply in different settings. With the same technology that allows us to watch a news anchor interact in real time with his/her correspondent in a distant part of the globe, or view through the use of a telephoto close-up lens, a distant landscape in intimate detail, so too can we examine a patient at a remote site.

For the rural based physician other operational motivating issues require that: (1) the time involved in a telemedicine consultation must integrate into his/her daily schedule and, if the physician can not participate in the consultation, a nurse at the remote end would suffice to allow for an effective examination by the consulting physician; (2) the consultation be reimbursable; (3) the consultation not be competitive; (4) continuity of care, by avoiding unnecessary referrals to secondary or tertiary care centers, be increased; (5) the physician's revenue stream be enhanced; (6) the consultation functions as an effective educational experience; (7) the system be easy to use; and (8) most importantly, it be perceived by that physician's patient as an effective consultative exchange.

Many of the critical factors outlined for the rural based physician hold true for the consulting physician. Economy of time, ease of use and a method for reimbursement are obvious needs. Perhaps the most difficult hurdle that telemedicine needs to clear is to satisfy the technical requirements of the consulting physician. To achieve this it is important that the system architect understands those needs prior to designing the system. Resolution capabilities are critical for the radiologist/pathologist: technological simplicity and user friendliness characterize the need of the mental health care professional, and audio quality of the electronic stethoscope and real time transmission of echocardiograms identify the desire of the cardiologist. Experience from previous telemedicine initiatives have taught us to anticipate that each specialist will come with a different expectation of the systems capability. This needs to be addressed and understood by those who endorse the introduction of telemedicine into the healthcare delivery system.

The ultimate test of the value of telemedicine will be dependent on how the patient perceives and adapts to it. If the patient feels the technology makes the consultation too impersonal; if the telemedicine consultation costs more and is not covered by insurance, and if the patient wants to have the physician literally at their side, telemedicine will not be an acceptable delivery system. In the same manner that there is a learning curve for the physician, we can anticipate a similar situation for the patient. A system that is designed to allow direct eye-to-eye contact, that is easy to use, and that gives the patient the ability to control the interview camera has been shown in previous telemedicine systems to be very "patient friendly." In fact, the patient has perceived himself or herself as being treated in a very special way. In the final analysis it will be the human component at each end of the system - not the technology - that will determine whether it is successful or not. Once again the design of the system must be determined by the needs of the people who use it!

Other Uses

It should be recognized that the telecommunication link between sites can be used for multiple purposes, including administrative meetings, nursing and other allied health educational or direct patient care activities. Telemedicine sites could also be integrated into a state's distance learning initiative so that preventative health care programs as well as acute episodic care intervention can be introduced to the classroom.

Continuous Quality Improvement - CQI

As with any component of the health care system, new or old, there must be regular oversight evaluation to ensure that the objectives for which it was introduced are continuing to be met. Economic viability, quality care, accessible service, appropriate utilization and educational strengths will need to be regularly verified in order to justify the continued operational status of the system.

Conclusion

This paper has attempted to sketch a picture of some of the issues related to the implementation of telemedicine. Whatever new directions or programs we eventually initiate to impact the problems in our health care delivery system it must be coupled with a commitment to analyze and critique them. Despite the feeling that changes need to be made rapidly, solutions cannot come overnight. While tradition can not justify maintaining the present inequities, a new idea can not simply be equated with a proven solution. New programs must be developed to provide the flexibility to accommodate to a wide variety of practice situations and a built-in mechanism to respond to changes in program objectives.

The true measure of the performance of any new system will be whether it effects an improvement in the health of the people it serves. Finally to those of us who believe that telemedicine is a solution close at hand and will require only simple changes we had best heed the words of the philosopher John Gardner, "Social change is a learning process for all concerned. It always requires reeducation of large numbers of people to accept new objectives, new values, new procedures. It can not go forward without the breaking down of long established ways of doing and thinking. This is true whether the problem is one of civil rights, the reform of local government, educational improvement, or urban renewal. Most human institutions are designed to resist such learning rather than facilitate it."

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Expert Opinion

Medicine must accept paradigm shift in information processing

BY JAY H. SANDERS, M.D.

High-quality, affordable health care for all remains an elusive goal. As a result of geographic and socioeconomic barriers, more than 40 million people in the U.S. are disenfranchised from our health-care system. Even more frustrating is the realization that while our skill at diagnosing and treating disease continues to improve, our ability to distribute and deliver that care has not.

The challenge we face is to integrate our ability to treat with the delivery of that treatment. Alternative health-care systems must be explored, and advances in telecommunication and information processing provide obvious tools to help structure those systems.

One such option is telemedicine. As described elsewhere in this issue, telemedicine can provide immediate access to medical care while retaining the patient in the rural setting. This results in an increased bed census and improved financial stability for the rural hospital. For the patient, it translates into improved quality of care while reducing the overall cost of that care. Most significantly, telemedicine alleviates the sense of professional isolation felt by many rural-based primary-care physicians and enhances their continuing medical education.

Since telemedicine is adaptable to an assortment of communication modalities, it can link the referral hospital with a variety of health-care settings. It is anticipated that during the first decade of the 21st century, the availability of fiber-optic cable will allow a physician using this electronic umbilical cord to make a house call into every home in the U.S.

Ironically, as access to medical care is facilitated, a new concern will arise: the capability of the physician caring for the patient to maintain and draw on an up-to-date database in making a diagnosis. Presently, the physician formulates a differential diagnosis based on a diagnostic decision tree largely defined the expertise of the physician. That expertise depends in turn on the memory capacity, alertness, consistency, reasoning capability and currency of the physician's database. Alterations in any of these parameters can affect the validity of the diagnosis.

As a result of the explosive growth in our understanding of the pathophysiology of disease processes, not even the most gifted physician can retain the requisite information. Patient care is thus compromised. We need to adapt the same paradigm shift in information processing for medicine as we have in other fields. As a result of new technology in information storage, retrieval and transmission, we can anticipate striking changes in how a physician evaluates a patient. The future "patient evaluation center" will contain an interactive computer that will take a history using a branched logic tree driven by the patient's response to the previous question.

Drawing on a vast data bank, the computer will correlate the patient history and physical exam to provide a high-probability diagnosis. It will suggest further testing that may help to confirm the diagnosis and provide the most effective, cost-efficient way to treat the identified problem. All this information will be added to a computer-stored patient file that can be accessed by any treating physician, regardless of location.

This description of the health-care encounter of the future may provoke some anxiety in both patient and provider, as it appears devoid of the personal interaction between patient and physician that presumably now exists. However, the risk of impersonalization must be an acceptable alternative to a missed diagnosis and inappropriate therapy—or, indeed, no care at all.

Dr. Sanders is a professor of medicine and director of telemedicine at the Medical College of Georgia in Augusta.

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EDITORIAL OFFICES

600 Harrison St., San Francisco, CA 94107
(415) 905-2200, Fax (415) 905-2235.

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Telemedicine Home Healthcare Network Demonstration

The Home Healthcare Network (HHN), an electronic housecall, is an innovative health care alternative for patients requiring frequent health care services that can only be provided traditionally in a hospital or ambulatory care facility. The network is designed to bring the health care provider electronically into the home environment of his or her patient to provide more frequent assessment/interventionso as to avoid or prevent progression of the disease process to a state of receiving acute hospitalization. Each in-home installation will be tailored to fit the needs of the patient. Non-invasive sensing functions such as vital signs, pulmonary function, heart and lung sounds, electrocardiogram, and blood gas analysis will be provided. Access to patient education materials and the type of clinical staff available for scheduled and/or on-demand interactive care (Video 911) will be individually designed. A consortium of specialists in health care, biomedical engineering, and medical informatics will design and test an HHN prototype serving 25 patients in the Augusta, Georgia area. The data collected will be used to evaluate (1) essential user interface characteristics of the presentation and operation of the system, (2) the elements of monitoring and therapeutic protocols required in the home environment and (3) the acceptance of the Telemedicine equipment and health care delivery in the home, (4) satisfaction with home health care by Telemedicine, and (5) the economic implications of Telemedicine-based home health care. The expected outcome of the demonstration will be an increased understanding of the potential of Telemedicine-based home Healthcare to lower health care costs, maintain quality, and increase patient access to and satisfaction with health care services.

Jay H. Sanders, M.D.
Max D. Miller, Ed. D.

Jay H. Sanders, M.D., F.A.C.P.

Dr. Jay H. Sanders is Professor of Medicine and Surgery, Director of the Telemedicine Center and Eminent Scholar of Telemedicine at the Medical College of Georgia. In addition, he is Senior Research Scientist at the Georgia Institute of Technology (GT), a member of the Board of Directors as well as founding member of the American Telemedicine Association and Senior Advisor to NASA on Telemedicine. He earned his medical degree from Harvard Medical School where he graduated magna cum laude and was a member of the Honor Medical Society, AOA. After medical school he did his residency training at the Massachusetts General Hospital in Boston, where he was Chief Medical Resident, and did a research fellowship in Immunology at the National Institute of Health. In 1970, Dr. Sanders joined the University of Miami School of Medicine, where he attained the rank of Professor of Medicine, and became Chief of Medicine at Jackson Memorial Hospital, the largest teaching hospital in the Southeastern United States. Prior to becoming Chief of Medicine, Dr. Sanders headed the Medical Intensive Care Unit, the Medical House Staff Program and the Division of General Medicine, which was the first to be established in any medical school. He has spent the majority of his professional career involved in teaching, health care research and, for over 27 years, in the development of interactive telecommunications as a means of addressing the problems relating to quality, cost and access to care that now plague our health care system. Dr. Sanders designed the telemedicine system at the Medical College of Georgia and is overseeing the implementation of a statewide telemedicine system that interfaces with rural hospitals, public health facilities, correctional institutions and ambulatory health centers. This network will also be able to interface with all the distance learning sites, so that preventative health care initiatives will be introduced into the classrooms. Finally, a project that would allow for "electronic house calls" is being developed for the next generation telemedicine system.

June 1994

The Telemedicine Health Care Delivery System

A system that electronically transports a consulting physician from a medical center complex to a patient at a distant health care facility

The Telemedicine Health Care Delivery System

The system utilizes interactive video communication integrated with remote controlled biomedical telemetry providing a consulting physician the ability to examine a patient at a satellite location as if the patient were in the physician's office

The Rural Community Hospital/ Physician Dilemma

- Lack of access to specialty care
- Declining bed census
- Professional isolation
- Discontinuity of care

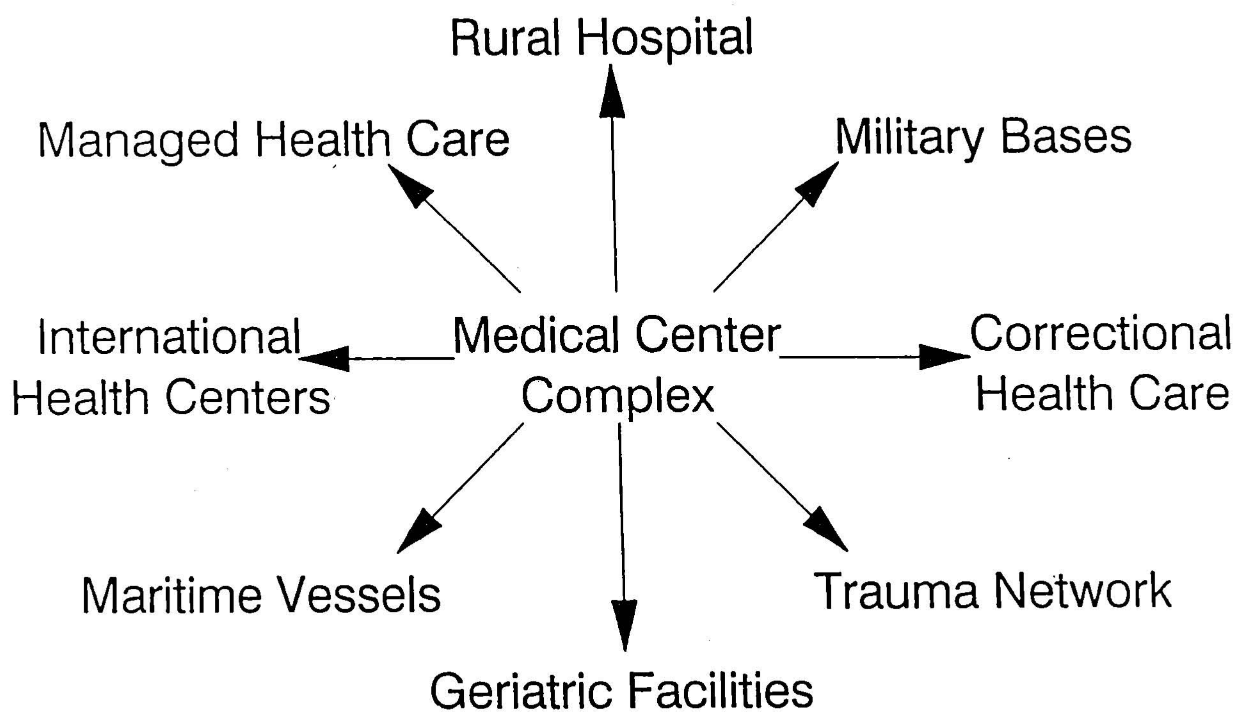
The Rural Community Hospital/ Physician Dilemma (continued)

- Compromised quality of care
- Ineffective continuing medical education
- Excess cost of care
- Lack of a medical data base

Telemedicine Health Care Delivery System Applications

- Rural health care
- Military health care
- Aging population
- Academic medical centers - Community hospital network
- Managed health care systems - HMO
- Correctional health care
- Trauma network

A Telemedicine Healthcare Network



Medical Advantages of Telemedicine

- Provides access to care
- Decreases professional isolation
- Enhances continuing medical education
- Enhances continuity of care

Medical Advantages of Telemedicine (continued)

- Decreases unnecessary referrals
- Immediate attention to life threatening problems
- Establishes an integrated health care network
- Provides enhanced quality

Economic Advantages of Telemedicine

- Increases revenue stream for remote site
- Increases revenue generated by primary health care provider
- Decreases cost of care to patient
- Decreases malpractice exposure

Economic Advantages of Telemedicine (continued)

- Decreases hospitalization days
- Does not compete with existing physician-patient population
- Expands market for base station physician
- Expands market for base station facility

Research and Development Opportunities

Quality

Cost

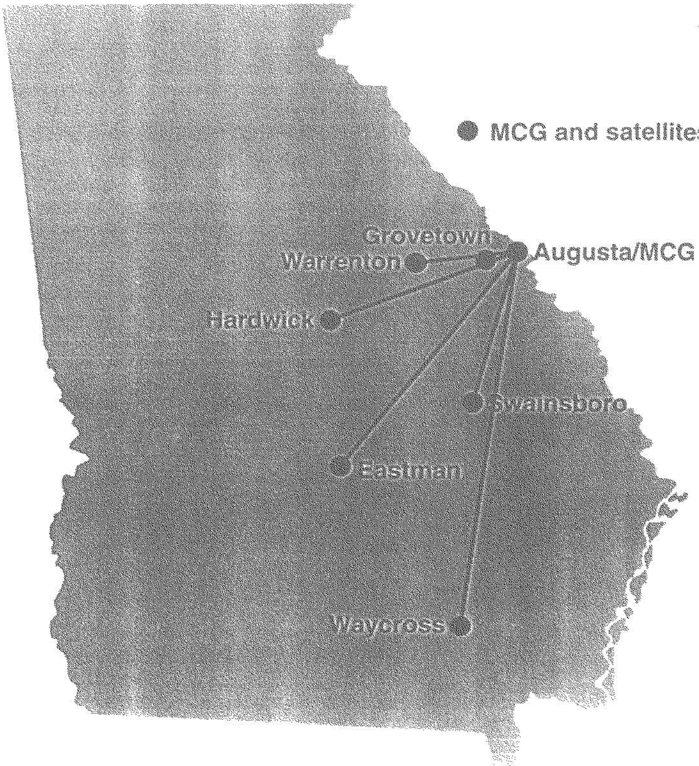
Access

Acceptance - The Human Technology

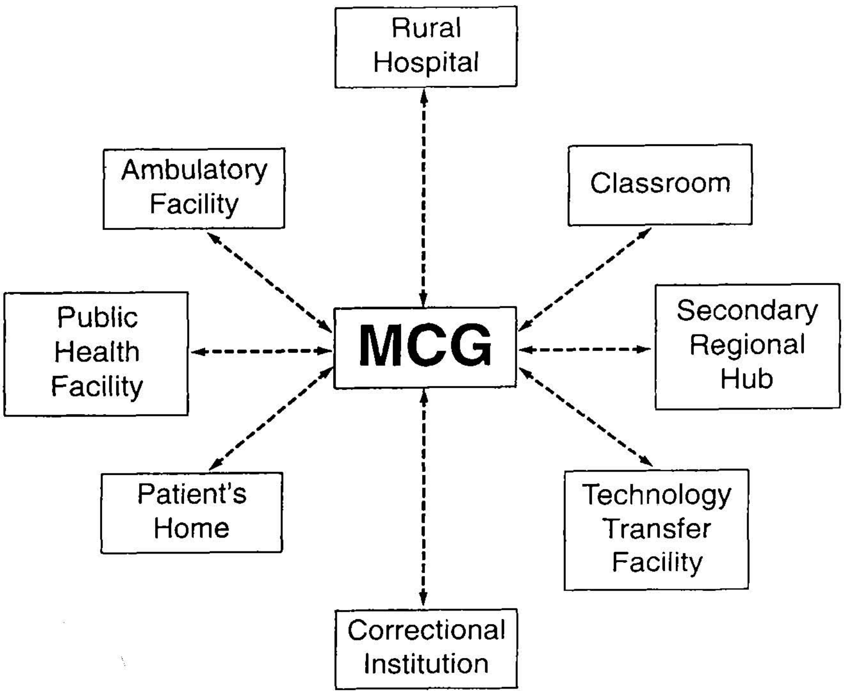
Continuity

Continuing Medical Education

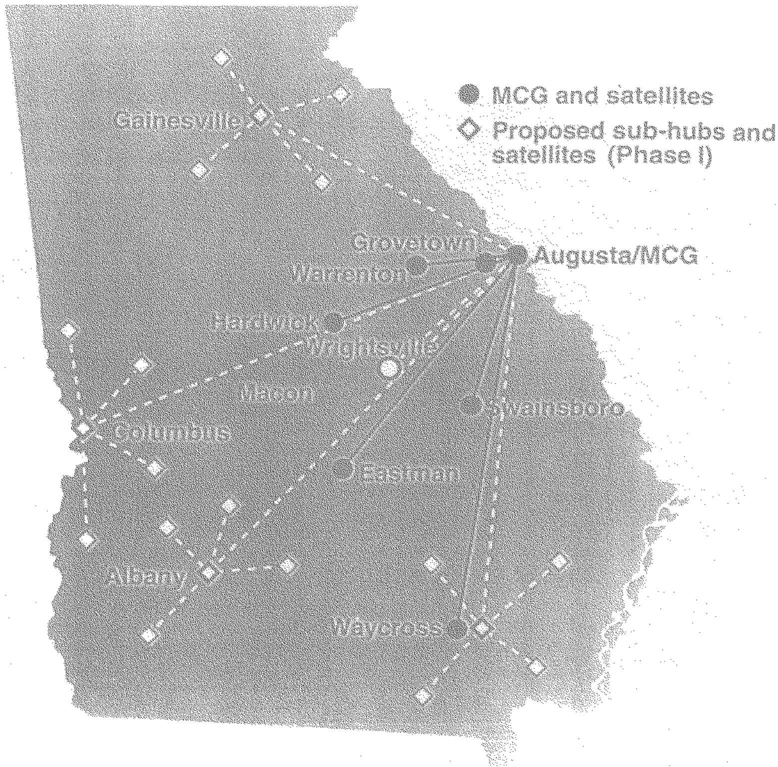
Regionalized Telemedicine Health-Care Delivery System (Existing)



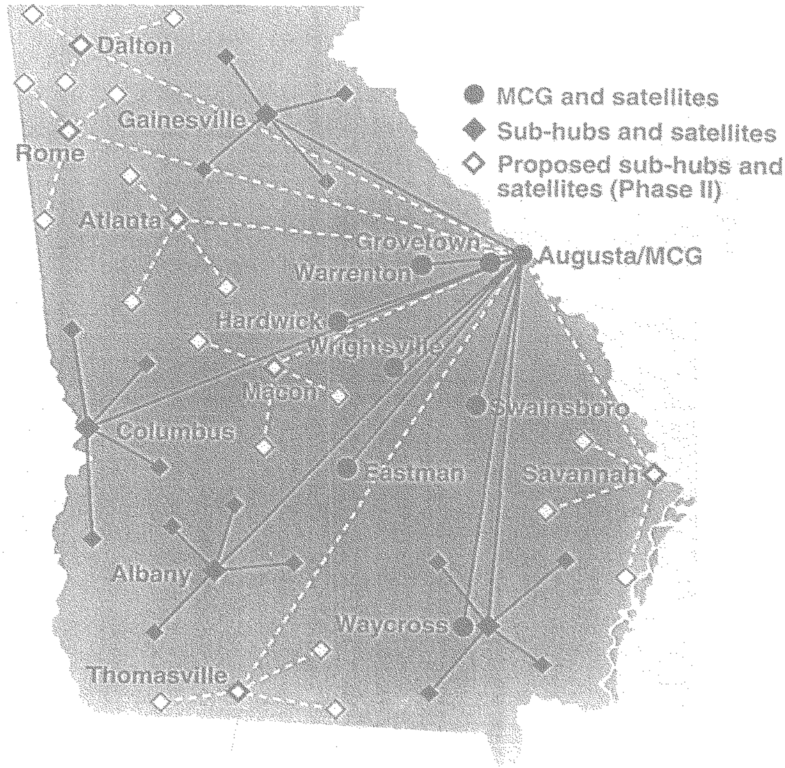
MCG Telemedicine Network



Proposed Regionalized Telemedicine Health-Care Delivery System (Phase I)



Proposed Regionalized Telemedicine Health-Care Delivery System (Phase II)



Center for
Public Service
Communications

(703) 528-0801 • Fax (703) 528-0802 • Telex 650-437-2154
1600 Wilson Boulevard, Suite 500, Arlington, Virginia 22209, USA

Neal Neuberger Testimony
before the
House Veterans Affairs
Subcommittee on Oversight and Investigations
"VA Health Care and Communication and Information Technologies"
Wednesday, July 20, 1994
Room 334, Cannon House Office Building

Chairman Evans, members of the Committee, my name is Neal Neuberger and I am Senior Partner at the Center for Public Service Communications, an Arlington based consulting firm established in 1990 to support educational, scientific, health and humanitarian organizations apply new communications and information technologies to their programs. At CPSC, we are primarily concerned about public sector applications of emerging technologies. Much of our work involves assisting U.S. government agencies and international organizations by providing program support and technical expertise to clients including NASA, various agencies of the United Nations, and the Agency for International Development.

Interest in issues and projects in telemedicine and health care informatics is growing at a tremendous rate. After a long gestation period, there is now a heightened and growing awareness that communications and information technologies can be valuable tools in the organization, delivery and financial management of health care services. The implications of this are becoming more clear as debate ensues on two of the major national domestic initiatives -- Health Care Reform and the National Information Infrastructure.

Over the past 20 years, there have been numerous demonstrations applying data, audio, and video technologies in both acute and chronic care settings. To date, clinical specialists and academic health centers supported by the high-end technologies of the telecommunications industry have lead the way in health care applications. Examples include uses in rehabilitation medicine, reconstructive surgery, burn management, psychiatry, sanitation and epidemiology, preventative medicine, and post-traumatic stress therapy. Even so, telemedical applications have typically been of short duration, and without sufficient validation to overcome the skepticism of a cautious and often conservative healthcare community. In large part this is why telecommunications and information technologies have not yet found their way into routine practice on a wide scale.

Accomplishing management savings while maintaining accepted community standards of care will be of significant interest to health care administrators and payers including corporate benefits managers, insurers, and patients. Intermountain Health Care of Utah has, for example, projected that the application of telecommunications technologies to the delivery of health care will lead to "increased specialty consultation, more appropriate selection of diagnostic studies and procedures, more appropriate choice and execution of therapeutic management plans, fewer unnecessary patient transfers, more timely necessary transfers of patients to higher levels of care, reduction of complications, and improved patient outcomes."

These are only some of the more visible benefits. Community health, home care, and the economic and social benefits of health care alliances within communities should also be part of these efforts, yet these beneficiaries currently have a smaller voice and have yet to be substantively included. In the long run, success will depend upon community alliances of users -- e.g education, agriculture, economic development, and health -- because installation and upkeep of new information infrastructure will require a broad base of public sector users.

INTEREST ON THE PART OF GOVERNMENT IS SIGNIFICANT

More than a dozen federal agencies presently have responsibilities with regard to this emerging field. Each brings to the debate a particular orientation, point of view, or unique approach to these often complicated technical and medical issues. Department of Agriculture approaches telemedicine as a public utility; the Department of Commerce is concerned with technology development and related commerce, public telecommunications programs, and radio spectrum allocations; the Department of Defense is interested in field support operations, military medicine, and patient records; NASA develops and tests technology and provides remote health care on space missions; the Department of Health and Human Services approaches telemedicine and information technology from a public health, policy and financing perspective; and the Department of Veteran's Affairs has responsibility for veteran's health care and records.

Many agencies have significant grant or other available funding programs. Others, including DVA conduct important intramural research which stands to substantially benefit the particular constituencies they serve. By extension, their efforts should also significantly impact on emerging health care delivery systems throughout the nation. In addition, many legislators at both a state and federal level have undertaken projects including committee-sponsored demonstrations and the introduction of bills to encourage further system development. Moreover, advances in the field are occurring throughout the United States and in other countries at an steady rate as a result of the initiative of academic health centers, private hospitals, and community health organizations.

Increasingly the Center for Public Service Communications has been called upon to assist policy makers interested in sorting through the many pending issues pertaining to the intersect between health care reforms and establishment of a national information infrastructure:

o Many individual Members of Congress have been increasingly interested in developing a strategy for approaching telemedicine policy issues at a federal level in the context of the health care reform and NII debates. In September of 1993, Senator Kent Conrad (D-ND) asked CPSC to work with his office in assembling key parties for a series of informal meetings to begin the process of building a consensus approach to identifying these issues. The Senate/House Ad Hoc Steering Committee on Telemedicine has been active under the leadership of Senators Conrad, Rockefeller, and Representatives LaRocco and Synar. Among other things, CPSC helped the steering committee convene a well attended series of informational "brown bag" lunches on the hill in April for members and staff concerning "Federal Agency Programs and Activities", "Applications in Health Care", and "State and Federal Policy Issues and Barriers to Implementation".

- As Chairman of the Administration's Information Infrastructure Task Force, Commerce Secretary Ron Brown asked AT&T to help organize a major health care demonstration and round table discussion of the economic benefits to be derived in the area of health care and the NII. Working with AT&T, area health care institutions and other corporate partners, CPSC helped stage a live interactive program in late May to demonstrate applications for clinical care, non-clinical public health services, and management of health care information. The event was used as the part of the "kickoff" to the Administration's draft position papers in seven different NII applications areas.

- CPSC is presently supporting Dr. John Silva in his role as Chairman of the Health Information and Applications Working Group of the Information Infrastructure Task Force Committee on Applications and Technology, helping to convene a major invitational consensus conference on August 8-9 entitled "Working Conference on Telemedicine Policy for the NII". The conference's objective is to gain an understanding of the priority actions which should be taken by Congress, the Administration, industry and user communities towards maximizing opportunities for improving health care through the NII. The Department of Veteran's Affairs Washington Information Systems Center has been integrally involved in the planning of this event and Dr. Ruth Dayhoff of the Center will be one of the major participants.

- As a pioneer in the field of Telemedicine, NASA has ongoing interests in keeping abreast of the many recent developments, and also in helping to disseminate information in pursuit of better collaboration between interested parties. In addition to our responsibilities of helping NASA to establish an a telemedicine demonstration project -- "Space Bridge to Moscow" which linked four major U.S. teaching hospitals to counterparts in Moscow -- we have been responsible for the design, compilation and maintenance of a *Tracking Document of Projects in Telemedicine and Information Technologies*. Tracking document categories include: Major Existing Federal Grant and Other Assistance Programs and Activities; Legislation Effecting Telemedicine and Health Care Informatics Policy at a Federal Level; An Overview of Projects Using Various Technologies Throughout the United States; Applications in Home Health Care; Wide Area Health Care Educational Programming; and Projects in Other Nations. This information is expected to be of particular use to NASA in testing and evaluating technologies and clinical protocols for responding to medical crises on shuttle and space station missions.

Information contained in the Project Tracking Document is also of growing interest to policy makers, telemedicine providers, health services researchers, industry representatives and potential end users. Over time, we would hope that NASA's interest in the establishment of this core document might serve as the impetus for other nascent efforts to establish a more coordinated approach to the collection and dissemination of information in a number of related areas. Mr. Chairman, I have provided copies of the project tracking document and ask that it be entered into the record.

To continue, I would simply like to outline just a few of the many wide ranging activities and projects being undertaken by various government and the private sector organizations in the field of telemedicine and health care informatics. A more complete description of these may be found in the project tracking document. Then I would like to highlight just a few of the overarching principles which we believe should be embodied in any further policy, and conclude by make just a few recommendations for further legislation.

AN SHORT SURVEY OF U.S. GOVERNMENT AND MAJOR PRIVATE SECTOR INITIATIVES

In order to give the Committee an appreciation of the range of Telemedicine and health care informatics activities underway, I would like to list just a few the many projects which we routinely track:

Agency Activities

Information Infrastructure Task Force -- comprised of representatives of several different federal agencies and chaired by Secretary Brown, the IITF contains a working group on health care headed by Dr. John Silva, Program Manager at ARPA. The Task Force released a major draft report for public comment on May 3, 1994 entitled "Putting the Information Infrastructure to Work". The health working group is sponsoring a major invitational consensus conference on the policy issues regarding telemedicine on August 8-9, 1994.

High Performance Computing and Communications -- The Administration's HPCC program consists of 10 federal agencies providing basic research and technological implementation to support NII initiatives. A number of additional agencies have observer status. With over $1 billion appropriated in FY 1994 to the HPCC effort, ARPA, NASA, and NIH are some of the larger participating agencies. The National Library of Medicine through Dr. Lindberg serves as the focal point for HPCC efforts. Over the past three years, NLM has awarded $30 million for testbed projects under its "Healthcare Applications of High Performance Computing and Communications" program.

Rural Electric Administration -- Under a $10 million FY 1994 Congressional appropriation, REA awarded 28 grants to educational and medical organizations in 26 states under its "Distance Learning and Medical Links Grants" program late last year.

DHHS Office of Rural Health Policy -- ORHP is presently in its review cycle for the award of $4 million in program grants which will focus on systems development in rural areas, and evaluation of the costs and benefits to be derived from telemedicine projects. Additional telemedicine related grants may become available through ORHP's "Rural Outreach Grant Program".

DHHS Office of Disease Prevention and Health Promotion -- Has undertaken its "New Media Projects" group within the National Health Information Center to explore a range of information exchange options for access to information by public health and health communication intermediaries. ODPHP is looking at innovative communication and multimedia technologies for health promotion and disease prevention. Together with the National Library of Medicine, ODPHP has sponsored a unique "Community Services Workstation", a client centered computer based system designed to serve as one stop shopping for health and human services.

DHHS Health Care Financing Administration -- is interested in pursuing a number of efforts to determine appropriate payment policies with respect to telemedicine services as a substitute for face to face interactions between practioners and patients. $5 million has been appropriated for studies this year.

National Telecommunications and Information Administration -- Has $26 million in FY 1994 for a variety of applications including those in health care. A review process is currently underway to determine the best applicants from among over 1,088 applications from 50 states totaling $556 million in requests for assistance.

Advanced Research Projects Agency -- Recently announced two programs: The "Advanced Biomedical Technology Program" and the "Clinical Associate Software System". Several interesting dual use research projects are underway, the results of which should benefit the state of the art of both battlefield medicine and civilian trauma and other care.

United States Air Force, Army and Navy -- Are each involved various remote linkages and demonstrations involving their respective facilities throughout the world.

Department of Veteran's Affairs -- has funded a number of studies over the years using commercially installed systems. In addition, DVA has developed several "in-house" capabilities which, using their own communications infrastructure, allow them to link up 171 medical centers throughout the system. The VA's Decentralized Hospital Computer Program may now be used to handle new data types including imaging. The system is unique because of the variety of data it may handle including admissions, pharmacy, lab, health care summaries, engineering, purchasing and finance. Baltimore VA Medical Center has purchased a commercial PACS radiology system which will be operating in a filmeless mode. The system will interface with DHCP to allow display of images on workstations throughout the hospital at a cost of approximately $900,000. The Committee will hear much more today about these and other related DVA capabilities.

Legislation

CPSC has identified nearly 20 bills which at least touch on the subject of Telemedicine and/or health care informatics. Some would provide improved access to services via telemedicine for rural areas of the nation, while others deal with pending issues of standards and privacy of individually identifiable health care information or data. Still others relate more to communications requirements in terms of NII development. Several pending measures would provide additional grant assistance for telemedicine demonstrations and evaluations, or require increased interagency coordination visa vis the establishment of task forces or high level commissions.

To mention just a few:

- HR 3070 -- by Rep LaRocco would establish three grant programs to encourage the development of telemedicine networks in rural areas.

- HR 4077 -- by Rep. Condit would establish uniform federal rules governing the treatment of individually identifiable health information.

- o Representative Schroeder has circulated a discussion draft of legislation which would create a Presidential Commission on Telemedicine.

- o S. 4 -- by Senator Hollings et al would significantly bolster appropriations to the National Library of Medicine to foster testbed networks for hospitals, software and visualization technology for visualizing the human anatomy, virtual reality technology, collaborative technologies for remote treatment of patients, and database technology to improve patient records.

- o S. 1775 -- by Senator Conrad (incorporated into the Senate Finance Committee report on Health Care Reform) would provide an additional $20 million for demonstration projects to promote telemedicine in rural areas and create a federal interagency task force.

- o S. 1779 -- by Senator Wofford (incorporated in large part into the Senate Labor Committee report on Health Care Reform) would establish a national health care data network and requirements with respect to privacy of medical records.

In addition to these and other bills, there have been a number of useful hearings and telemedicine demonstrations on the hill in recent months. While many of the pending bills touch on some important areas for consideration, CPSC would simply note the absence of an overall encompassing consensus measure, one which attempts to incorporate the many disparate yet important issues relating to issues like community and practioner acceptability, liability, financing of services, licensure of practioners across state lines, evaluation of telemedicine efforts, ubiquitousness and scaleability of telemedicine and related services, standards, dissemination of telemedicine efforts into underserved rural and urban areas, etc.

Private Sector Projects

Projects at academic health centers predominate in the field of telemedicine. The Medical College of Georgia which is represented today is among the leaders. In addition to projects at teaching institutions, several research and other consortia are being formed to further explore many of the technology, health care policy and other issues which must be addressed. Over time, public-private partnerships which center on combined uses of the available technologies will allow needed services to become available in areas which otherwise could not support the necessary infrastructure.

Here is a sample of some of the private sector efforts underway:

- o San Diego State University -- is performing a feasibility study to determine how transportation issues in California will be affected by the use of information infrastructure for health care. Among other things, can the use of telemedicine help reduce California's transportation problems?

- o Washington University School of Medicine is working with Kodak, IBM, Southwestern Bell and BJC Health System to develop and implement an integrated information system and high-speed digital telecommunications network for 18 BJC hospital sites in Missouri and Southern Illinois.

- University of South Carolina is working with several corporate partners including Bell South, and GTE to conduct a telemedicine demonstration which examines the value and cost-effectiveness of telemedicine implementation and maintenance in the Midlands area.

- The Clinical Telemedicine Cooperative Group which represents several telemedicine projects nationwide, has formed to pool data from many projects with the goal of measuring utility and cost-effectiveness of telemedicine interventions.

- Voluntary Hospitals of America is using compressed video extensively for various applications among its regional health care systems and divisions for administrative and management purposes. VHA also plans to help extend medical services to rural communities served by its members and to provide services to community groups.

- The Working Group on Electronic Data Interchange, a consortia of major health care insurers, providers and government representatives has issued a study which projects that more than $42 billion could be saved by the year 2000 through the adoption of Electronic Data Interchange standards and implementation of related technologies. WEDI has sponsored several demonstration projects to test different transaction standards.

OVERARCHING PRINCIPLES IN CONSIDERATION OF POLICY DEVELOPMENT

Following are several general principles which we believe are essential to the health care communications and information technologies policy development process:

"It's the application, stupid"

To turn a phrase used by President Clinton during his campaign, we should think of the imperative "It's the application, stupid!" As important as the National Infirmation Infrastructure initiative is to health care, its development and implementation must be in support of well-conceived applications. Participants to the process of defining these applications must include, in an organic way, providers, consumers, and payers. The challenge in applying information technology to health care is not only a question of the suitability or availability of the technology itself. There is an equally important challenge to develop the relationships among the users to ensure a broad base of support.

Technology shouldn't be legislated

Technologies and delivery modes should not be legislated, and NII should not be seen as a means to promote one particular mode of delivery over another. Funding should be available to enable the health care providers to select connectivity commercially and competitively, and not be limited to partnering with companies who will fund access based on government support.

Broad spectrum of service

NII should be seen -- and promoted -- as being inclusive of an entire spectrum of services and not just the "high end." With respect to health care, this means supporting broad-based social service applications that may only be phone-based as well as high definition clinical diagnosis and consultation. Government must give the signal that it encourages new adaptations of available technology as well as promoting the pioneering of new technology.

A level playing field

Work to provide a "level field" on which health providers can develop and test applications appropriate to their needs. Where possible, we must adopt standards in areas where agreement already exists. Where standards have not been determined, government should further the process by looking to, and supporting, industry (health care and technology) for standards development. One way government could facilitate standards development is to jointly fund clinical trials of sufficient magnitude as to made determinations of efficacy. These trials should include multiple sites and multiple health care disciplines. Once agreed upon, government should then demonstrate its support for standards by adopting them, for example as a part of its own purchasing procedures.

Continued support for testbed experimentation and transfer of experience

How can health providers -- particularly those in rural and other underserved areas of the United States where local resources are frequently strained to manage even the most basic of social and economic development programs -- afford the cost of testing and evaluating technologies whose application may offer revolutionary ways to deliver and manage vital services to their communities and improve their condition? One answer is to cooperate with states to make available planning resources (for example through the NTIA grants program) that will permit experimentation -- before costly commitment to purchase -- with technologies and modes of access between and among the appropriate service providers within communities. And, further, government can help ensure that the benefits of experimentation are shared broadly

Communities involvement

Government can facilitate collaboration between Industry and health care providers (representing a variety of disciplines and communities) in the design and development of government-funded programs so that 1) these programs accurately reflect community needs and 2) so that "users," or "participants" -- having been part of the process -- are receptive to applications of information technologies.

PROPOSED LEGISLATIVE PROVISIONS

The following proposed legislative provisions would create an framework for an overarching national policy to accelerate the benefits which may realized through the application of telemedicine and information technologies for health care. The above general principles and approach would be included in these recommendations:

- **Applied Research Centers**

Applied Research Centers would be established in each DHHS region to conduct basic scientific, health policy and applications research in the field of telecommunications and health care delivery, management, and financing. Implementation of each Centers' activities would be collaborative, involving major interested constituencies in the public and private sectors. The primary focus for each center would be non-proprietary projects designed to advance the overall availability of interoperable community-wide networks for various health care services, including management and transmission of patient information, electronic claims processing, inventory control, training and continuing medical education, disease prevention, community and consumer health promotion, and clinical diagnostics and consultation.

Telecommunications and information management projects would be considered which have been designed to achieve the overall goal of improving access to health care services in an more affordable, cost effective and quality manner than is presently available in many areas.

- **Regional Health Care Information Technology Coalitions**

Regional Health Care Information Technology Coalitions would be established consisting of representatives of state and local governments, telecommunications and information technology, equipment manufacturers and service providers, health care provider organizations, purchasing groups, health plans, and consumers. Using data and information gathered through projects of the Applied Research Centers, the Regional Coalitions would help examine the full range of services available to ensure that public service interests are adequately represented throughout the systems development process.

Coalitions would work to determine a basic level of services in each region to become ubiquitously available. Services might include electronic access to and management of complete patient medical records information; improved storage and distribution of aggregated health care data for comparative and other research uses; and transmission of audio, data, and diagnostic images for clinical consultations and exchanges. The Coalitions would also facilitate the development and testing of advanced health information technologies, and provide opportunities for small businesses and community users to access shared testbed platforms. Finally, Coalitions would serve as advocates of local interests before the federal Information Infrastructure Task Focre.

- **Interagency Cooperation on Health Care Technology**

Building on the work of the Information Infrastructure Task Force Subcommittee on Applications, it should be possible to significantly boost the level of interagency cooperation which now exists. Additional resources might be devoted to help coordinate federal grant and other agency activities; receive input from the Regional Coalitions and Applied Research Centers; and help set out a national agenda for the implementation of the National Information Infrastructure as it relates to Health Care Policy Reforms.

In a more formalized structure, the IITF might serve as a coordinator of Regional Coalition activities, and also as the lead organization for the management of a clearinghouse of local evaluative results in consideration of reimbursement, licensure, standardization and other federal policy issues. In this fashion, each of the appropriate federal agencies would continue to play an important role based on their particular orientation and expertise. Both the Task Force and the Regional Coalitions would be supported by appropriate governmental or private sector staff as needed.

HOW DO WE GET THERE ?

Telemedicine is an issue whose time has come. The level of interest in the field is growing daily. As a practical matter, better use of existing and new communications technologies is not a luxury but a requirement of improved health care service delivery in a "systems" environment. With or without further Congressional action on health care reform or the NII initiative, the communications and health care industries are forging ahead forming new alliances. Government could be an important catalyst for the changes which are already taking place. From a public policy point of view, the question becomes how will the public's interest best be served? As a major purchaser and provider of services, government should also want to pay close attention to developments in the private sector. Conversely, non-government health care systems have much to learn from the projects and programs of the DVA and other government health systems.

The need to further coordinate the efforts of the federal agencies is clear. Many department leaders are largely unaware of the independent, but not unrelated, activities of their counterparts within government. The framework for such coordination may already exist within the White House Information Infrastructure Task Force and its Committee on Applications. Within Congress there is also clear need for coordination and leadership.

Even as these steps are being taken, there is a need to encourage and support communities as they determine desired destinations on the super highway of the future, and to ensure that the technologies and delivery systems that shuttle communications to and from these destinations are developed to serve the needs identified by the health care and other user industries.

Equipment manufacturers and service providers are already in the process of developing new markets. Without the immediate and active participation of the user communities in systems planning, the degree to which the "hardware" will be appropriate and useful will depend heavily (possibly too heavily) on the accuracy of assessments made by technology interests. Further, mechanisms for recovering costs of capital investment and payment for services that use these technologies must be identified and sanctioned by appropriate local, state and national administrative bodies before infrastructure commitments are made.

In the meantime, widespread application of information technologies on the part of an increasingly competitive health system will require evidence that use of these technologies and delivery systems is effective as measured by standards that are universally accepted.

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STATEMENT OF
KAREN WALENGA, RN
ASSOCIATE CHIEF, NURSING SERVICE, EXTENDED CARE
DEPARTMENT OF VETERANS AFFAIRS
CARL T. HAYDEN VA MEDICAL CENTER
PHOENIX, ARIZONA
BEFORE THE
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
HOUSE COMMITTEE ON VETERANS' AFFAIRS

VA USE OF EMPLOYEES AS VOLUNTEERS IN PROVIDING CARE TO VETERANS
JULY 20, 1994

Mr. Chairman and members of the Committee,

Thank you for the opportunity to appear before you today to present testimony on and demonstrate how the Department of Veterans Affairs (VA) is using employees to care for our veteran patients.

In the Spring of 1989, the 120 bed nursing home care unit of the Veterans' Medical Center, Phoenix, AZ., experienced an acute rise in patients requiring total nursing care. Along with multiple other functional losses, 25% of the population required total feeding with another 50% needing tray preparation and encouragement to self feed. Managerial attempts to handle the increased demand through, a) staggering of tray delivery times; b) alteration of work schedules to concentrate staff at meal time and c) attempts to recruit individuals through Volunteer Service brought insufficient relief with individual nursing staff still trying to manage the feeding of three or four patients at mealtime. Due to time constraints and numbers of patients it was distressing to note that the staff began grouping patients and hurrying between them with little social interaction occurring. Functionally impaired, but otherwise cogitatively intact patients were acutely aware of the dilemma and felt a need to hurry at mealtime. The obvious solution, more staff, was not possible due to the reality of fiscal constraints.

The idea for the "Breakfast Club" was born one hectic noon meal in June 1989. As supervisor for the nursing home care unit, I found myself simultaneously resolving a priority issue with an employee from another department while assisting patients with meal set-up and feeding. While engaged in conversation, fueled by the frustration of the moment, I spontaneously asked the individual to pick up a spoon and help the patient next to him. His response, sparked the idea. Hesitant at first, he picked up the spoon and then stated, "I had no idea that you needed this kind of help...it really isn't so hard to do....maybe I could help again sometime." Idea: why not ask medical center employees to volunteer some time before work, or after work to help feed nursing home patients? Caring, motivated people exist in every organization particularly health care facilities. Many volunteer in multiple community agencies. Could we tap into this resource and encourage employees to volunteer "on site"?

The answer was "Yes" growing from a small nucleus of eleven employees to ninety within the first year. The phenomenal response to the program is attributed to the following actions taken prior to and during the initiation of the program:

a) Gain Top Management Support - Explanation of need resulted in commitment of Volunteer Service and Medical Media support along with personal involvement of the Medical Center Director and Chief of Staff in the feeding program.

b) Publicity - Getting the word out to employees - adopted a Breakfast Club logo, locally designed, with Medical Center recognition. Flyers, posters, badges, CCTV, newsletters, staff meetings, and word-of-mouth were utilized to recruit participants.

c) Start Small - Asked employees to volunteer one hour, once a month, to feed a nursing home patient.

d) Recruited Volunteer Coordinator - Probable secret to volume of participation and longevity of program. Individual knows patients, staff and volunteers. Coordinator facilitates scheduling, personal preferences, provides positive reinforcement to participants, problem solves, and maintains lines of communication.

e) Nursing Staff Support - Nurses welcome volunteers, are available for questions, and are appreciative of volunteer effort.

f) Flexibility - Program open to suggestions from volunteers. If individuals felt complete feeding was overwhelming, help by preparing trays, socializing during meals. Incorporated talents brought and then offered by employees in other areas - walking patients, visitation, gardening, hair dressing. This increased personal ownership in program.

g) Recognition - In order to recognize "Volunteer" employees and increase staff awareness buttons with "Breakfast Club" logo are worn by participants. An annual breakfast and certificates of appreciation builds morale. Medical Center employee awareness of contributions of individual volunteers fostered through pictures and personal accounts in medical center newsletter.

Publicity and top management personal commitment lead to interest and curiosity from various veteran service organizations. Discussion with these organizations resulted in them providing "hands on" help at the noon and evening meal where employee volunteerism was low. As a result the "Let's Do Lunch" bunch and "Guess Who's Coming to Dinner" volunteers were established.

The costs of the employee feeding time have been minimal in comparison to its benefits. Purchasing lapel buttons and an annual recognition ceremony are the monetary costs. The patients in the nursing home care unit reap multiple psychosocial and quality of life benefits. Their otherwise closed community is opened up to a variety of volunteers who provide service, friendship, caring and a tie to the outside community. Mealtime becomes "special" with increased socialization, and food intake; sometimes accompanied by decreased confusion and increased desire for personal grooming. The mingling of employee/patient in a personal bond increases patient satisfaction and may result in a more inspired, informed and involved workplace.

Disciples of the highly successful patient/staff volunteer program at the Phoenix VA Medical Center exported the idea to other VA's and private sector agencies. Through national telephone hotlines, participation in national/local workshops and poster presentations the work spread. Approximately, fifty VA's to date have requested information in order to institute their own employee volunteer program.

You've seen the movie...

...now join the cast

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Casting Director Karen Walenga now taking appointments at ext. 7778/B#396

Volunteer your time for one short hour a month to help feed some of our Nursing Home residents (staff–assisted)...

...You'll both feel better for it!

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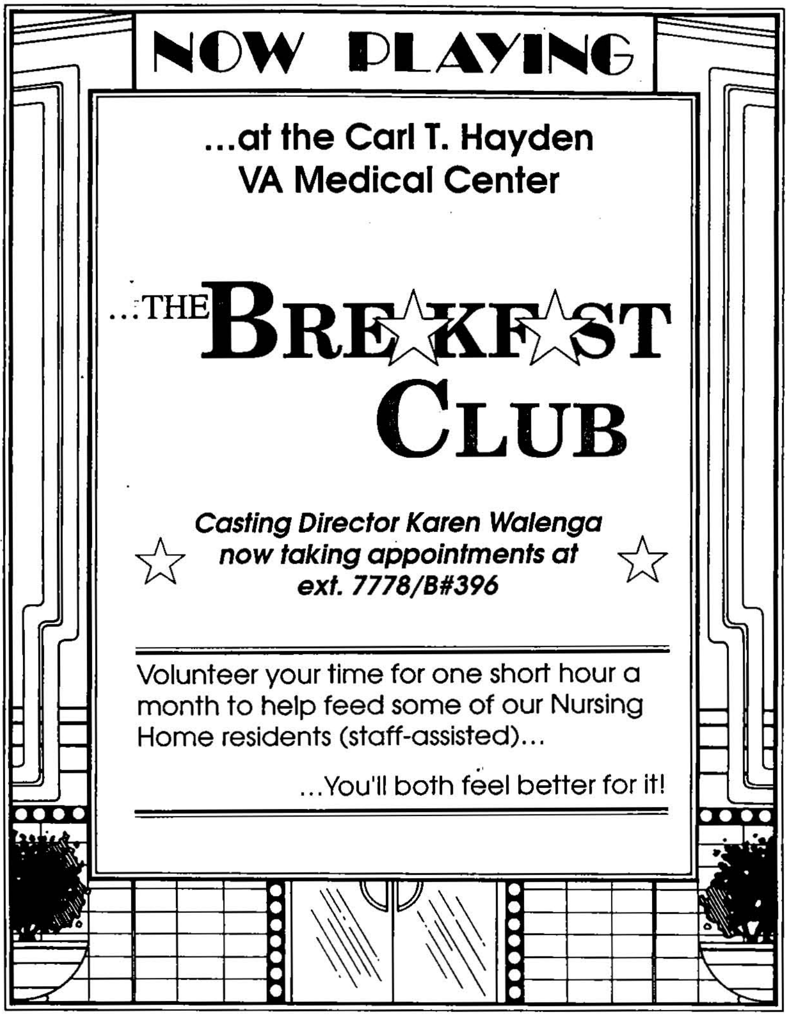
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QUESTIONS SUBMITTED BY
SUBCOMMITTEE ON OVERSIGHT & INVESTIGATIONS
COMMITTEE ON VETERANS' AFFAIRS

VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES

JULY 20, 1994

QUESTIONS FOR DR. KOLODNER
DIRECTOR
MEDICAL INFORMATION RESOURCES MANAGEMENT OFFICE
VETERANS HEALTH ADMINISTRATION
DEPARTMENT OF VETERANS AFFAIRS

1. Traditionally VA has provided hospital-based specialty care. How can VA use telemedicine to improve veteran access to primary care and help VA succeed in a competitive health care environment?

Answer: VA is using and testing a broad range of telemedicine technologies to improve veterans access to primary care. The use of telemedicine has greatly increased the availability of clinical information at the time of treatment. This expansion of the provider's information base reduces the number of repeat studies required for referral patients, adds greatly to the comfort of the patient, reduces costs, and improves timeliness. Patients seeking care at a different VA facility can now be sure their doctors have rapid access to all the information necessary to provide quality care. Patients with atypical or complex cases can obtain the services of the best medical specialists in the field, even if they live in rural and underserved areas. Telemedicine technology even allows health care providers to go into the patients' homes, something the Department of Veterans Affairs (VA) has been doing with Cardiac Pacemaker monitoring for over ten years.

Telemedicine experience is one of the competitive advantages VA brings to health care reform. The future under health care reform will be in integrated health care delivery networks, which cover the entire continuum of care from in-home services to tertiary care. VA has begun the process of creating networks to exchange health care information among VA facilities and other providers.

As VA continues to evolve into a managed care organization, telemedicine technologies will support the efficient delivery of high quality primary care and the full continuum of care, from medical centers, and outpatient clinics through long-term facilities and community care, and veterans health plans. Using telemedicine over VA's national and local networks, VA will be able to assemble treatment teams of health care professionals from a variety of disciplines to support primary care providers, without regard to patient or provider location. Patients will have easy access to specialty tests and treatment available at any location within the VA system and affiliates. This will significantly reduce patient travel time and expenses incurred by repeat tests and travel to obtain specialty tests and treatment.

2. A well-established network of healthcare providers and facilities, VA is already well suited to use and test telemedicine applications. What is needed for VA to take full advantage of its unique structure as a test-bed?

Answer: As VA continues progress toward the development and use of telemedicine technologies, several challenges have been identified.

The first issue is broader than VA. Standards for connecting different systems must be developed and used throughout the industry. Without standards and integrated networks, hospitals will divide into smaller groups that can teleconsult with each other, but not with those outside their particular group. In turn, each group must be dependent on the vendor of their unique system, and patients would not benefit from the wider availability of medical specialists and care.

VA is exploring ways to participate with federal and non-federal agencies and the private sector, in collaborative telemedicine efforts where joint funding is advancing the development of both technologies and applications. We are currently addressing federal procurement issues that will more easily enable VA to participate.

In addition to innovations underway, VA is actively moving to participate in telemedicine efforts in West Virginia, and Washington. VA is discussing the cooperative use of telemedicine with the Department of Defense (DoD) and the Indian Health Service. VA provides an excellent professional environment with an existing infrastructure of staff and computer capability. Telemedicine will, in all likelihood, evolve as one of the basic information systems of the patient care infrastructure, speeding the usability of the national information infrastructure for health care delivery.

3. How have the general population and non-veteran patients benefited from VA telemedicine innovations and leadership?

   What reimbursement does VA receive from non-VA facilities for their use of VA telemedicine innovations?

Answer: Over 104 medical and dental schools are affiliated with VA. Additionally, just over 50 percent of the licensed medical community rotate through a VA medical center at some point in their clinical training. As VA continues to offer practical experience and leadership in the use of emerging telemedicine technologies, this will further enhance the skills and knowledge of health care providers in preparation for practice within and outside of VA.

VA telemedicine activities such as our pacemaker surveillance centers, provide a centralized database of failure rates for any pacemaker model. These rates are compiled, published and available upon request to health care providers within and outside of VA. These data provide quality control measures in the form of an early warning system. VA notifies the manufacturer of a particular model in the event of poor performance.

At the VA Medical Center in Baltimore, Maryland, a link was installed by VA between a commercial radiology imaging system and VA's hospital information system (DHCP). This is the first link in the world that uses health care standards to exchange text and medical image information between a hospital information system, and a Picture Archiving and Computing System (PACS). This marks the first time these system standards have been mapped to each other. This link overcomes a major obstacle to telemedicine information exchange on the information superhighway, and provides a model for non-VA sites to follow.

VA is involved in collaborative projects with agencies and organizations outside of the federal sector. These include many local initiatives with affiliated medical schools; West Virginia Consult; the state of Washington; Germany; and the National Cancer Institute in Cairo, Egypt. VA is in the initial stages of connection with the West Virginia Mountaineer Doctors Television program. This is a two-way interactive audio and video network that links rural hospitals to a hub site for telemedicine and educational purposes.

Additionally, VA is working with the Department of Defense (DoD) to create a common connection between our respective health care information systems and those offered commercially. We are developing plans to provide a link between VA Medical Center American Lake, Washington, and the DoD Medical Digital Imaging System at Madigan Army Medical Center, Washington. DoD has contracted with VA to supply a copy of the VA link at all of DoD's Medical Digital Imaging System sites.

VA developed software is in the public domain and available under the Freedom of Information Act. VA software is used in derivative form by the Department of Defense, Federal Bureau of Prisons, Indian Health Service, state hospitals in Idaho and Washington, and private hospitals worldwide. VA public domain software is available free-of-charge to all government agencies. All other requesters are charged for the reproduction costs.

VA receives reimbursements from non-VA facilities for use of VA telemedicine innovations under sharing agreements negotiated between the parties. Additionally, VA continues to participate in the exchange of technology with non-VA facilities, and has served as a test bed for the development of public domain and commercial software.

4. What has VA learned from its past experience with telemedicine and telemedicine demonstration projects?

Answer: Ongoing telemedicine projects are providing VA with experience that will help integrate these technologies into the clinical, administrative, and educational processes of health care delivery. Technologies being tested include image teleconsultation via the VA's electronic mail network, voice response systems, and video-teleconferencing between selected sites. Telemedicine includes a variety of technical options with widely varying costs. Based on pilot tests, the VA will be able to match technology to the needs of health care providers and patients to obtain the most cost-effective solutions.

From the experience of our national Pacemaker Surveillance Center, we find that telemedicine allows a personal "visit" to be provided in a very short period of time, saving travel time and energy for the veteran. Very importantly, telemedicine can shorten the time between the onset of a patient's symptoms and the time that the patient contacts the health care system. This may be critical to the patient's well-being. Telemedicine is used very successfully to reach out to patients by providing preventive care in the patient's home. Patients actively participate in their own care with a small amount of training. Patient's become very comfortable with their telephone care providers who use automated medical records to enhance continuity of care.

VA's imaging system has been found extremely valuable at the Washington and Baltimore VA Medical Centers and is now expanding to additional sites. The system is used extensively during clinical conferences and has increased communication between medical center clinicians. Experience sending electronic mail containing images between sites is in its early stages. This technology offers the advantage that the sender and receiver do not need to be present at the same time for a consultation. Diagnostic quality images can be sent between sites to allow sharing of medical specialists during off-hours coverage.

From our pilot videoteleconferencing sites in Florida, South Carolina, and Minnesota, we have found that telemedicine is not just a new technology, but a new approach to patient care. Both patient and physician have expectations about the nature of a doctor's visit and it is difficult to change the setting and procedures without thorough discussion. The most immediate telemedicine benefit for patients is access to providers that they could not otherwise see, at least not without travel, delays, and possible inconvenience. Some medical disciplines are more able to use the technology than others. Technology puts some scheduling demands on the health care environment when both consultant and referring provider must participate.

In all pilot projects, it has been very important to involve the clinical staff from the beginning. VA has learned that incorporation of a telemedicine encounter into the patient's electronic medical record is an important element of the process. The presence of the patient's record during a teleconsultation is more important than during a face-to-face visit. The teleconsultation record must include multimedia data, such as electrocardiograms, medical images, and audio files. The ability for the telemedicine care providers to communicate with local providers is critical in allowing continuous care at the veteran's local medical center. In some pilot projects, the telecommunications infrastructure has been a major source of government procurement difficulties and reliability problems. It is clear from the pilot studies that the installation of incompatible systems today will cause major problems in the future, and standards within the industry should be a major area for national attention.

5. How can telemedicine be used to improve VA access to the service medical records of former service members? Describe current initiatives to improve VA access to the service medical records of former service members.

Answer: The Veterans Benefits Administration is working with the Department of Defense (DoD) to obtain service-connected records electronically from DoD systems in minutes versus weeks or months. These records are of former service members seeking compensation, and or medical treatment at VA facilities.

There are several ongoing discussions concerning sharing medical records electronically, separate network security, privacy, and establishing a VA presence at the DoD Integration and Interoperability (I&I) Laboratory. VA/DoD joint venture sites are addressing the issues of security, and privacy. For example, VA and the Air Force developed a Proof of Concept platform that will enable all joint venture sites to roll-up select extracted patient data from VA and DoD medical information systems into a single patient movement request for transmission to the TRANSCOM Regulating and Command Control Evacuation System. This will provide for a peace time patient request, i.e., DoD discharging a service person to a VA facility.

6. What are the advantages and disadvantages of VA becoming a full member of the Interagency High Performance Computing and Communications Initiative? When does VA plan to seek full membership status?

Answer: As a member of the High Performance Computing and Communications (HPCC) Initiative, VA will be in a position to make significant contributions to the HPCC program particularly in the areas of clinical applications, wide area networks linking hospitals and clinics, remote systems access, filmless x-ray technology, electronic transfer of key clinical data and imagery, and testing of advanced technologies. This will be an opportunity for VA to garner support for critical initiatives, leverage funding by participating in joint projects, and obtaining advanced technologies developed by HPCC members at minimal cost. The additional reporting requirement and coordination may have an impact on project timetables, is not a significant disadvantage.

VA is currently proceeding to develop HPCC initiatives and working towards becoming a full member in FY95.

7. Compare VA to other healthcare providers in the application of information and communications technologies.

Answer: The hallmark of the VA information system (DHCP) is the breadth of integration and flexibility it provides. There are more than 60 administrative and clinical software modules available to all 172 VA medical centers, 353 outpatient clinics, 128 nursing homes, and 37 domiciliaries. All of these modules are integrated and use a common database with the result that data only need be entered once, and it will be immediately available to users throughout the hospital. Because of the standardized nature of DHCP, communication technologies can be added without costly re-coding. Through facility initiatives, voice response and schedule reminder systems have been placed in more than 25 VA medical centers within a two year period. We know of no system that provides as much comprehensive, integrated, clinical information, in as cost-effective manner as the VA information system.

In a recent survey, it was determined that several nation-wide HMOs and health insurance providers are unable to transmit data across their regions. The Mayo Clinic, however, is more advanced in exploring high-end videoteleconferencing.

VA is equal to other non-VA health care providers in the development and use of telemedicine technologies. In selected areas, such as pacemaker surveillance, we could be identified as a leader. In any comparison, VA continues to educate colleagues and learn from colleagues in academic and health care environments throughout the nation.

VA has achieved its high level of medical automation using less than 2 percent of appropriations for all information resource management activations. This includes personnel, hardware, software development, and maintenance. Typical costs of automation for a non-VA medical center are closer to 4 percent. VA has been successful in doing more with less by taking advantage of economies of scale. The system is capable of running on a wide variety of computer hardware systems, thus providing a competitive choice among hardware vendors, eliminating vendor dependence. Because it is an integrated system, with common utilities and a standard user interface, maintenance costs have been kept at a minimum.

Chairman Evans to Dr. Helen L. Smits, Deputy Administrator, Health Care Financing Administration, Department of Health and Human Services

SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, HOUSE COMMITTEE ON VETERANS' AFFAIRS HEARING ON VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES

Response to questions submitted by the Honorable Lane Evans, Chairman:

Q1. (a) **What constitutes, "an adequate visual image for communications and diagnosis" referred to on page six of your written testimony?**

Dr. Smits: Mr. Chairman, your question addresses one of the issues to be examined in the recently funded telemedicine demonstration projects. Medicare does not have clear information on a wide range of issues, including the type and methods of telemedicine used to send images, what type of technology is the best method to use when offering effective diagnosis and treatment, and how the best results of telemedicine are achieved. Specifically, the University of Michigan will be undertaking two tasks. The University will develop a detailed methodology for evaluating accessibility, quality and cost effectiveness of telemedicine. The University will also evaluate existing telemedicine programs in Georgia and West Virginia using this newly developed methodology. Through demonstrations such as this, HCFA can garner the information and experience necessary to develop a cost-effective framework to define what technology can be used and shared. Once the demonstrations are completed, I will be better able to define and identify what types of communication technology can be used to provide adequate diagnosis.

(b) **What constitutes "telemedicine networks that are part of integrated systems of care," also referred to on page six of your written testimony?**

Dr. Smits: Mr. Chairman, the best examples of how "integrated systems of care" would function via telemedicine are the pilots underway at the Medical College of Georgia and Texas Tech. Each network has an academic health center that serves as a "hub." Each hub has the technology, resources and staff to answer any consultation call from any rural area that is connected to the system on a 24-hour basis. Consultations within the network can also take place between a primary care practitioner in a remote site and specialists such as general surgeons located in a mid-sized town. Consultations between mid-level practitioners and physicians can also take place over the network. Follow-up consultations can also be done from any site. In addition, academic centers broadcast continuing education classes to doctors, specialists and nurse practitioners. Based on these examples, the possibilities for using networks to serve providers, health care professionals, patients, and the community as a whole appear very attractive.

(c) **Which specialties are best and least suited for telemedicine use?**

Dr. Smits: Mr. Chairman, based on information available from operating telemedicine networks such as the Mayo Clinic, Texas Tech and the Medical College of Georgia (I have visited some of these sites), specialties such as dermatology and general surgery seem very effective at providing diagnosis and treatment. There seems to be a high rate of satisfaction among physicians, the consulting physicians, and the patients involved when using telemedicine. I do believe that further research is needed to determine what other types of medicine would be good candidates for telecommunication use. The demonstrations that HCFA has recently funded will examine this issue. I would be happy to provide the Committee additional information as the demonstration projects move forward.

Q2. **Describe what you learned from the telemedicine demonstration sites which you have visited.**

Dr. Smits: Mr. Chairman, after visiting sites in Texas and in the western part of the country, I realized how isolated a community can be and what that means in terms of technological capability of using telecommunications to provide routine consultations, second opinions, and 24-hour assistance is increasingly available and necessary in today's world. I believe that as this new technology evolves and more research is conducted to find out better applications and procedures for applying technology, society will accept, trust and use it. I believe the need is great for telemedicine, but we must first develop the correct procedures and determine its cost effectiveness through carefully designed demonstration projects in order to determine the best way to proceed with this emerging and promising technology.

Chairman Evans to Dr. Donald A. B. Lindberg, Director, National Coordination Office, High Performance Computing and Communications

Question 1: A well-established network of health care providers and facilities, VA is already well suited to use and test telemedicine applications. What is needed for VA to take full advantage of its unique structure?

Response 1: The number of VA facilities, their geographic distribution, and size of their patient list provide an excellent testbed for the early testing and use of telemedicine applications. To take full advantage of this structure, the VA needs to identify the facilities that will participate in the testing activities. Each of these facilities must have adequate computing and storage capabilities to handle the necessary voice, text, and images needed for telemedicine applications. I believe that these facilities should be connected with high-speed data transfer capabilities. Finally, the staff at each of these sites must have sufficient background and training to use this technology for the planned telemedicine activities. The exact level of capabilities, resources, and training should be determined by the VA, based on the desired size of the test and the nature of the telemedicine applications to be demonstrated.

Recently, the VA has begun working more closely with the HPCC Program, with a goal of full membership in this area. These collaborations with HPCC should help to identify substantial telemedicine challenges for the VA. The VA has already made much progress in some of these efforts, for example, the development of an electronic patient record system, and should certainly join with the other agencies in advancing other related health care applications for the NII.

Question 2: What action(s) should Congress take to establish telecommunication standards and particularly standards for telemedicine applications?

Response 2: Standards, particularly in the fields of computing and communications, tend to evolve at a rapid pace based on experimental activities and testbed implementations. Telecommunications standards in the U.S. develop and evolve through a consensus process among representatives from academia, industry, and government. In addition, any effort would need to operate within the context of existing Federal, national, and international standards setting processes. Congress can make an important contribution to the process by encouraging and enabling the interactions that permit the consensus to develop. For example, HPCC currently funds six different testbeds for gigabit networks. These testbeds allow different groups of companies, universities, and national laboratories to cooperate to make their systems and applications work together. Continued funding for follow-on efforts for these gigabit testbeds will advance the standards process. No one group is likely to produce "the" final standards for gigabit networks; however, the experiences of all of the groups will certainly lead us to improved standards for communications.

In the context of telemedicine applications, standards are premature. The field needs time and experience with the tools and technology to assess the tradeoffs that will occur in establishing standards. As a part of this process, NLM has recently announced 12 research contracts (totalling $ 26 M over three years) to create and evaluate testbed networks and prototype telemedicine systems. As these testbed efforts mature, we hope it would be possible to support linking these testbeds to advance the process of developing standards for interoperability.

Question 3: What lessons have been learned from the numerous telemedicine demonstration projects conducted over the last twenty years?

Response 3: The primary goal of telemedicine demonstration projects has been to test the feasibility of using telecommunications technology for the purpose of diagnosis and treatment of patients in remote locations.

Projects may need to be tested over longer periods of time than they have been in the past. Projects have been conducted for a few years and then discontinued, sometimes prematurely.

Telemedicine applications need to adhere to established technical standards. Standards for image file formats, digital resolution, and compression techniques, for example, are critical for broad telepathology and teleradiology applications. Standards to ensure security and privacy will be required as telemedicine is used regularly for patient care.

Many telemedicine projects have had narrowly defined target populations and applications. This implies a need to demonstrate the capabilities of these systems with a broader patient and provider population.

Many successful applications of telemedicine have been in the areas of telepathology and teleradiology. Studies will need to be conducted to consider patient acceptability of the use of telecommunications technology in direct patient encounters. It has already been shown, for example, to be readily accepted in cardiac pacemaker monitoring, but it may not be acceptable to patients in other types of situations, such as psychiatric consultations.

In some cases, adequate training in the use of telemedicine technology has not been given to the health care providers who have been asked to use these systems. Systems have sometimes been under-utilized simply for lack of sufficient training. As more complex systems are designed for use by a general population of health care providers, it is important to consider issues of training not only in the technology itself but also in the most appropriate way its use can be integrated into the busy schedules of health care providers.

While many important and successful telemedicine demonstration projects have been carried out since the early 1970's, few have had an explicit evaluation strategy as a primary objective. This is due, in part, to the desire of those developing these innovative systems to put them to use for the benefit of their patients as quickly as possible. Telemedicine projects involve factors such as the adequacy of the underlying technology, their medical appropriateness and effectiveness, and cost-benefit considerations. The rapid rate of advances in the underlying technologies of telemedicine means that the telemedicine applications of today and tomorrow will differ significantly from earlier experiments. Applications will be broader in scope and more sophisticated in their capabilities. It is apparent that in order to continue to make significant progress in telemedicine applications, projects will need to include rigorous evaluation and review of both process and outcome.

Question 4: If a goal of the National Information Infrastructure is a wide-area, comprehensive, integrated, network of information systems, with hackers already gaining access to even the most secure computer networks, how can the confidentiality of information, including patient medical records, be maintained?

Response 4: The National Information Infrastructure objective of securely creating and disseminating information over a wide-area network of information systems is a technically attainable goal. Information pertaining to patient records can be maintained in a confidential manner. The layman's view of confidentiality most often includes four technical goals of information security: confidentiality, integrity/authenticity, availability, and legitimate use. Confidentiality ensures that information is not disclosed to unauthorized persons; integrity/authenticity prevents unauthorized creation, alteration, or deletion of information; availability ensures that authorized users of information have access to that information; and legitimate use ensures that resources are not used by unauthorized persons or in unauthorized ways.

Question 4 translates to whether these four technical goals can be achieved and if so, at what cost. Overt and subtle interactions must be taken into account. For example, while a file may be stored and transmitted in encrypted form, it must be viewed at some point in plain text. If the information is viewed on a compromised multi-user system so that the attacker can view the observer's screen, then the confidentiality will fail.

Confidentiality may be achieved through encryption in storage and transmission and isolation in viewing. There are multiple storage encryption products, most based on DES (data encryption standard). Integrity/authenticity may be achieved through "digital signatures" and "cryptographic checksums." Digital signatures ensure the authenticity of an electronic document even better than a signature ensures the authenticity of a physical document. Cryptographic checksums are algorithms that ensure that the contents of an electronic message are not changed; if they are, the checksum will fail. Both these algorithms are extremely strong and cannot be reversed. Legitimate use may be achieved through appropriate access controls. That is, a physical object (card), personal knowledge (password), and biometrics (thumbprint). Recent experience shows that passwords that are used more than once are no longer adequate, since they may be recorded by network eavesdropping programs and "replayed." There are currently multiple methodologies for non-reusable passwords using both "smart cards" (one time password generators) and cryptographic algorithms. Availability may be maintained through a variety of mechanisms. From a security perspective, it's important to make certain that networked systems are configured not only securely, but in such a manner that routine attacks, such as password guessing, are handled appropriately without seriously degrading performance.

In summary, technical solutions to these goals are available. Hackers have gained unauthorized access to current systems because most of the technology just described is not in everyday use. Most of the communications networks (like Internet) and operating systems that manage computers on the networks (like Unix) were developed assuming a friendly environment of sharing and collaboration. Trying to go back and retrofit these newer kinds of security measures is expensive and requires a cultural change within the community. The change is beginning, but the progress is far from complete.

Looking forward to the NII, the entire system (networks, software, policies, and procedures for use) must be developed with security measures built in from the beginning and a culture that clearly understands and maintains that security. As your question indicates, confidentiality and privacy of patient records are of paramount importance. Likewise as we move toward expanded uses of the NII, these same kinds of issues are critical for allowing businesses to rely on the availability, confidentiality, and privacy of the network to interact with their customers. Current and developing technology provides potential solutions to give the NII the desired security characteristics. However, we must ensure that these technologies are deployed and used faithfully to avoid more serious and harmful intrusions by hackers in the future.

Question 5: Who are the information infrastructure and telemedicine winners and losers likely to be?

Response 5: The simple answer is that those individuals and organizations that have the knowledge, access, and inclination to exploit these technologies will be the winners. These criteria apply equally to those who develop and those who use the technologies.

Telemedicine technology developers span a broad spectrum of industries including: medical databases, telecommunication systems, remotely-supervised diagnostic equipment, specialty-care physician centers, and remote-care physician assistants. Opportunities abound for integrating these new technologies within the existing health care infrastructure. For example, the opportunity for extending medical care will increase as a result of telemedicine. Those professionals that evolve their practice to exploit telemedicine can increase their effectiveness; those that do not risk a potential loss of patients. It appears that rural hospitals that establish access to specialized medical facilities will be able to retain and better serve their patients; those that do not will have the opposite effect.

On the other side, the users of the technology are the general public. They must know the potential of the technology, have access to it, and create the demand for its use. Those communities and institutions that push for its adoption the soonest are likely to benefit the most.

The HPCC Program emphasizes both education and access as critical parts of its program. HPCC is expanding the workforce of skilled personnel and helping to educate the public, with programs ranging from K-12 education to expanded training for professionals in fields of endeavor other than computing and communications. The HPCC Program is also helping to develop the technologies that will make possible the universal access envisioned by the NII. These activities help to provide the opportunity for everyone to succeed.

Potential "losers" are the rural and frontier communities and those made up of minority population groups. Even today, such populations are known to be "medically underserved." Traditionally, these areas are not limited by inclination, but by the lack of timely education and access to the technologies needed to permit them to be winners.

Question 6: If one benefit of telemedicine is improving access to specialty care from remote locations, what are the financial implications of this for those who provide specialty care and those who operate the facilities where this care has been provided?

Response 6: The overall impact of telemedicine on health care costs is not known. One study estimates that $30 billion can be saved by the electronic management of patient information and that another $200 million can be saved by the use of video-conferencing for training and medical consultations. Dr. Jay Sanders reports that telemedicine consultations throughout the State of Georgia have permitted treatment in local hospitals for 80% of those patients who otherwise would have been transferred to Atlanta for specialty care at Emory University.

The financial implications for those who provide the specialty care will depend in part on larger payment policy issues. The Health Care Financing Administration's approach to Medicare payment for telemedicine services is expected to have an impact on how other payers will respond. Medicare currently does not pay for interactive video consultations between a primary care practitioner and a specialist. It has been suggested, however, that to the extent that the specialist provides care similar to that which would be provided if the patient were in the specialist's office, the specialist should be paid equitably for the service provided.

As hospitals and private practices become involved in telemedicine applications, it is expected that they will become more active users of a wide range of information technologies. They can, therefore, expect to realize significant savings of time and money in their management of patient information and in their access to the latest medical findings.

Question 7: Why has the health care sector trailed behind other sectors in applying information and communications technologies?

Response 7: In the rapidly progressing field of electronic information and communications, identifying the "sectors" that are ahead or behind is a very subjective proposition. In the related field of high performance computing, it is relatively clear that the fields of physics, engineering, and mathematics pioneered use of computers to solve critical defense and space exploration problems (e.g., weapons design, intelligence gathering, and spacecraft control). As a result of this early experience, they are also likely to have an early advantage in information and communication technologies. Beyond this limited group of scientists, it is less clear which sectors of users are "ahead" or "behind."

My earlier testimony to the Committee highlighted a number of substantial R&D activities geared toward improving the use of information and communication technologies in the health care sector. Rather than taking a position on the relative status of the health care sector my response to your question will concentrate on highlighting what barriers pose the most problems for future progress. Four major themes appear to dominate concerns now. First, the complexity of the medical field requires a great deal of R&D to integrate it effectively with these technologies. For example, while an artificial intelligence (AI) system for supervising some industrial process can be quite complex, that complexity is tiny in comparison to the complexity of an AI system for medical diagnosis and the "costs" of erroneous diagnosis may be grave damage not merely loss in investment.

Second, the number of individuals cross-trained in biology/medicine and information/ communications needs to be substantially increased to begin to address many of these issues. Given the complexity and expense of training health care professionals, it should not be surprising that few have the time and energy to add another set of skills to their repertoire. Adding computing and information sciences as a specialization discipline within medical training programs may provide an effective solution. Medical Informatics represents the emerging discipline that provides the theoretical and scientific basis for this integration of computing and medicine. Among others, topics within this discipline include: access and use of databases in support of patient treatment and disease research, use of simulation and modeling as a tool for the effects and side-effects of drugs, and the use of computing and communications to carry out effective long-distance collaborations.

The third barrier to full use of the information and communications technologies results from the current structure of the health care system. At present, we have a large number of autonomous entities that provide health care. Communicating medical information will require expanded standards for medical terminology and data representation. As indicated in the response to question 2, expanded efforts in testbeds is likely to help the most in overcoming this barrier.

The final barrier relates to profit and loss --the applications need to be evaluated to demonstrate that the benefits outweigh the costs. The people who commit resources within the health care sector need to be convinced that heavy investment in information and communications technologies will produce corresponding payoffs. For example, electronic access to an individual's complete medical records is a valuable diagnostic tool. A recent study by the National Academy of Science's Institute of Medicine describes computer-based patient records (CPR) as "an essential technology for health care." One of the recommendations from this report is that "The costs of CPR systems should be shared by those who benefit from the value of the CPR. Specifically, the full costs of implementing and operating CPRs and CPR systems should be factored into reimbursement levels or payment schedules of both public and private sector third-party payers. In addition, users of secondary databases should support the costs of creating such databases."

Chairman Evans to Jim Elias, Executive Director, Technology Assessment, US West Communications

1. Please provide several examples of the excessive regulation referred to in your testimony which slows widespread deployment of telemedicine applications.

An unprecedented degree of cooperative information exchange will be essential to the process of standards development in telemedicine. The decree court's 1987 ruling that the MFJ's manufacturing prohibition bars RBOCS from engaging in design and development erects a significant artificial barrier to the already challenging process of developing standards through effective information exchange. It is in every provider's best interest to ensure product compatibility within the NII framework. The court's ruling encumbers a major group of information highway providers from easily sharing product design information, making standard development unnecessarily difficult, prolonged and costly.

The MFJ's broad prohibition barring RBOCs from interLATA communications poses a formidable obstacle to the interoperability of diverse NII systems, in requiring RBOCs to identify and properly handle information flow which may or may not be interLATA in nature. While some information services will unquestionably be local, access to others, or even use of a gateway to access another providers' network, may take the user across a LATA boundary.

Sending a message on the Internet, for example, or finding and accessing a remote database with the help of a search agent such as Gopher or Mosaic, will often entail an interLATA communication. For U S WEST, or any network provider, to be able to sort out each message or information request and determine whether it crosses a LATA boundary, and to treat those that do differently than those that do not, could prove to be a formidable, practically impossible task.

The most significant barrier to making increased bandwidth available to the widest possible market is the FCC's requirement in its Video Dialtone order (Common Carrier Docket 87-266) that telephone companies, despite their status as the new entrant to the broadband video services market, must shoulder stringent video common carrier obligations not imposed on the established providers, the incumbent CATV companies. The order requires that, as a condition for market entry, telephone companies must make 75 percent of their video capacity available for others to use, and undertake all reasonable steps to expand capacity as necessary to meet demand. In effect, to double its own video capacity in a given market, U S WEST must devote three times that investment to enlarging the video capacity reserved for others. Such a policy has the effect of concentrating finite capital resources of the new entrant in fewer locations that otherwise would be possible. No such requirement is imposed on the incumbent CATV provider.

Very prominent examples impeding rural health care delivery are the Health Care Facilities Act regulations which deny Medicare reimbursement for most telemedical procedures. Likewise, Internal Revenue Service rules sharply restricting the deductibility of home offices may impede the development of telecommuting practices beneficial to the environment and greater business efficiency.

2. Your testimony recommends VA continue to participate with companies like U S WEST in programs which demonstrate and test telemedicine applications. What are the benefits of these tests to companies like U S WEST?

The VA environment simplifies the testing and demonstration of new telemedicine applications in as much as when dealing with the VA, the provider and payer are one in the same. In addition, the VA is under "single ownership" where competitive concerns are not an issue. The VA is also geographically distributed, creating an ideal environment to test the value of moving information over longer distances.

These characteristics of the VA facilitate a demonstration environment in which U S WEST gains directly by gaining an understanding of the needs of the medical community for communications. Too often technology becomes a solution looking for a problem. The VA would provide U S WEST a strong focus on the problems to be solved.

3. What is the status of Project Seahawk and when will it be operational?

Project Seahawk is in the design and initial implementation phase. Its first operational capability will be demonstrated in early calendar 1995. One of the first actions in Project Seahawk will be to connect the VA Hospital at America Lake to the larger Project Seahawk network with optical fiber. The VA Medical Center in Seattle, Washington is already connected to the network with optical fiber.

4. A well-established network of health care providers and facilities, VA is already well suited to use and test telemedicine applications. What is needed for VA to take full advantage of its unique structure?

It would be useful to make a joint assessment of opportunities for telemedicine applications with communications companies like U S WEST. The assessment could prioritize the opportunities and identify where to concentrate the attention to expand telemedicine. Personnel from both the VA Medical Imaging and Information Resources organizations should meet with communications companies like U S WEST to develop plans for the testing and implementation of telemedicine applications.

5. What standards are needed and what action should Congress take to establish telecommunication standards and particularly standards for telemedicine applications?

Congress should encourage the industry to take on the responsibility for creating standards in cooperation with the medical community. The Cross Industry Working Team (XIWT) is a good example of industry stepping up to the responsibility of resolving fundamental issues concerning the National Information Infrastructure. The chairman of this group is Bob Kahn of the Corporation for National Research in Reston, VA.

The most effective standards are designed from experience. Congress and the agencies should facilitate testbeds and demonstrations to create the experience from which the standards can be derived.

6. Who will have access to the National Information Infrastructure (NII) and who should bear the cost of universal access?

U S WEST believes that information technologies and advanced communications services hold great promise. As an emerging industry, the services and products it will eventually provide are still evolving. While we cannot predict the direction of this evolution, the Federal government, industry and marketplace will have a role in determining standards for access to the network over which these services will be provided. This focus on the future, however, does not diminish the need to ensure continued access to the network at some basic level.

U S WEST, therefore, proposes a complete plan designed to promote universal service in today's changing telecommunications industry. Part of this plan ensures the ubiquitous deployment of a core set of services grouped under the headings of "universal service" and "universal access". U S WEST includes in this set called "universal service" basic telephone services available to all who want them: one-party service, a voice-grade line with touchtone capability, equal access to competing long distance carriers, basic end user equipment, telephone relay services for hearing- or speech-disabled customers, and dialing access to emergency services and directory assistance. The second part, "universal access," recommends the development of public policies to encourage competing providers to offer advanced communications services to urban and rural communities on an economically sustainable basis.

The following chart outlines differences between recommended policies for "universal service" and "universal access."

	Universal Service	Universal Access
Definition	A core set of services which are ubiquitously available to everyone who *wants* them.	Public facilities offering widespread access to data and video services.
Services included	• One-party service • Voice-grade line • Touch-tone • Equal access to competing long distance carriers • Telephone Relay Systems for hearing- or speech-disabled customers • Access to emergency services • Access to directory assistance service • Basic end user equipment.	Access to multimedia services, such as: • Interactive data transfer • Internet access • Image transfer • Switched interactive video
How provided	Through competitive forces and explicit funding mechanisms to support the provision of these services where the competitive market fails to provide them.	Through government and private consortia procurement from competitive providers.
Funding	Provided through the competitive marketplace. Where needed, external funding should be targeted to low income individuals, social programs and narrowly-targeted high-cost areas.	Competitive market pricing, with government support targeted to qualifying institutions.

7. What lessons have been learned from numerous telemedicine demonstration projects conducted over the last twenty years?

Experience in various telemedicine projects have yielded numerous "lessons learned":

- There are numerous opportunities to use existing networks for telemedicine applications.
- Advances in communications technology will expand opportunities for telemedicine.
- The medical need, not the technology, must be the focus of telemedicine
- The process for delivering medical service needs to be rethought in its entirety when new technology is introduced. This rethinking needs to be along the lines of the re-engineering activity that the Federal Government and many firms in the U.S. are undertaking. Dropping technology into the middle of a system without rethinking the entire system seldom works.
- Interfaces to the technology need to be as human centered and transparent as possible.
- Training and follow-up are essential.
- New technology needs to be introduced where it is welcome if it is to be successful.

8. If a goal of the National Information Infrastructure is a wide-area, comprehensive, integrated, network of information systems, with hackers already gaining access to even the most secure computer networks, how can the confidentiality of information, including patient medical records, be maintained?

Security and confidentiality are a concern for many applications in addition to medical records. U S WEST recognizes this as a critical need and has a team of people exploring the entire field of secure communications. We have had numerous discussions with vendors who have provided technology for secure communications to the Department of Defense and the National Security Agency (NSA). We are also in discussions with NSA about the possibility of using some of U S WEST's ATM/Sonet testbeds to develop and evaluate secure networks. We believe that the testbeds must be dealing with real applications as security is explored. We have selected applications in Health Care across all networks.

9. Who are the information infrastructure and telemedicine winners and losers likely to be?

There are winners and losers today. The orientation ought to be to make as many winners out of today's losers as possible. A few places to start creating more winners would be with:

- Regular physicians and clinics who could retain a greater number of patients.
- Purchasers of health care who are not only paying for services but also spending time and money on associated travel to medical centers.
- Patients that have limited access to quality care and limited access in general.
- Individual physicians whose access to current information is limited.
- Patients with slow response to their medical needs.
- Patients and professional medical personnel located in rural and remote regions of the country.
- Numerous other similar opportunities.

RESPONSE TO ADDITIONAL QUESTIONS SUBMITTED BY HONORABLE LANE EVANS, CHAIRMAN SUBCOMMITTEE ON OVERSIGHT & INVESTIGATIONS COMMITTEE OF VETERANS AFFAIRS

TO:

MR. DUFFY SOTO, CHAIRMAN
DIVISION OF TELECOMMUNICATIONS & ADVANCED TECHNOLOGY
LAKE CITY COMMUNITY COLLEGE, LAKE CITY, FLORIDA

REGARDING

TESTIMONY BEFORE THE COMMITTEE ON JULY 20, 1994
VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES

1. QUESTION: Will all veterans in the Lake City Community College service district be able to have video teleconferences with Lake City VA Medical Center officials and staff?

ANSWER: Not necessarily. Those veterans who are connected to an operating commercial cable TV service, and whose home is equipped with a working telephone will have immediate access to video teleconferencing capabilities with VA Medical Center officials and staff. However, veterans with no commercial cable TV service in their own household can participate by locating themselves to a facility (such as a VFW hall or American Legion Post or a neighbor's home) that might be wired. The ability to participate--at least immediately--does depend on: (a) Their household having a television set that is connected to a commercial cable TV service; (b) Their household being equipped with a telephone.

(A) Because LCCC-TV transmissions use the FCC allocated ITFS broadcast bands, the college's tele-network depends on the various commercial cable TV systems to carry and deliver its programs. Currently all of the cable TV providers operating within the LCCC service district have allocated a channel to the college, thus allowing our programs to air in all cable households within the service district. Therefore, any veteran whose household is connected to any of the commercial cable TV systems operating within the five counties served by the college has access to a LCCC-TV channel, and thus, would have access to the VA Medical Center's transmissions as well.

(B) Lake City Community College TV is continuing to develop it's current delivery system in order to provide access to more households. The current LCCC-TV delivery network presently utilizes only those cable systems offering "hard-wired" service. However, the college has negotiated commitments from several wireless cable operators agreeing to allocate a channel on each of their systems for college use as well, giving the VA Medical Center access to wireless cable TV households. Once in operation, the combination of hard-wired and wireless systems will immediately expand the range of the LCCC-TV network within the service district. This expansion will increase the accessibility of video-conferencing capabilities to veterans whose households may not currently be connected to a hard-wire system because of lack of availability.

*(C) **SUMMARY:*** Any veteran with access to a TV connected to a commercial cable TV service that carries the LCCC channel, as well as an operating telephone, will be able to participate in interactive teleconferences with the VA Medical Center once equipment is installed at the VA.

2. QUESTION: How will the cooperative service you propose improve veteran triage?

ANSWER: Many of the questions--and possibly the procedures--associated with triage can be handled via teleconferencing thus reducing the number of trips possibly required to the VA Medical Center by the veteran to obtain admissions or other information he may otherwise be able obtain through the broadcasts. He/she can be advised well in advance of registration or admission of VA or Medical Center policy; can be informed of the documents required and that may be needed to be brought along at the time of admission; provide interactive training about how to obtain information, and, perhaps to even be able to request specific paperwork be mailed directly in advance of his/her Medical Center admission. Such services (and others) will reduce the cost and time of unnecessary travel to the veteran, because many veterans who once traveled long distances only to wait in the lobby in order to get information, may now be able to receive it in their household by TV. Use of the system to conduct some triage functions will also reduce time and costs to the VA. It will also increase efficiency by allowing a number of functions to be taken care of via teleconferencing that would otherwise have to be done in a face-to-face manner. Other tasks that the VA Medical Center could accomplish through the support of this system include: training seminars, telemedicine, patient post-op follow-up, nurses training, aide training, and CEU updates. Officials are further encouraged to devise other tasks for this system which is otherwise limited only by what VA officials and LCCC agree to do with it.

3. **__QUESTION__: How many hours of VA programming are planned to be broadcast monthly?**

__ANSWER__: At this time, the VA and college officials have reached no formal agreement as to how much time will be allocated for use by the VA. The college is amiable and is willing to discuss any reasonable amount of lease time the VA might deem necessary. Our current plans include the allocation of several more channels that, when obtained, would allow us to provide almost unlimited access to the VA if necessary. However, the amount of time initially allocated will primarily be determined by what the VA elects to do with their broadcasts, what their personnel commitments to programming will be, the time that the broadcasts are scheduled, and how often they wish to use the system. First indications are that the VA will start slowly--perhaps four to six hours a month---until they develop a broadcast that works most efficiently and is of continued interest to the veteran. At any later time, an agreement for more access can be discussed.

4. **__QUESTION__: Do all veterans in the Lake City Community College service area have cable service?**

__ANSWER__: No. The college's service district is quite rural. Cable penetration within several of these areas is limited to mostly the incorporated areas. While we are not certain how many veterans have active cable service now, we do know that cable penetration averages around 50%-60% and that service to these areas is on the rise. As more service companies get in the cable business, (i.e. wireless groups and telephone companies) penetration even in the rural areas will be quite significant. Estimates are that penetration within the next five years in these areas could reach 75% if all the players that are planning to play, do. When they do begin operations, our plans are to be ready for immediate connection to their systems. Currently, the majority of veterans reside in Columbia County (more than 5,700), which also has the largest cable TV penetration.

In preparing for the future, the college has successfully negotiated agreements that provide access channels by several wireless groups, and are prepared to negotiate terms for connection to any telephone company that may be approved to provide cable TV service. As this growth occurs, we will add more viewers (veterans) without increasing the cost of delivery.

5. **__QUESTION__: More than 12,000 veterans who reside in the Lake City Community College service district receive care from the Lake City VA Medical Center. How many total veterans reside in the Lake City Community College service district?**

__ANSWER__: First, let me clear up a previous error for which I apologize. Earlier documents indicated that the VA Medical Center, Lake City counts as patients more than 12,000 veterans who reside in the LCCC service district. Medical Center officials indicate that as of September 30, 1993 (the last count for which figures are available) 12,096 **total** veterans resided within the LCCC service district, but not all of these were considered **active** or ongoing Medical Center patients. However, the figure **does**, indeed, accurately reflect the potential number of clients who, at some time or another, will likely become VA Medical Center customers and will have need for outreach services provided by the VA Medical Center, Lake City.

SYNOPSIS

Electronically connecting the Lake City VA Medical Center with Lake City Community College in order to present outreach opportunities for veterans in their home offers several immediate, heretofore unavailable benefits.

1.) It proposes to be one of the first (if not the first) telecommunications network that offers **the veteran** him or herself practical, direct distance teleconferencing opportunities with their VA Medical Center host facility. While some other systems in operation may link medical centers with each other, few (if any) actually link the rural or distant veteran him or herself directly with the medical center in a real-time, interactive teleconferencing fashion;

2.) This system takes advantage of existing infrastructure. This means that a functional, operating system DOES NOT have to be built from the ground up because most of it is already in place and is operational. By using available resources, immediate services can begin in an efficient and cost effective manner;

3.) The college *(a non-federal agency)* is joining with a federal agency *(the VA Medical Center)* to deliver practical, needed and necessary telemedicine outreach services to veterans right in their home. This is a very valuable form of cooperation providing outreach that otherwise would not be available without extensive capital investment and years of design and construction on the part of the VA;

4.) The VA Medical Center will lease from the college only the time it needs to conduct its program functions. The VA will have no maintenance or operational costs to the system other than keeping their own studio in working order, thus operational costs to the VA Medical Center are negligible;

5.) The partnership offers an ***immediate solution*** to a veterans outreach program that can be working for the veteran **NOW**. No waiting for a system to be designed, constructed, funded. Simply, with the addition of an electronic link between the VA Medical Center and the college, outreach can start relatively quickly;

6.) Because it is TV, the advantage of real-time, synchronized audio and video lends itself to a myriad of platforms that the VA may wish to use in the future for increasing interactive outreach services. Benefits such as in-home training, basic post operative care, and telemedicine functions can be performed using the system. The VA will also be able to electronically link with other sites as well. As new technologies come into the market (video compression, the availability of fiber optics, etc.) the system will easily adapt;

7.) The VA, Lake City, can immediately begin to demonstrate a partnership between federal and non-federal agencies that offers a practical, inexpensive method of outreach to veterans directly in their homes. It is certainly a model that can be extended to other areas of the country where ITFS systems--or the availability of frequencies-- exist. Adapting such systems in other areas, as we propose here, will extend the outreach and service range of the VA to millions of veterans everywhere at significant cost savings to the Veterans Administration as a whole, as well to the individual medical center facilities;

8.) Everybody involved in this project wins:
The Veterans Administration: They take advantage of very low cost system of outreach, built and maintained by someone else; offer outreach services unavailable before; as pressure is placed on the Veterans Administration to streamline operations and become more competitive, the system offers immediate, practical and cost-saving solutions; de-centralizes responsibility to build and maintain national systems--each VA Facility can lease from the local ITFS provider cheaper, quicker - and negotiate their own best deal;

The VA Medical Center Facility: Provides an efficient program of outreach at a very nominal cost because it leases from the ITFS provider only the time it needs for its outreach programming; no system construction costs other than equipment that electronically links the facility with the ITFS provider; can adapt itself to existing facility space--no need to construct a larger studio or broadcast facility; no fiber access fees, no building and development costs, no expensive tele-system equipment to man and maintain; "Plug and Play" simplicity;

The ITFS Provider (in this case Lake City Community College): Is able to take advantage of partnerships with federal, as well as state and private agencies, to provide outreach along a number of different paths. This gives the college (provider) a chance to derive nominal income by leasing otherwise unused airtime making its own operation more useful, efficient and effective; gives the college a chance to be a partner in outreach projects and become involved in community projects (like this one) that otherwise it would not have the resources to do.

The Veteran: Is provided access to a number of valuable outreach services right in his/her home that has never been available before--and at no cost. He/she can get information, participate in discussions, get advice, and take advantage of triage programs right from the comfort of his own home. A windfall for veterans.

Neal Neuberger
Questions Submitted for the Record
To Committee on Veterans Affairs
Subcommittee on Oversight and Investigations

1. **The Working Group on Electronic Data Interchange reportedly projects that more than $42 billion could be saved by the year 2000 through the adoption of Electronic Data Interchange standards and implementation of related technologies. What is needed to speed adoption of these standards and related technologies ?**

To begin, an underlaying structure or "architecture" is required for the National Information Infrastructure. One of its requirements, especially in health care, is making sure that information is shared in a common or standard manner. This is particularly difficult given the high degree of specialization in the health care field, practitioners speak many different languages and the services they provide reflect a particular orientation or niche, usually one that is not necessarily conducive to the broader goal of integrated delivery systems.

The federal government must quickly focus on developing a telemedicine architecture which is open, scalaeble, portable, and interoperable. Standards need not be legislated, but government can serve as a catalyst for their adoption in a public-private sector approach.

The bottom line is that health care practitioners must be made to feel that the communications technologies they are using are "transparent" in look and feel. Health care service delivery is a complicated enough process as it is, technologies which are supposed to improve efficiency must not in practice simply add to the confusion which already exists.

Certification standards for health care practitioners, uniform reimbursement policies between government and private payers, a national approach to privacy and patient confidentiality issues will all be needed, and the sooner the federal government helps the private sector to address some of these thorny issues, the sooner technologies will be more widely or ubiquitously available.

2. **Why have telemedicine applications typically been of short duration?**

Telemedicine demonstrations have typically been of short duration due to lack of funding. In addition, they have not been designed for sustainability. Projects have been designed to accommodate available (mostly) government grant and other assistance programs without regard to the sustainability of the projects. For this reason, we don't really have a good idea of what works and what doesn't in a variety of care giving situations over long periods of time. It is hard for health care organizations who may be entertaining large capital outlays to adequately predict success given the limited nature and scope of projects which have been in place around the country.
The government could help rectify this problem by helping to fund some "applied research initiatives" in various regions of the country, projects at research centers which plan for the transition of federal seed capital into industry-led, sustained efforts. To start, by pooling some resources among the various interested federal agencies i.e., VA, Office of Rural Health Policy, Health Care Financing Administration, NTIA, Rural Electric Administration, we could begin to answer in an accelerated time frame many of the outstanding issues and policy considerations which simply haven't been adequately addressed yet.

3) **A well-established network of healthcare providers and facilities, VA is already well suited to u se and test telemedicine applications. What is needed for VA to take full advantage of its unique structure?**

This may sound simplistic, but one of the things VA needs is better exposure for the interesting and cutting edge technologies its developing through efforts like its "Decentralized Integrated Teleconsulting Project". I think that the testing of these technologies in communities will allow administrators at a delivery level both within and outside of the VA structure to more immediately realize the full potential of some of the interfaces and remote teleconsultation capabilities. The biggest mistake would be if these projects, as many others we've referred to, end up being "of short duration". Hopefully VA has the resources through its existing system of 180 hospitals to help make these technologies a reality and part of the everyday practice of VA medicine.

4) **What lessons have we learned from numerous telemedicine demonstration projects conducted over the last twenty years?**

Mainly we've learned a lot of little things about a variety of applications using a variety of modalities. Individual researchers have addressed issues or questions which may have been of some importance to some particular funding organization. A company might care if a particular scope or camera functions appropriately for a certain type of remote examination.

Perhaps more importantly the question to ask is what haven't we learned that yet needs to be addressed ? The answer to this is several fold. There are a whole series of over-arching communications and health care policy questions which, surprisingly, we still don't know the answers to. Is telemedicine an effective alternative from a quality point of view to face-to-face consultations and under what circumstances ? Is telemedicine an more cost effective means of providing care in remote rural and inner city situations? What assurances are there that health care practitioners will even use these new and emerging communications technologies in their every day practice?

Not only do we lack the answers to these and other critical questions, but we don't even have the mechanisms or the methodologies in place to begin ask the questions. Recently, HCFA, the Office of Rural Health Policy and others have begun to set aside funds for the evaluation of telemedicine projects and programs. These analysis is critical to the momentum which has been building recently concerning health care oriented uses of communications technologies.

5. **Who are the information infrastructure and telemedicine winners and losers likely to be?**

With respect to health care, we have to be careful to ensure that telemedicine or perhaps more appropriately "tele-healthcare" develops to its fullest potential in a manner beneficial to the overall health system development goals of a community. If we're not aware of the different potential applications including the non-clinical ones like prevention, health promotion, home health and others, we run the risk of establishing yet another set of costly tools which is used exclusively by physicians to the exclusion of the many other competent health care providers in the system. Telemedicine should be not seen as yet another means of "fencing-in" physicians and the traditional practice of medicine in the face of growing pressures to open up those care delivery to the other licensed allied health care professionals. At the same time, many large academic health centers which, to their credit, have done much of the pioneering work in the field, stand to benefit significantly at a critical time just as their role in the scheme of things is being rethought by policy makers here in Washington. Telemedicine may help redefine the roles and relationships which large teaching institutions have with the communities they serve. At the same time, rural institutions and the constituents they serve may become increasingly apprehensive about these changing roles. Neither are necessarily "winners" or "losers", but could end up they way depending on the attention they give to the development of telemedicine systems.

6) **If one benefit of telemedicine is improving access to specialty care from remote locations, what are the financial implications of this for those who provide specialty care and those who operate the facilities where this care has been provided?**

Telemedicine can help to bring needed (but otherwise unavailable) specialty services into a community -- but there is a risk.

Small or rural communities are struggling to maintain the health care services they currently have, to keep their hospitals from closing in the face of financial pressures and the trend towards regionalized systems of care. Telemedicine is a financial issue from the perspective of big and small hospitals. Larger facilities could very easily view new communications tools as a means of reaching into and capturing new markets by making available in rural areas specialty services which they control. At the same time, rural communities need to be concerned because the potential exists that these services may render their struggling hospitals and clinics obsolete. From a planning perspective the federal government will want to look at the resultant market relocations which may occur as these tools become more widely available.

Enlightened telemedicine programs are not insensitive to this issue. In Louisiana, the Louisiana TELEMEDicine Research Project ® has stated as one of its tenants that it will not simply replace services which may already otherwise be available in the communities it is reaching.

Its a good question and a matter which careful consideration must be given to.

RESPONSE TO QUESTIONS SUBMITTED BY
HONORABLE LANE EVANS, CHAIRMAN
SUBCOMMITTEE ON OVERSIGHT & INVESTIGATIONS
COMMITTEE ON VETERANS' AFFAIRS

QUESTIONS ANSWERED BY
MICHAEL D. MCDONALD
SENIOR ADVISOR
HEALTH AND TELECOMMUNICATIONS
C. EVERETT KOOP INSTITUTE

Below I am addressing your questions briefly and in some cases in an outline format in the interests of getting you a response as soon as possible. If there is a question regarding any of my answers, please call me at (301) 299-1507. I apologize in advance for having to be so brief in the interests of getting something to you in a timely fashion.

1. ARE REPRESENTATIVES OF VA AND THE VETERANS HEALTH ADMINISTRATION ROUTINELY PARTICIPATING IN THE ACTIVITIES OF THE C. EVERETT KOOP INSTITUTE (CEKI)?

No. They are not participating routinely at the present time. However, we at CEKI are open to collaboration with the VA. In fact, both the CEKI and VHA staff have worked together on outside endeavors. I have enjoyed the time I have spent with Rob Colladner, especially in the VA's Silver Spring Information and Research Center.

I think that the most fruitful engagement of VA staff in CEKI activities would be in: 1) the Health Information Infrastructure Toolset R&D project, which the DOD is already involved as an informal partner and testbed; and 2) as a participant in the HII Consortium, which focuses on building leadership and collaboration in order to develop the HII and its marketplace.

We would be interested in having a VA representative join us at the next HII Consortium meeting on Oct 13 at the Cosmos Club. For more information call Marcy Vierzin at (603) 650-1450.

2. YOUR WRITTEN TESTIMONY IDENTIFIES SEVEN ELEMENTS OF THE HEALTH INFORMATION INFRASTRUCTURE AND CALLS ON VA TO "UNDERSTAND AND UTILIZE THE RAPID, CASCADING DEVELOPMENTS EMERGING IN THE PRIVATE SECTOR".

PLEASE IDENTIFY SOME OF THESE "RAPID, CASCADING DEVELOPMENTS EMERGING IN THE PRIVATE SECTOR".

Below, I will outline a few of the larger changes taking place.

2.1) Administrative Information Systems

WEDI standards

X 12 standards

2.2) Clinical Information Systems

CPRI efforts to catalyze the computerized patient records.

the Mayo Clinic and Hewlett Packard's computerized patient record approach

the movement toward distributed clinical information systems
Microsoft
Rosman and Associates
Medware
Ameritech
Dow Jones (formerly Bell Atlantic)
Regenstrief Institute

clinical decision-making
PKC (Larry Weed)
First Opinion
Stanford Medical Informatics program
Disney Celebration (AT&T)

adverse drug effects knowledge base
LDS Hospital

2.3) Professional Education Information Systems
interactive media learning labs
groupware
interactive testing facilities
interactive video
simulation
virtual reality
robotic probes for minimally invasive therapy
telepresence

Dartmouth
Harvard Center for Clinical Computing
UCSD
SUNY

2.4) Telemedicine

numerous pilots, demonstrations, and infrastructure development projects
national, regional, and local

e.g. Northern New England Health Information Infrastructure Initiative
Mayo Clinic
Oklahoma
Kansas
Montana
CA HIP project
Georgia Telemedicine Trial
Michigan Prison Telemedicine project
AT&T
Ameritech
Sprint

parallel processing and video servers
NCUBE (Dartmouth/MIT)

ATM and SONET

telemetry for home-based physiological monitoring

broad deployment (DOD Testbed)

2.5) Personal Health Information Systems

Windom Health Enterprises
Harvard Community Health Plan
Kaiser
Apple
Video on Prescription
DisneyLink
Time Warner

Mosaic servers (NCI)
Intelligent agents (MIT Guardian Angel)
TV-based multimedia programming with air mouse navigation
wireless curb to house connections
digital compression boxes for high bandwidth twisted pair transmission
functional health assessment-driven informed consent and shared decision-making as a mechanism for decreasing cost and liability and monitoring outcomes of high cost/high utilization procedures.

2.6) Population databases and system coordination

geographic information systems
forecasting simulations
CDC national network
state public health networks
algorithm-based analysis of need and service mismatches
outcomes research and cost control
fitness landscapes as engines for dynamic simulations
methodologies emerging from the sciences of complexity for epidemiology

Centers for Disease Control
CHIPP: California Health Information for Policy Project
SimHealth (Maxis)
Codman database
CIESIN
DEC simulation tools

2.7) Community Networks
CHIMIS
CHINS
Healthy Cities Communications Toolbox
Community Services Workstation

Hartford Foundation
Windom Health Enterprises
Benton Foundation
World Health Organization

3. WHO SHOULD BEAR THE COSTS OF UNIVERSAL ACCESS?

A new formula for all cable and telecommunications companies (local and long distance) who provide and charge for the delivery of transport should pay for universal access. The traditional parties responsible for universal access (local and regional phone companies) are quickly losing the ability to appropriately support universal access because of local competition by players who at present carry no burden of universal access. Universal access should be defined broadly enough to include all emerging interactive and broadband applications, especially in health and education. Special provisions must be made to subsidize the economically and geographically disenfranchised.

4. WHAT ACTIONS BY CONGRESS AND THE ADMINISTRATION ARE NEEDED TO SPEED THE EMERGENCE OF HEALTH-ORIENTED TELECOMMUNICATIONS APPLICATIONS?

Title 7-like incentives for those who take to risk to innovate with interactive and broadband services (e.g. tax incentives, regulatory waivers, pre-market R&D dollars). Remove antiquated regulatory barriers (e.g., InterLATA restrictions) which inhibit commerce and stifle marketplace investment and development. Provide funds for the development of a life- and health-critical core knowledge base for the personal health information system, which would be put into the public domain. This would establish a national standard which would diminish errors and liability which might otherwise inhibit the development of personal health information systems. Like the CDC's development of the health risk assessment engine, this core knowledge base would have direct applicability nation-wide. It would kick start the market and stimulate innovation and content development around the core knowledge base.

There needs to be a coordinated public sector /private sector plan to develop the entire health information infrastructure. This will require the investment of approximately $150 billion in health-related infrastructure. This should be organized to heavily leaverage the relatively limited pre-market development dollars from the government.

There should be an HII mapping project that maps all public an private-sponsored HII demonstrations, pilots, testbeds, and infrastructure development projects. This should track these efforts across four dimensions: 1) geography; 2) technology; 3) application elements; and 4) target populations. The geographic information system used for the HII mapping project could then become the foundation for: 1) a dynamic simulation of the HII (identifying how the marketplace is emerging, and not emerging); an 2) a geographic information system underlying the Health People 2000 project.

5. WITH A WELL-ESTABLISHED NETWORK OF HEALTHCARE PROVIDERS AND FACILITIES, THE VA IS ALREADY WELL SUITED TO USE AND TEST TELEMEDICINE APPLICATIONS. WHAT IS NEEDED FOR THE VA TO TAKE FULL ADVANTAGE OF ITS UNIQUE STRUCTURE?

Once an initial strategic plan and architecture has been rendered, start with pilots, then trials, then system-wide infrastructure development projects. The VA could bring in public and private moneys in acting as a testbed. The VA should become affiliated with the DOD testbed

The VA in becoming a premier testbed for health informatics could develop the relationships to remain on the cutting edge. To establish this position, the VA should be able to offer private sector players resources and facilities to leverage their innovations.

6. WHAT LESSONS HAVE BEEN LEARNED FROM NUMEROUS TELEMEDICINE DEMONSTRATION PROJECTS CONDUCTED OVER THE LAST TWENTY YEARS?

The human infrastructure to support telemedicine is critical. Practitioner reimbursement is critical. An emphasis on sustainable telemedicine economies is essential. It is arguable that to date no telemedicine effort is sustainable outside of the research and development context until organic markets can be grown.

7. WHO ARE THE INFORMATION INFRASTRUCTURE AND TELEMEDICINE WINNERS AND LOSERS LIKELY TO BE?

If there is an empowered public, who are more able to take better care of themselves and make wiser decisions regarding how they utilize health services, health care utilization will go down. This will decrease the use of health facilities and practitioners. Some sickness care facilities and providers will continue to lose revenues. The public and services which support prevention, health promotion and self care will benefit. Those with medical problems that have led to restrictions or institutionalization, who can be managed at home with the use of health informatics, will have vastly improved quality of life.

8. IF ONE BENEFIT OF TELEMEDICINE IS IMPROVING ACCESS TO SPECIALTY CARE FROM REMOTE LOCATIONS, WHAT ARE THE FINANCIAL IMPLICATIONS OF THIS FOR THOSE WHO PROVIDE SPECIALTY CARE AND THOSE WHO OPERATE THE FACILITIES WHERE THIS CARE HAS BEEN PROVIDED?

In general, those who adopt and build market share in information-intensive specialty practices will greatly benefit financially from the emerging health information infrastructure. The laggards and will most likely lose their base of operation because the economics will shift toward the information-based practices. It will allow more rural clinics and hospitals to improve retention of local business. It is likely that informatics will, in the medium to longer term, also support greater proficiency in a broader clinical practice by generalists. As a result, some specialty practices will likely lose their economic base. In general, this will be a plus for access and quality of care. It will most likely have an important impact on medical cost containment.

Responses from Marilyn S. Cade,
Director, Technology and Infrastructure
AT&T Government Affairs
at the request of The Subcommittee on Oversight and Investigations
September 12, 1994

Question 1: A well-established network of healthcare providers and facilities, VA is already well suited to use and test telemedicine applications. What is needed for VA to take full advantage of its unique structure?

Response:
The VA itself is most qualified to provide detailed input and suggestions on the role it can play to ensure that it participates fully in national information infrastructure improvement efforts, in the evolution of telemedicine, and in the development of an electronic patient record. However, in AT&T's view, there are four essential and interrelated elements of the National Information Infrastructure:

- Information appliances
- Interconnected and interoperable communications networks
- Information resources
- Skilled, well-trained people to build, operate and use the above physical elements would benefit from the participation of the VA as an integral part of the various evolving testbeds.

For instance, in our view, the VA is well positioned to be a testbed for telemedicine applications and the provision of monitoring services in follow up treatment to patients in their homes or nursing/alternative care facilities. From their size, and complexity alone: 80,000 beds, 2.6 million patients treated each year, and 171 hospitals, over 350 clinics and 128 nursing homes spread over a healthcare delivery network that crosses state and national boundaries, the VA truly has unique distributed health population to serve which can benefit greatly from the enhanced services in healthcare which will evolve via the NII. It makes great sense that they become a participant, alongside private healthcare institutions, in testbeds and demonstration projects which examine how information can contribute to improved delivery and lowering cost to both the reimbursement system and the patient.

Undoubtedly some changes will be needed. Most existing systems need to improve and expand interconnected and interoperable communications networks, and augment the availability of very usable and mobile information appliances.

For instance, private sector, industry, and academic institutions are actively involved in the development of a healthcare information structure based on the evolving NII for the nation's future health care delivery system. By participating in these testbed environments, VA would also benefit from resources allocated for national telemedicine pilots.

In order to enable the VA to effectively participate in these endeavors, it may be necessary to define a clear path for VA to pursue cooperative and collaborative telemedicine efforts with other federal agencies, private sector industry, and academic institutions. For purposes of these demonstration/testbed endeavors, a private-Federal partnership would allow VA to work together with industry in pursuit of standards and solutions to the highly technical problems posed in telemedicine applications. For instance, the NIIT, National Information Infrastructure Testbed, an industry led coalition founded by AT&T, HP, DEC, IBM, Ellery Systems, SynOPTICS, Sprint, Sandia Labs and several other companies, universities, the National Labs, and other government agencies, is an excellent example of an initiative where government/industry partnerships are already making a difference.

We also believe that the leadership the VA already shows in working with other federal agencies' efforts in telemedicine, concerning telemedicine, rural health care, health care informatics, and NII development is to be applauded.

AT&T is already a provider of essential products and services used by the VA, and will continue to implement NII applications which are in concert with the VA's interests and initiatives.

An initiative that is also just beginning which could be of immediate interest is the NPR initiative being led by Dr. Ed Deagle of DoD on Telemedicine. This will be a cross-agency initiative which will include "dual use" telemedicine concepts to be prototyped by DoD for its dependent Health Care centers.

A first pilot is being planned at Brooke Army Medical Center, Ft. Sam Houston, Texas. It will include Telemedicine Links to the USAA retirement community in San Antonio (for geriatric patient monitoring) and to nearby Fort Hood, for OB/Gyn linking. Private sector participation is being organized under the C. Everett Koop Institute. AT&T is a leader in the private sector involvement in both this initiative and others like it. We would welcome the VA as a partner in this, or similar testbed/demonstration projects.

Question 2. ***What standards are needed and what action should Congress take to establish telecommunications standards and particularly standards for telemedicine applications?***

Response:
In AT&T's view, specific standards just for telemedicine are not a useful approach since that would segregate telemedicine to a highly specialized, and singular set of networking applications, limiting the use of commercially available products which can be customized to meet the telemedicine applications. We will discuss the presently evolving standards which are presently moving ahead fairly aggressively in some detail, and would be happy to arrange a further discussion about the standards process and the standards we have discussed in some detail, should your staff be interested, but want to make a critical point about the role of government in standards setting. In AT&T's view, neither Congress nor other governmental entities should establish standards, and in particular, we caution about setting standards in applications areas which are in the "evolving technology/applications" areas, including telemedicine. Voluntary industry related public processes already exist to develop any standards that may be required.

Standards are developed by the various standards organizations, primarily support several types of services:

- Transport services,
- Networking services
- Distributed computing and delivery services (known also as middleware services,) and
- Application services.

The transport services provide access and backbone transmission of information among systems, such as narrow band, Broadband, wireless, and wireline access. Networking services enable the establishment, maintenance, and termination of dialogues among systems, that might be built or operated by separate organizations or service providers. Distributed and delivery services provide the infrastructure that enable interoperabilty between applications that provide services for a specific industry, or across different industries. It provides services that enable different applications to cooperate while keeping information such as location and access methods transparent from the application. Health care applications may take advantage of standards that have been developed for these services, by building health care application based on the existing transport, networking, and distributed computing and delivery services. The computer and communications industry has developed in the last 20 years many standards that are recognized and used internationally and within countries. Example of such standards include directory services, electronic mail (messaging), databases, network management, security, local area networks, wide area networks, broad band and narrow band networks, multimedia networks and switching telecommunication

The international standards organizations, such as the International Standards Organization (ISO), the International Telecommunications Union (ITU), and the Internet Engineering Task Force, national standards organizations, such as American National Standards Organization (ANSI), industry forums and Consortiums (North American Directory Forum, Network Management Forum) were very instrumental in developing suits of standards fro the transport, networking, distribution and delivery services.

In some cases, specialized standards were viewed as necessary and are being developed. For example, the American College for Radiology/National Electrical Manufacturers Association (ACR/NEMA) has developed a standard for image transfer between devices. This standard specifies how to transfer medical images between devices by specifying all the services from the transport up to the application service. Implementing this application required building applications specifically to the specification of this standard. Recently ACR/NEMA has issued image transfer standards that utilize existing technologies, such as the protocol suit defined for the Internet, and by ISO and the ITU. Another example is the standards specified by the National Council for Prescription Drug Programs (NCPDP). This standard enables the interchange eligibility and billing information and is used by the majority of the community pharmacies in the United States. However, the standard has been implemented into a separate network that does not interpolate with other existing networks, that might already exist in a particular organization set up.

Many believe that the health care industry has poorly managed its standards development process, with many overlapping standards and gaps with no applicable standards. Electronic data interchange standards, that specify the specific interchanged data elements and their syntactical structure, are developed by six separate standards organizations. There are many coding systems that have been developed by various organizations, e.g., some 12 coding systems for diagnostic purposes, about 20 coding systems for procedure observation and drug identifications. It is conceivable that more than one coding system needs to exist, but each such system should pertain to a specific subject domain to eliminate overlapping coding systems, e.g., a consistent coding system could include the following subject domains: clinical observations, diagnoses, drugs, procedures and patient outcomes.

However, this situation has been recognized by the health care industry and some measures have been taken to change this situation. ANSI has formed the ad-hoc Health Care Planning Panel that was charged to coordinate standards development processes across different standards organizations. HISPP is now considering alternatives to evolve the HISPP into a more permanent status, placed within the ANSI organizational structure. The attention of HISPP has been focused on data interchange standards, with a remarkable cooperation from the existing standards organizations that develop data interchange standards. There is a need to expand the scope of coordination and include other type of technologies such as computerized medical records and telemedicine. HISPP has shown that it is possible to successfully promote the spirit of cooperation to replace the lack of communication among the various health care informatics standards groups.

The Computer-based Patient Records Institute (CPRI) recognized that the health care in the U.S. is seriously hampered by the lack of tools to efficiently access and manage health information. CPRI has taken the lead and put together a joint public/private standards acceleration project proposal to improve the health information resources of the nation. The purpose of this proposal is to seek funds, matched with direct and in-kind contributions from the health care industry to accelerate the health data standards development. The major deliverables of this project proposal include developing conceptual models, develop standards, and demonstration and validation sites that will serve as testbeds for rapid incorporation of standards into live systems.

The activities of HISPP and CPRI, together with the ACR/NEMA example where it recognized the need to develop more general standards, show that the health care industry has recognized the need to develop a more consistent paradigm for the health care industry, and replace standards for specific health care applications with a more consistent approach. While Congress does not need to intervene in identifying the standards that are necessary to reach a coherent health care system in the U.S. there are nevertheless, other critical areas where Congress plays a critical role:

- Ensure that Congressional initiatives and appropriations support the full participation of both the private sector and government agencies in demonstrations and testbeds in areas such as telemedicine and healthcare informatics where standards can evolve
- Enact HR1757/S4, Title VI which extends the HPCC program into testbeds and application areas

Question 3: Who will have access to the National Information Infrastructure (NII) and who should bear the cost of universal access?

Response:

"Universal Service" must be both understood, and reexamined in the newly emerging NII environment. We are in the midst of a technological revolution which can dramatically change how people access and use information, and we should give some thought to what our Nation's goals are in the newly digitized, multimedia environment, and understand what competitive markets can bring to consumers/users, versus when government action and oversight is still needed.

AT&T believes that the examination of universal service needs some thought, and that telecommunications legislation reform, which introduces competition into the local exchange can take place, without delay, while other issues, such as universal service are given more thought and examination. Our citizens deserve the opportunity to understand and participate in the dialogue. Overall, the competitive model we use in this country for almost all of our industries has created a quality of life which is the envy of all other developed and developing nations. We must spend more time understanding the role of universal service and how to actualize the Twentieth Century version of Universal Access for all Americans. We believe that we "created" the concept, and we intend to be a key player in the debate. There is no doubt that the quality of life in our country, which we are all committed to providing for all citizens, depends on our ability to provide the 20th Century version of raw materials: information. At the same time, we should not be seduced by any one technological solution. Competition is needed not only among suppliers, but among technologies as well. If we had fallen into the trap, as a nation, to endorsing "fiber to the home" as our mainstream focus, we would have missed a phenomenon about Americans: we are rapidly becoming the truly "tetherless" society, demanding and craving information wherever we are, at our home, in our car, at our workplace. Portability and mobility are essential components of an effective and useful communications infrastructure. In the delivery of healthcare services, mobile devices are increasingly important, not only in the dispatched emergency vehicle, but in the emergency room, as the patient is transferred from ER to their room, in the technology an physician might use as they conduct an examination. And healthcare is only one of the examples of that need.

While is it premature to mandate definitions of universal service and access, some steps are underway to examine how to bring improved access to our schools and libraries by the year 2000 and AT&T is working actively to help to define possible solutions.

However, the definition of "Universal service" deserves more discussion with those who will be most affected – the consumers and voters of America – to ensure that their interests and concerns are understood and addressed, including how to create both a competitive environment which will ensure that private investment delivers the broadest possible infrastructure, affordably available to the widest possible constituency, and when that approach fails, how to provide essential subsidies to the consumer so that they can purchase from competitive alternatives.

Question 4: What lessons have been learned from numerous telemedicine demonstration projects conducted over the last twenty years?

Response:
Within the civilian healthcare environment, the electronic systems used for the management and administration of healthcare delivery are largely not integrated. While information management processes at many hospital s are automated, many are unable to communicate with departments within their facility, and the vast majority are still unable to link with their doctors' offices across the street.

Additionally, needed data is not collected in digital form. Highly trained professionals continue to rely on hand written notes. Clinical test results are often not available at the time of examination, thus, creating the need for duplicate testing.

Methodology for quantifying the clinical and administrative benefits of telemedicine is yet to be defined. Specifically, how do the costs of telemedicine compare with the benefits to be gained. It seems likely that significant cost savings in the treatment of individual patients by the application of telemedicine systems could be documented. Yet, there is no standard by which the healthcare industry can accurately assess the economic and quality of care issues surrounding telemedicine.

Patient and physician acceptance of telemedicine acceptance of telemedicine use is an additional concern. A broader issue within this arena is that of patient privacy and the confidentiality of electronic medical records. The issue here is to create information systems within the healthcare environment that will be acceptable to patients, will balance the need to make records available rapidly, at the geographic location where needed, in rural or remote areas or for needy citizens, while preserving individual privacy.

While there have been numerous public and private sector telemedicine trials and demonstrations, to date, there remain significant policy and procedural barriers to adoption of telemedicine on a broad basis:

- A major barrier to the use of telemedicine to support diagnoses and information access is the lack of standardized reimbursement processes. Specifically, concern that reimbursement for telemedicine will result in unnecessary use of second or third medical options.

- Licensure of healthcare providers becomes an issue when the physician and patient connect electronically, rather than physically. Federal and state government telemedicine licensing requirement issues must be addressed.

- Malpractice liability may prove to be a great impediment to the acceptance of telemedicine. Telemedicine systems which provide current references to support medical decisions, combined with the ability to store an electronic version of the information used to support the diagnosis, can provide additional supportive record keeping.

- The affordability and availability of technology in support of telemedicine is essential to assure its evolution as one of the information systems of the healthcare support infrastructure. It is our view that competition prescribes that the healthcare delivery system should be free to select the technology that support the services they provided to their users/clients. Thoughtful implementation of a competitive model which recognizes that monopolies are reluctant to relinquish their market advantage, and that to date, the effective competition model has worked best in our society to ensure a range of options, at affordable prices, and with ongoing commitment to innovation and research and development. Clearly, this would also require modification of complex, federal government procurement regulations which currently govern the purchase of electronic equipment and technology needed to support telemedicine within the public sector.

Further research and development to define the most viable and effective uses of telemedicine are needed. It is important to note that no consistent set of policies or approaches has yet emerged which will support the move of the full system of healthcare into an open systems architecture based on interoperable standards, which will facilitate the sharing of information to appropriate approved decision makers, in a timely and cost effective manner.

But, one lesson we have learned and can validate is that modern telecommunication and information applications are able to support various aspects of care giving from the storage and transfer of patient information to the use of remote experts that may remotely analyze images relating to patient maladies to help provide flexibility in a cost effective manner.
Our challenge is now to integrate that learning into our practices into our public policies, and into our systems of care, not only in the VA, but throughout the healthcare delivery system.

Question 5: ***If a goal of the National Information Infrastructure is a wide-area, comprehensive, integrated network of information systems, with hackers already gaining access to even the most secure computer networks, how can the confidentiality of information, including patient medical records, be maintained?***

Response:
While further work is needed in legislation defining parameters and penalties for misuse, this Congress is very close to enacting such legislation. But on the whole, what is needed is useful agreement on behavior on handling such information. For instance, many Americans fear the move into digital/electronic medical records, envisioning thousands of "hackers" looking for information which can be used to damage an individual, or that information which is in an electronic medical record might be "more available" to unauthorized" personnel in their place of work. That is frankly, not the case. Confidentiality of medical data is actually more secure in a physical sense if it resides electronically in a password protected system. In today's environment, the record is often left out to be seen by whomever passes by. While we might

not like to acknowledge these facts, they are the reality of all paper records, whether they are medical records, attendance files, personnel records, performance appraisals, etc. We have developed standards of practice to protect paper files, including legal protection, locking file cabinets, etc. Effective practices need to be codified and implemented in the electronic age.

In healthcare, confidentiality is mostly controlled by employer agreements with its employees. And today's technology can provide fairly sophisticated, and adequate protection. Network access security can be achieved through the use of technology (AT&T may lead the industry in its expertise since we have considerable experience in network management/security, but we believe that the technology largely exists today to provide adequate safeguards against most problems which will develop. For instance, we can describe our own capabilities to address these concerns: Data security can be achieved by a number of security and encryption systems, many of which are offered by AT&T Secure Products; these are commercial versions of those systems in use by the Department of Defense. As the proceedings of the Computer Based Patient Records Subcommittee on Security can attest, there are a number of outstanding issues to be resolved however. As an example, Primary Diagnostic Quality radiological images should not be encrypted via the standard encryption mechanisms such as the DES algorithm because these systems employ a technique known as bit replacement which in turn causes bit loss which is in violation of the ACR-NEMA standards. AT&T had developed replacement products in these areas and we have an installed example of a network security system as part of the Community Health Network initiative at Akron General Medical Center.

Question 6: Who are the information infrastructure and telemedicine winners and losers likely to be?

Response:
We believe that our nation's citizens will be the winners since information technology will expand to support professional caregivers, bringing improved access to support more informed decisions, and helping to reduce duplicate costs and burdensome paper work. Telemedicine will improve the patients' access to medical specialists, lower the burden on the family to transport the patient, and improve the patients' ability to remain in the home and in the community for treatment. Those information infrastructure and telemedicine service providers who relate to user needs will flourish as is the case for all service related activity in our country.

But, there are often "losers" when there is a shift in practice or policy. Increased access to physicians/specialists located in other geographic areas may cause a great deal of concern within states who are worried about the flow of patients outside the state boundaries and the inability of the instate physician/healthcare system to compete. Policies must take these issues into account.

To some extent, specialized physicians may be among the losers.. As expertise concentrates in telemedical service centers, these specialists will have greater competition and there will be need for fewer specialists vs. primary care physicians. The primary care physician will be a big winner as will the patient, since a better quality of care will be deliverable at the GP's office, for instance, the general practitioner with a network of specialists to draw upon electronically, can ensure the best and most convenient treatment support for their patients, with minimized need to travel, improved ability to involve the family in the diagnostic encounter, and in the treatment.

The biggest single hindrance to the success of telemedicine is the individual state laws requiring licensure of the doctors within their state to perform diagnosis or be reimbursed on a consult. States may be reluctant to change their licensure practices since it protects their base of physicians from competition of doctors in neighboring states but also gives them the oversight they need to ensure quality of care is protected. Multi-state licensure may be an optional move which would address this issue.

There may be concern that states with more prestigious medical universities will have a better ability to compete for these services since they will have a larger base of quality medical students and professionals to draw from to staff these telemedical centers of excellence; that could lead to a useful sort of competition within the medical practice area which would ultimately benefit the patient through better quality of care.

In summary, our concern must be patient concerned, improving care and information to support that care. Our nation is dependent upon the health and well being of our citizens– and the NII is an essential part of bringing improved access to information to patients, caregivers, administrators and policy makers.

Office of the Director
Center for Telemedicine

September 19, 1994

Honorable Lane Evans
Chairman
Subcommittee on Oversight and Investigations
U. S. House of Representatives
Committee on Veteran's Affairs
335 Cannon House Office Building
Washington, D.C. 20515

Dear Representative Evans:

I apologize for not responding sooner to your letter regarding Telemedicine and its application to the V.A. Health Care System. My travel schedule has been extensive and I was unable to respond until now. I have enclosed a packet of information that I hope will provide answers to your questions.

In general, the application of telemedicine to the V.A. Health Care System would address many of the problems that now exist. By developing a "hub and spoke" configuration between the V.A. Medical Centers and primary care facilities within a 75-100 mile radius, telemedicine would dramatically facilitate access to the medical expertise that exists at the hub facilities. In addition, based on the communication infrastructure, all hubs and satellites could network with each other, thus allowing an expert in one part of the country to be available to a patient in any other part of the country! Avoidance of delays in therapy, reductions in costs, and standardization of quality are some obvious benefits of this system.

Although you did not ask me for suggestions, I would recommend that the V.A. Health Care System develop a pilot study utilizing a telemedicine system in the above configuration, and evaluate it over a one-to-two year period to determine if it is meeting the objectives.

Honorable Lane Evans
September 16, 1994
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Obviously, since we have a comprehensive system already in place in Georgia, we could incorporate the V.A. "test bed project" into our existing evaluative framework. I would be happy to discuss this further with you. You may reach me at (706) 721-6616, (706) 721-7270 fax.

Sincerely,

Jay Sanders

Jay H. Sanders, M. D., F.A.C.P.
Professor of Medicine and Surgery
Eminent Scholar of Telemedicine
Director, Telemedicine Center

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Enclosure

TELEMEDICINE

CHALLENGES TO IMPLEMENTATION

Jay H. Sanders, M.D.

Professor of Medicine
Director, Telemedicine Center
Eminent Scholar of Telemedicine
Medical College of Georgia

Jonathan S. Sanders, Esq.

It is ironic that despite dramatic advances in our ability to care for patients, our ability to translate that knowledge into an accessible, affordable health care system remains an elusive goal. As a result, millions of people have been unable to obtain even the most basic of health care needs. Socio-economic and geographical barriers for patients, compounded by educational isolation for physicians, underline the problems. Providing a patient health care where and when it is needed with an assurance of quality and an economy of cost clearly must be the objective of any health care delivery system. Since the present system does not satisfy these criteria, alternatives are needed. Telemedicine has been proposed as one of those alternatives. However, if telemedicine is to play a significant role, a number of implementation and operational issues will need to be addressed.

Licensure

It is anticipated that, based on the present individual state licensure system, a physician utilizing telemedicine to provide consultative services to a patient would have to be licensed in every state that the patient resided. Given the often burdensome process involved in obtaining state licensure it is unlikely that many physicians will pursue that avenue and, thus, potentially significantly limit the networking capability that this telecommunication system affords.

A number of potential solutions are proposed:

(1) individual state licensure for telemedicine should be converted to a national licensure similar to the military health care system. In fact, since physicians are required to take national examinations for licensure and certification it seems illogical to have a system of individual state licensure

in the first place. Perhaps, in order to assess the impact of such a change, a "national" license could be provided to those physicians who provide telemedicine consultations to patient populations that have been defined as "underserved";
(2) in the instance of a specialty consultation requested by the primary care physician, the referring physician retains responsibility for the care of that patient, and, therefore any "care" provided over telemedicine by the consulting physician in another state could be viewed as recommendations only;
(3) perhaps the most logical way to deal with state licensure requirements is to determine that the patient is, in fact, being "electronically transported" to the physician rather than the physician being transported to the patient.

Another licensure issue that surfaces when considering telemedicine consultations across state lines is whether the Federal Trade Commission would view this as interstate commerce.

Credentialing

Although issues similar to the licensing debate can be raised with reference to credentialing, it would appear that an opinion provided by the Joint Commission on Accreditation of Healthcare Organizations for the Medical College of Georgia telemedicine system could be uniformly applicable. The JCAHO determined that a physician at MCG who provided a telemedicine consultation of a patient at Dodge County Hospital (a rural hospital 130 miles distant from MCG) would not have to be credentialed at that rural hospital as long as any orders written in the patient's chart were by the referring physician at Dodge County Hospital. The consulting physician is not considered the physician responsible for the care of the patient.

Liability/Malpractice

Malpractice liability may prove to be one of the most vexing problems and could impede the general application of telemedicine. Obviously, any analysis of "what might be" will only gain validity from the outcome of precedent setting cases.

Although, to date, we have no evidence of any malpractice activity having been generated by past and present telemedicine initiatives, one can anticipate that as reimbursement becomes a reality, and as medical centers with "deep pockets" who become networked with remote sites are viewed in an "agency" relationship, more attention will be paid to this area by the legal profession. It also should be recognized that those telemedicine systems that utilize digital compression technology to transmit images will have a very special type of liability exposure, namely, that the "data" being reviewed by the consulting physician is not complete! Finally, the inability, at present, for telemedicine systems to allow for actual "hands on" examination of the patient will serve to foster the perception that a telemedicine consultation is incomplete or inadequate.

Clearly, a preventative approach to liability is the best defense. It must be stressed to the physician that if the visual/audio links do not provide adequate information transfer to allow for appropriate diagnostic interpretation none should be made. Videotaping of the entire consultative exchange will provide excellent record keeping and avoid the common pitfall of lack of documentation. Telemedicine systems that provide access to up-to-date references as well as the expanding library of "practice guidelines" now being introduced by the specialty societies will help to address the issue of whether the care provided by the physician satisfied community standards. Perhaps the doctrine of "sovereign immunity" could be applied to those physicians/medical centers that offer telemedicine consultations to the underserved.

Confidentiality

The transmission of personal and sensitive medical information over communication lines clearly lends itself to electronic intrusion and exposure. Encrypting algorithms will need to be introduced but it is naive to think that even the most sophisticated code could not be broken. Once again legal precedent will determine the standard, but it is likely that if "reasonable and customary" efforts are taken to maintain the security of records this issue will not be difficult to resolve. In fact, if one examines the fairly open access to patient records that prevails in our existing system it can be expected that the electronic transfer of medical information may have more security.

Recordkeeping

As has been noted, videotaping will allow for more accurate, as well as, expanded capture of medical information. However, medical records will exist at both ends of the communication link, thus raising the question as to which record reflects the legal one. How are we going to "edit" the vast amount of information retrieved, and will deletion of "unimportant" components of the patient's history and physical examination be considered record tampering?

Technology - Design/Operation/Maintenance

Today any technology-based system needs to share the following characteristics: (1) adaptability to change; (2) ease of operation, and (3) minimal maintenance requirements.

Changes in communication technology and information processing and management are occurring at a more rapid pace than even the most optimistic predictions. It is essential, therefore, that any multicomponent telemedicine system have an open architecture and modular design that can adapt to upgrades with component replacement rather than system extinction. Technical expertise should be a prerequisite only for the integrator of the system not the people using it. System controls must be user-friendly and incorporated into a single control panel. Every effort should be made to convert the present configuration, in which a separate telemedicine consultative room is utilized, to a more flexible desktop multi-media platform that is accessible to the physician in his/her office. Portability must also be a prerequisite to allow for the deployment of transportable telemedicine units that can service multiple remote facilities on an "as needed basis." System maintenance needs to be the simplest task of all - modularity of system components, telephone dial-up maintenance assessment algorithms, and "strategic" redundancy need to be incorporated into the system design. Most importantly, the design of the system must be dictated by the needs of the end-users not those of the system architect. Functionality must control structure and the technology should have a transparent interface between users.

Operational personnel requirements are minimal. A single FTE at each site can manage system operation, scheduling of the consultations and preventative maintenance responsibilities. If the base station system is situated in proximity to the emergency department, telemedicine consultations can be made available to the remote rural hospital on a 24-hour per day basis.

Technological Compatibility

It is imperative that equipment manufacturers strive for competitive similarities rather than proprietary constructs. Systems that can't "speak" the same language will never integrate with each other, and, thus, will paralyze network development. Witness the minimal use of facsimile machines prior to the introduction of a common language and the explosion in sales when a common alphabet was introduced.

Value/Economics

Telemedicine must be identified as a value added service to maintain its viability, and central to that objective, is that it be cost effective. Preliminary data from the MCG telemedicine system demonstrates that 81% of the patients who are seen over telemedicine have not required transfer to a secondary or tertiary care center. Given an average cost differential of $500 per day between the rural hospital bed ($800) and that at the Medical College of Georgia ($1300), even a 25% decrease in transfers would be a significant cost savings. Add to that the savings in transportation costs, increased productivity, and the decreased hospitalization days resulting from treating a patient at an earlier stage in their disease process, and it is apparent that the potential savings are significant. Consider also that the health care revenue generated is staying at the rural site thus enhancing not only the fiscal stability of that hospital but also the socio-economic fabric of that community. Finally, in contrast to most new medical technology, telemedicine systems do not require major capital investments, and the cost of individual components continue to fall as the technology improves. Despite the relatively low cost, however, it is recommended that rural health care facilities, in order to conserve cash flow, lease the system over a three to five year time frame allowing the revenue generated by the anticipated increase in bed census and ambulatory activity to offset the leasing costs. (The leasing contract should provide for component upgrades so that the system always remains at the cutting edge.) Assuming that the average cost of a satellite site if purchased outright is about $160,000, it should be noted that an increase of a single patient to the average per day bed census represents a net cash flow of $150,000/year to the hospital. However, despite the reduced capital expenditure many rural hospitals will still not have the needed start-up funding. If that is the case, then it is recommended that government (local, state and/or federal) provide a loan to "pump prime" these facilities. As revenue is generated the rural hospital will then be able to assume the monthly leasing costs as well as payback the start-up loan.

Educational Value

Perhaps one of the most important applications of telemedicine that will significantly foster its implementation is its capacity to alter the state of professional isolation that now exists for the rural based physician. Telemedicine addresses each of the necessary characteristics of an effective CME experience namely that the information provided is (1) timely, (2) pertinent to the issue, (3) convenient to obtain, (4) repetitive and (5) up-to-date. By providing immediate access to colleagues at the medical center, telemedicine creates an "electronic umbilical cord" between the two facilities, and allows for a real-time interactive educational experience for the referring physician. As importantly, it helps the academic based consultant to be more aware of, and sensitive to, the needs of the rural-based physician. An added fringe benefit is that, depending on the nature, format and comprehensiveness of the consultative interchange, it is possible to grant category I CME credits to the rural-based physician. The significance of obtaining these credits is underlined by the fact that in many states relicensure is dependent on having accumulated these credits and without this on-site opportunity afforded by telemedicine the process is both inconvenient and expensive.

Communication Costs

Telemedicine systems can interface with a variety of communication modalities (copper wire telephone lines, fiberoptic cable, microwave and satellite) thereby providing maximum flexibility for interconnectivity between sites. One problem with the use of telephone lines, however, is the complex rate structure that exists between LANs that create unrealistic communication costs. Although the introduction of ATM switching and fiberoptic cable will dramatically reduce per use cost, until those technologies are more generally available lower transmission costs for telemedicine will need to be structured to make it economically feasible for rural hospitals to participate.

Motivation for Providers and Patients

It is clear that a number of factors need to be in operation for both physician and patients to use the system, but, perhaps the most fundamental, is for the "users" to recognize a simple paradigm shift. One of the interesting aspects of telemedicine is the perception on the part of both physician and patient that this technology is futuristic. In fact, it incorporates all "off-the-shelf" technology. The telecommunications, cameras, remote control optics and examination devices are utilized on a day-to-day basis by each of us simply in different settings. With the same technology that allows us to watch a news anchor interact in real time with his/her correspondent in a distant part of the globe, or view through the use of a telephoto close-up lens, a distant landscape in intimate detail, so too can we examine a patient at a remote site.

For the rural based physician other operational motivating issues require that: (1) the time involved in a telemedicine consultation must integrate into his/her daily schedule and, if the physician can not participate in the consultation, a nurse at the remote end would suffice to allow for an effective examination by the consulting physician; (2) the consultation be reimbursable; (3) the consultation not be competitive; (4) continuity of care, by avoiding unnecessary referrals to secondary or tertiary care centers, be increased; (5) the physician's revenue stream be enhanced; (6) the consultation functions as an effective educational experience; (7) the system be easy to use; and (8) most importantly, it be perceived by that physician's patient as an effective consultative exchange.

Many of the critical factors outlined for the rural based physician hold true for the consulting physician. Economy of time, ease of use and a method for reimbursement are obvious needs. Perhaps the most difficult hurdle that telemedicine needs to clear is to satisfy the technical requirements of the consulting physician. To achieve this it is important that the system architect understands those needs prior to designing the system. Resolution capabilities are critical for the radiologist/pathologist; technological simplicity and user friendliness characterize the need of the mental health care professional, and audio quality of the electronic stethoscope and real time transmission of echocardiograms identify the desire of the cardiologist. Experience from previous telemedicine initiatives have taught us to anticipate that each specialist will come with a different expectation of the systems capability. This needs to be addressed and understood by those who endorse the introduction of telemedicine into the healthcare delivery system.

The ultimate test of the value of telemedicine will be dependent on how the patient perceives and adapts to it. If the patient feels the technology makes the consultation too impersonal; if the telemedicine consultation costs more and is not covered by insurance, and if the patient wants to have the physician literally at their side, telemedicine will not be an acceptable delivery system. In the same manner that there is a learning curve for the physician, we can anticipate a similar situation for the patient. A system that is designed to allow direct eye-to-eye contact, that is easy to use, and that gives the patient the ability to control the interview camera has been shown in previous telemedicine systems to be very "patient friendly." In fact, the patient has perceived himself or herself as being treated in a very special way. In the final analysis it will be the human component at each end of the system - not the technology - that will determine whether it is successful or not. Once again the design of the system must be determined by the needs of the people who use it!

Other Uses

It should be recognized that the telecommunication link between sites can be used for multiple purposes, including administrative meetings, nursing and other allied health educational or direct patient care activities. Telemedicine sites could also be integrated into a state's distance learning initiative so that preventative health care programs as well as acute episodic care intervention can be introduced to the classroom.

Continuous Quality Improvement - CQI

As with any component of the health care system, new or old, there must be regular oversight evaluation to ensure that the objectives for which it was introduced are continuing to be met. Economic viability, quality care, accessible service, appropriate utilization and educational strengths will need to be regularly verified in order to justify the continued operational status of the system.

Conclusion

This paper has attempted to sketch a picture of some of the issues related to the implementation of telemedicine. Whatever new directions or programs we eventually initiate to impact the problems in our health care delivery system it must be coupled with a commitment to analyze and critique them. Despite the feeling that changes need to be made rapidly, solutions cannot come overnight. While tradition can not justify maintaining the present inequities, a new idea can not simply be equated with a proven solution. New programs must be developed to provide the flexibility to accommodate to a wide variety of practice situations and a built-in mechanism to respond to changes in program objectives.

The true measure of the performance of any new system will be whether it effects an improvement in the health of the people it serves. Finally to those of us who believe that telemedicine is a solution close at hand and will require only simple changes we had best heed the words of the philosopher John Gardner. "Social change is a learning process for all concerned. It always requires reeducation of large numbers of people to accept new objectives, new values, new procedures. It can not go forward without the breaking down of long established ways of doing and thinking. This is true whether the problem is one of civil rights, the reform of local government, educational improvement, or urban renewal. Most human institutions are designed to resist such learning rather than facilitate it."

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TELEMEDICINE: Bringing Medical Care to Isolated Communities

Jay H. Sanders, MD, Francis J. Tedesco, MD

Using an interactive voice and color video telecommunication system integrated with biomedical telemetry, physicians at a medical hub can examine and treat patients at multiple satellite locations.

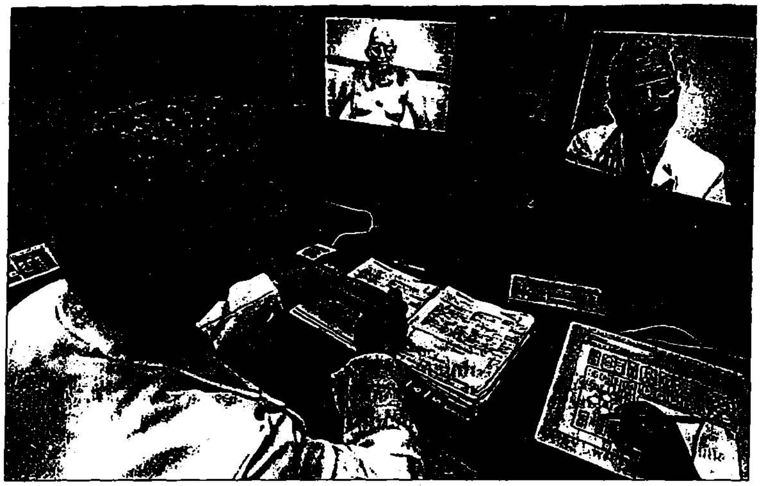
DESPITE ADVANCES in our ability to diagnose and treat both acute and chronic medical conditions, we frequently fail to translate that ability into deliverable services. As a result of geographic and socio-economic constraints, thousands of Georgians, disenfranchised from the health care system, are being denied basic medical services. Providing affordable, quality health care to patients where and when they need it has remained a frustratingly elusive goal. One of the major barriers to health care for patients in isolated or impoverished communities is the inadequate number of physicians who choose to establish or maintain their practice outside of a major metropolitan area. This resulting lack of physicians in Georgia's more isolated communities compromises both quality and continuity of care. Transportation costs also increase as patients must be transferred to distant hospitals. These transfers are deleterious not only to the patient but to the community as well. As a local hospital's bed census declines, its fiscal viability, along with the socio-economic fabric of the community, is threatened.

Clearly, innovative alternatives to the existing health care delivery system must be developed, implemented, and evaluated. Georgia's isolated communities need a health care system that brings together existing professional and technologic resources to meet patients' medical needs. This alternative system needs to have the capacity to disperse and decentralize resources without compromising quality of care or escalating costs.

Committed to alleviating Georgia's health care delivery crisis, the Medical College of Georgia (MCG) developed and implemented a medical network known as the Telemedicine System. Introduced in November, 1991, and operating at MCG, the Telemedicine System effectively narrows the gap between our medical expertise and our health care delivery system. Using an interactive voice and color video telecommunication system integrated with biomedical telemetry, physicians at a medical hub, such as MCG, can examine and treat patients at multiple satellite locations, e.g., rural hospitals, ambulatory health centers, nursing homes, emergency rooms, correctional institutions, and international health facilities. By electronically transporting the expertise and state of the art technology of a major medical center to an isolated community, the Telemedicine System enhances patient care. When this System is utilized, patients can receive optimum medical care in their local hospital, avoiding both the costs and emotional distress of travel to a distant hospital. By remaining in their community, the patient also benefits from the continuity of care offered by their own physician. In cases of trauma, the Telemedicine System can decrease both morbidity and mortality by bringing immediate, state-of-the-art, trauma care to the injured patient.

By providing consultation, technologic services, and continuing medical education, the Telemedicine System also enhances the capabilities of local physicians. This, in turn, reduces their malpractice exposure and diminishes their sense of professional isolation. These benefits encourage physicians to establish and maintain practices in our smaller, rural communities. An increase in the number of physicians translates not only into better medical care for patients but also into economic growth for

Dr Sanders is Director of the Telemedicine Center, Medical College of Georgia, and Dr. Tedesco is President of MCG. Send reprint requests to Dr Sanders at MCG, Augusta, GA 30912-1655.



Using the Telemedicine System, Dr. Marshall B. Allen, Chief of Neurosurgery at the Medical College of Georgia, conducts a consultation with a patient at a satellite location.

hospitals and the communities they serve. When revenues generated in meeting the health care needs of local residents remain in the community, everyone benefits.

The Telemedicine System is effective with virtually any medical specialty. Based on the requirements of the satellite location, any number of diagnostic devices can be integrated into the system. The physician at the medical hub can conduct a complete history and physical examination as if the patient at the satellite location were sitting in his/her office. The remotely controlled examination camera has a powerful zoom-focus capability, enabling a dermatologist to examine minute details of a patient's skin. An electronic stethoscope, in conjunction with real-time digital transmission of an EKG or echocardiogram, enables a cardiologist to conduct a complete cardiac examination.

Specific camera adapters and resolution capabilities, enhanced by remote controlled optics, provide the ophthalmologist a clear view of the retina of a patient who may be miles away. An ENT specialist can observe a laryngoscopic examination. A gastroenterologist can direct an endoscopic procedure. A radiologist can interpret x-ray findings, including MRIs, CAT scans, and ultrasound. A pathologist, utilizing the telemicroscopic adaptor, can examine a frozen section or bone marrow slide. A surgeon or gynecologist can guide a laparoscopic procedure.

In addition to directly examining and treating patients, specialists at a medical hub can also provide assistance and ongoing training to physicians at a satellite location. A thoracic surgeon can guide a local surgeon performing thoracoscopic surgery. A urologist can monitor a cystoscopic procedure; an orthopedist can direct arthroscopic surgery. A trauma surgeon at a medical hub can examine an accident victim at a satellite location and then guide the local medical team as they carry out resuscitative measures and surgical procedures.

At the heart of the Telemedicine System is a computer controlled switching matrix that allows networking between the medical hub and multiple satellite locations. If desired, the video component of the System can tape consultations for record keeping, quality assessment, and teaching purposes. A high speed, plain paper facsimile affords immediate, efficient document transfer of patient records, prescriptions, consultation notes, data base references, etc.

Freeze-frame capability allows any image projected at either the medical hub or satellite location to be "frozen" and sent as a slide to the other facility. With a special menu provided by the control panel, x-rays, EKGs, and slides can be annotated with an electronic pen. An x-ray can be viewed on one video monitor while the patient examination is viewed on a second monitor. And as the specialist at the medical hub and the treating physician at the satellite location can evaluate the patient simultaneously, the latter physician receives

an immediate interactive educational experience that would not otherwise be available.

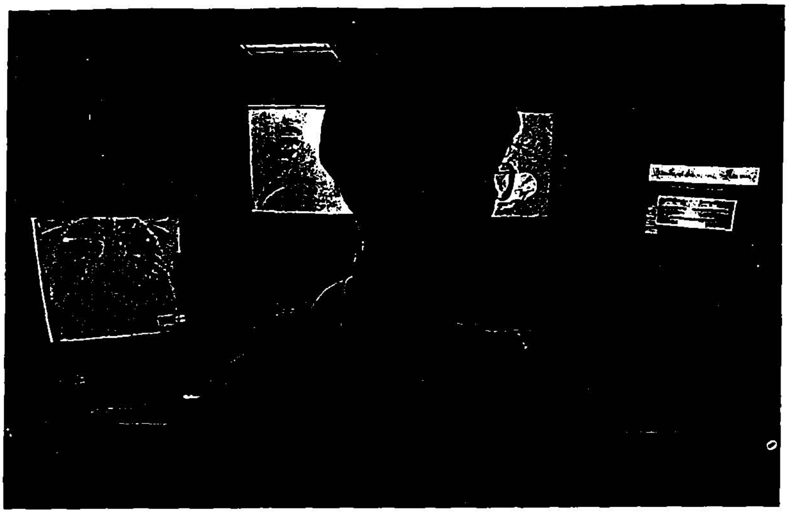
As a result of these interactive consultations, the expertise of local physicians is enhanced, enabling them to handle increasingly more complex problems. By sharing with physicians in isolated communities the expertise and technology available at major medical hubs, the Telemedicine System ensures that the latest advances in diagnosis and treatment are made available to all Georgians. The goal of The Telemedicine System is to assure that everyone in our state, whether living in the heart of Atlanta or on a south Georgia farm, has immediate access to quality medical care.

When patients are treated in their own community rather than transferred to a regional hospital, their physicians are able to provide continuity of care. In those instances where patient transfer is indicated, the local physician receives continual updates from the medical hub. Then when the patient is ready for discharge, the System provides the local physician with the expertise and technology needed to render follow-up treatment. For the patient, this means they are not further burdened with additional transportation costs of repeated trips back to the medical hub. In addition to saving both time and money, the patient is also able to conserve energy, typically in low reserve after a serious illness or injury.

A major benefit of the Telemedicine System is cost containment. The cost of a consult over the System is comparable to that of an EKG or chest x-ray. However, a decrease in total expenditures occurs due to the decline in patient transfers. This savings results from decreased transportation costs as well as the cost differential between the two types of facilities. Though overall costs are reduced, revenues that are generated remain within the patient's community. Keeping health care dollars in the community encourages physicians to continue practicing in the area. This, in turn, strengthens the revenue base of the community hospital, enhancing quality of care while reducing per-patient costs. And as the health care industry is frequently a major employer in rural areas, the entire community can benefit from economic growth.

The medical hub requires space comparable to the total square footage of a physician's office. Space requirements for the satellite location are equivalent to a physician's examination room. The Telemedicine System is compatible with multiple types of communication systems; telephone, cable, microwave, satellite. The full complement of equipment needed by both the medical hub and its satellite locations can be easily installed and, as the need arises, relocated.

Adaptable to a mobile configuration, the equipment can also be placed in a small van and taken to multiple sites. This flexibility enables a satellite location to have access to specialty equipment on an as needed basis. Another advantage of the Telemedicine System is its almost limitless range. Once hooked up to the System, a cardiologist in Atlanta would be able to examine the heart of a patient across the country or across the street.



Elizabeth Michael, the Telemedicine Coordinator, studies patient test results in the Telemedicine Center.

The impact of the Telemedicine System has been so significant in the Augusta region that the Medical College of Georgia is proposing to Governor Miller that it be replicated statewide. We envision the state being divided into 6-8 regions that parallel existing medical (trauma network) and communication (LATA) boundaries.

Each medical hub would be charged with the responsibility for providing consultation and technologic assistance to all under-served health care facilities in their region. This would include, in addition to isolated hospitals, public health clinics, correctional institutions, and nursing homes. We will propose to the Governor that he charge a designated state agency or a public-private partnership group with the responsibility of establishing the criteria a health care facility would need to meet in order to be included in the network.

We will ask that this designated agency or group also be charged with the responsibility of establishing and maintaining a digital telecommunication system that links each hub to their area health care facilities and to each other. Additional responsibilities that would appropriately fall to the designated agency include purchasing, integrating, and maintaining the system. This would involve assuring system component compatibility, assessing new technologies for system integration and assuring multipoint switching capability. Finally, we will ask the Governor to appoint regional quality assurance committees, composed of physicians, patients, and other community professionals, to monitor the System's quality, accessibility and affordability.

By adopting this System statewide, Georgia has a unique opportunity to enhance medical services while simultaneously lowering costs and advancing economic development in our more isolated areas. By providing immediate access to quality health care services, the System alleviates many of the problems we confront in our efforts to bring technology and expertise to the people we took an oath to care for. The Telemedicine System puts quality medical care within reach of geographically and socio-economically isolated patients. By fostering continuing education, the System also markedly diminishes the sense of professional isolation physicians in rural communities often experience. And when patients are able to remain in their local hospital, they benefit from both the medical and psychologic advantages that continuity of care by one's own physician inherently confers.

The Telemedicine System exemplifies how the introduction of new technology can expand the availability and accessibility of medical care. With increased access to medical services, Georgians can become healthier and the overall burden on our health care system can be subsequently diminished. As local medical facilities become better able to care for patients, more physicians and health care dollars will remain in these smaller, more isolated communities. The Telemedicine System has the capacity to take Georgia's health care delivery system into the 21st century; and in so doing, point the way for the nation.

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* * *

In vain do they talk of happiness who never subdued an impulse in obedience to a principle. He who never sacrificed a present to a future good, or a personal to a general one, can speak of happiness only as the blind speak of color.

— HORACE MANN

Our definition of success is unorthodox. We claim that any man who is honest, fair, tolerant, kindly, charitable of others and well behaved is a success, no matter what his station in life.

— JAY E. HOUSE

What is difficulty? Only a word indicating the degree of strength requisite for accomplishing particular objects; a mere notice of the necessity for exertion; a bugbear to children and fools; only a mere stimulus to men.

— SAMUEL WARREN

Temptation rarely comes in working hours. It is in their leisure time that men are made or marred.

— W.M. TAYLOR

Head knowledge is good, but heart knowledge is indispensable. The training of the hands and feet must be added to make a rounded education. We must all learn these days to become spiritual pioneers if we would save the world from chaos.

— E.V. HAMMOND

The functions of an executive are to create and enforce policies rather than to work out problems resulting from such policies.

— LOUIS F. MUSIL

Gaiety that sweetens existence and makes it wholesome — a sense of humor, a zest of enjoyment — this is the accompaniment of courage which gives it a supreme value. Something of the high laughter of a Cyrano de Bergerac — the world needs it.

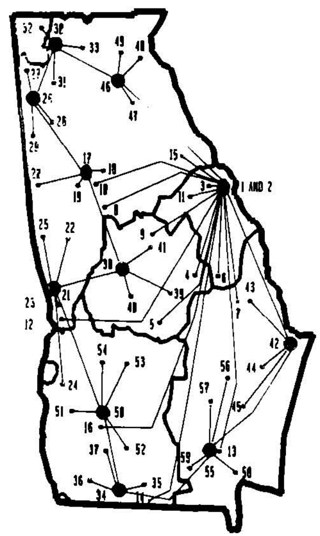
— DR. HEBERT HICKEN

Telemedicine Home Healthcare Network Demonstration

The Home Healthcare Network (HHN), an electronic housecall, is an innovative health care alternative for patients requiring frequent health care services that can only be provided traditionally in a hospital or ambulatory care facility. The network is designed to bring the health care provider electronically into the home environment of his or her patient to provide more frequent assessment/interventionso as to avoid or prevent progression of the disease process to a state of receiving acute hospitalization. Each in-home installation will be tailored to fit the needs of the patient. Non-invasive sensing functions such as vital signs, pulmonary function, heart and lung sounds, electrocardiogram, and blood gas analysis will be provided. Access to patient education materials and the type of clinical staff available for scheduled and/or on-demand interactive care (Video 911) will be individually designed. A consortium of specialists in health care, biomedical engineering, and medical informatics will design and test an HHN prototype serving 25 patients in the Augusta, Georgia area. The data collected will be used to evaluate (1) essential user interface characteristics of the presentation and operation of the system, (2) the elements of monitoring and therapeutic protocols required in the home environment and (3) the acceptance of the Telemedicine equipment and health care delivery in the home, (4) satisfaction with home health care by Telemedicine, and (5) the economic implications of Telemedicine-basedhome health care. The expected outcome of the demonstration will be an increased understanding of the potential of Telemedicine-basedhome Healthcare to lower health care costs, maintain quality, and increase patient access to and satisfaction with health care services.

Jay H. Sanders, M.D.
Max D. Miller, Ed. D.

GEORGIA STATEWIDE ACADEMIC and MEDICAL SYSTEM
GSAMS TELEMEDICINE LOCATIONS



- TELEMEDICINE TERTIARY HUB SITE
- TELEMEDICINE SECONDARY HUB SITE
- TELEMEDICINE REMOTE SITE
- FIBER OPTIC BACKBONE

1 AND 2 MEDICAL COLLEGE OF GEORGIA HUB, AUGUSTA
- 3 AUGUSTA CORRECTIONAL AND MEDICAL INSTITUTION, GROVETOWN
- 4 COMMUNITY HEALTH CENTER, WRIGHTSVILLE
- 5 DODGE COUNTY HOSPITAL, EASTMAN
- 6 EMANUEL COUNTY HOSPITAL, SWAINSBORO
- 7 REIDSVILLE STATE PRISON, REIDSVILLE
- 8 GEORGIA DIAGNOSTIC AND CLASSIFICATION CENTER, JACKSON, MOBILE
- 9 MEN'S CORRECTIONAL INSTITUTE, HARDWICK
- 10 METRO CORRECTIONAL INSTITUTION FOR WOMEN, ATLANTA, MOBILE
- 11 TRI-COUNTY HEALTH SYSTEMS, INC., WARRENTON
- 12 RUTLEDGE CORRECTIONAL INSTITUTION, COLUMBUS, MOBILE
- 13 SOUTHEAST HEALTH UNIT, WAYCROSS
- 14 VALDOSTA CORRECTIONAL INSTITUTE, VALDOSTA, MOBILE
- 15 WILLS MEMORIAL HOSPITAL, WASHINGTON
- 16 PHOEBE PUTNEY MEMORIAL HOSPITAL NURSERY, ALBANY

17 EMORY UNIVERSITY HOSPITAL HUB, ATLANTA
- 18 ROCKDALE HOSPITAL, CONYERS
- 19 SOUTHERN REGIONAL MEDICAL CENTER, RIVERDALE
- 20 TANNER MEDICAL CENTER, CARROLLTON

21 COLUMBUS REGIONAL HEALTHCARE SYSTEM, INC. HUB, COLUMBUS
- 22 MERIWETHER REGIONAL HOSPITAL, WARM SPRINGS
- 23 MUSCOGEE COUNTY JAIL, COLUMBUS
- 24 PATTERSON HOSPITAL, CUTHBERT
- 25 WEST GEORGIA MEDICAL CENTER, LAGRANGE

26 FLOYD MEDICAL CENTER HUB, ROME
- 27 CHATOOGA COUNTY HOSPITAL AND NURSING HOME, SUMMERVILLE
- 28 NORTH GEORGIA MEDICAL ASSOCIATION, TAYLORSVILLE
- 29 HIGGINS GENERAL HOSPITAL, BREMEN

30 HAMILTON MEDICAL CENTER, INC. HUB, DALTON
- 31 GORDON HOSPITAL, CALHOUN
- 32 NORTH GEORGIA FAMILY PHYSICIANS, RINGGOLD
- 33 NORTH GEORGIA MEDICAL CENTER, ELLIJAY

34 JOHN D. ARCHBOLD MEMORIAL HOSPITAL HUB, THOMASVILLE
- 35 BROOKS COUNTY HOSPITAL, QUITMAN
- 36 GRADY GENERAL HOSPITAL, CAIRO
- 37 MITCHELL COUNTY HOSPITAL, CAMILLA

38 MEDICAL CENTER OF CENTRAL GEORGIA HUB, MACON
- 39 FAIRVIEW PARK HOSPITAL, DUBLIN
- 40 HOUSTON MEDICAL CENTER, WARNER ROBINS
- 41 OCONEE REGIONAL MEDICAL CENTER, MILLEDGEVILLE

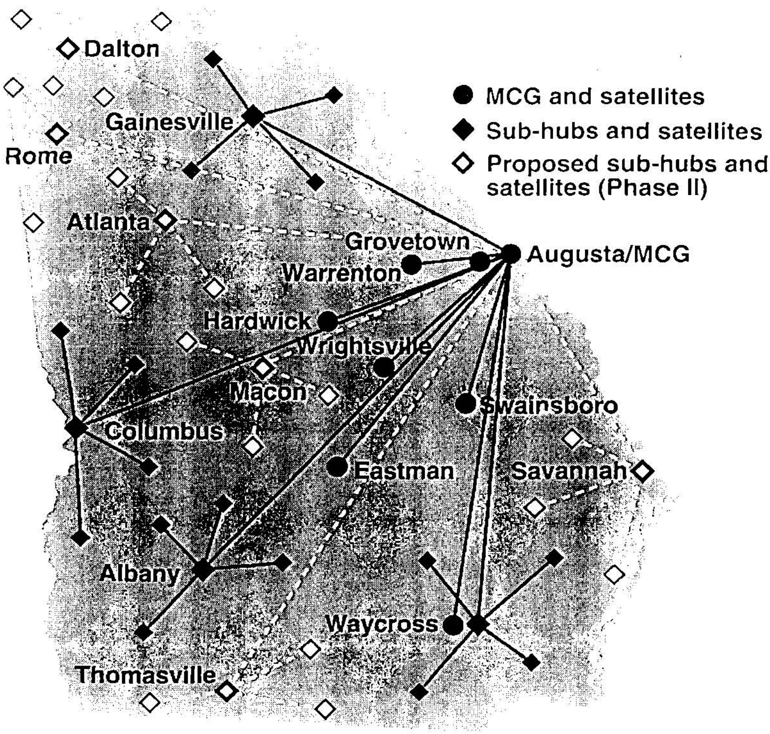
42 MEMORIAL MEDICAL CENTER, INC. HUB, SAVANNAH
- 43 BULLOCH MEMORIAL HOSPITAL, STATESBORO
- 44 LIBERTY MEMORIAL HOSPITAL, HINESVILLE
- 45 WAYNE MEMORIAL HOSPITAL, JESUP

46 NORTHEAST GEORGIA MEDICAL CENTER, INC. HUB, GAINESVILLE
- 47 BANKS-JACKSON-COMMERCE MEDICAL CENTER, COMMERCE
- 48 HABERSHAM MEDICAL CENTER, DEMOREST
- 49 WHITE COUNTY NEIGHBORHOOD HEALTHCARE CENTER, CLEVELAND

50 PHOEBE PUTNEY MEMORIAL HOSPITAL HUB, ALBANY
- 51 CALHOUN MEMORIAL HOSPITAL, ARLINGTON
- 52 COLQUITT REGIONAL MEDICAL CENTER, MOULTRIE
- 53 CRISP REGIONAL HOSPITAL, CORDELE
- 54 SUMTER REGIONAL HOSPITAL, AMERICUS

55 SATILLA REGIONAL MEDICAL CENTER HUB, WAYCROSS
- 56 APPLING GENERAL HOSPITAL, BAXLEY
- 57 BACON COUNTY HOSPITAL, ALMA
- 58 TBA
- 59 CLINCH COUNTY HOSPITAL, HOMERVILLE

Proposed Regionalized Telemedicine Health-Care Delivery System (Phase II)



The Telemedicine Health Care Delivery System

A system that electronically transports a consulting physician from a medical center complex to a patient at a distant health care facility

The Telemedicine Health Care Delivery System

The system utilizes interactive video communication integrated with remote controlled biomedical telemetry providing a consulting physician the ability to examine a patient at a satellite location as if the patient were in the physician's office

The Rural Community Hospital/ Physician Dilemma

- Lack of access to specialty care
- Declining bed census
- Professional isolation
- Discontinuity of care

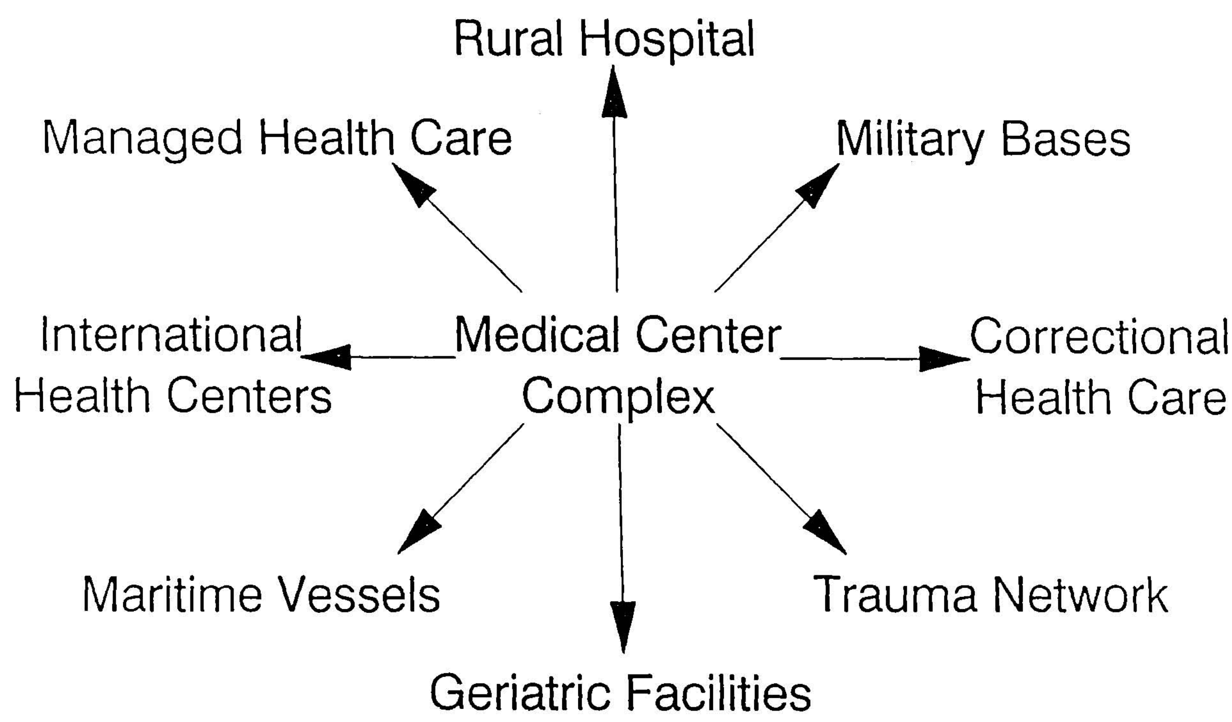
The Rural Community Hospital/ Physician Dilemma (continued)

- Compromised quality of care
- Ineffective continuing medical education
- Excess cost of care
- Lack of a medical data base

Telemedicine Health Care Delivery System Applications

- Rural health care
- Military health care
- Aging population
- Academic medical centers - Community hospital network
- Managed health care systems - HMO
- Correctional health care
- Trauma network

A Telemedicine Healthcare Network



Medical Advantages of Telemedicine

- Provides access to care
- Decreases professional isolation
- Enhances continuing medical education
- Enhances continuity of care

Medical Advantages of Telemedicine (continued)

- Decreases unnecessary referrals
- Immediate attention to life threatening problems
- Establishes an integrated health care network
- Provides enhanced quality

Economic Advantages of Telemedicine

- Increases revenue stream for remote site
- Increases revenue generated by primary health care provider
- Decreases cost of care to patient
- Decreases malpractice exposure

Economic Advantages of Telemedicine (continued)

- Decreases hospitalization days
- Does not compete with existing physician-patient population
- Expands market for base station physician
- Expands market for base station facility

Research and Development Opportunities

Quality

Cost

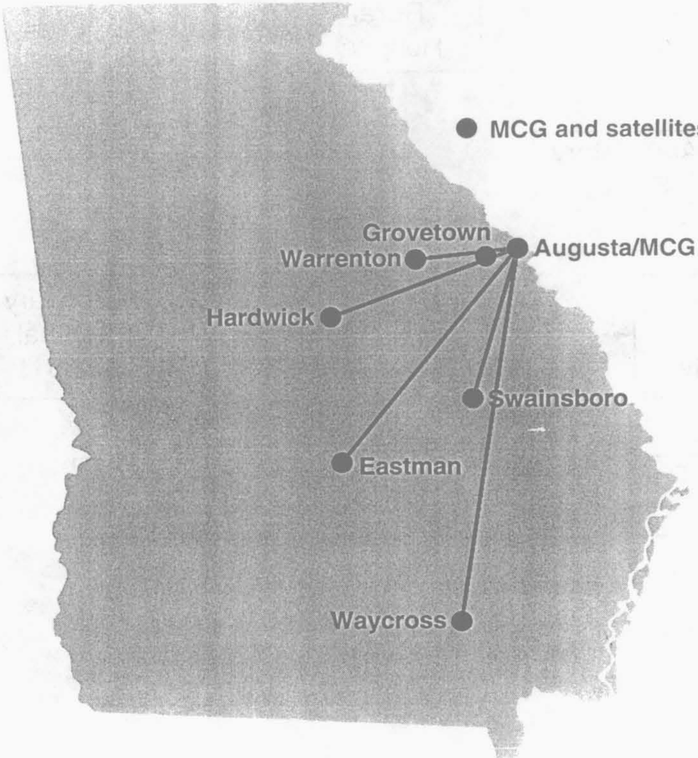
Access

Acceptance - The Human Technology

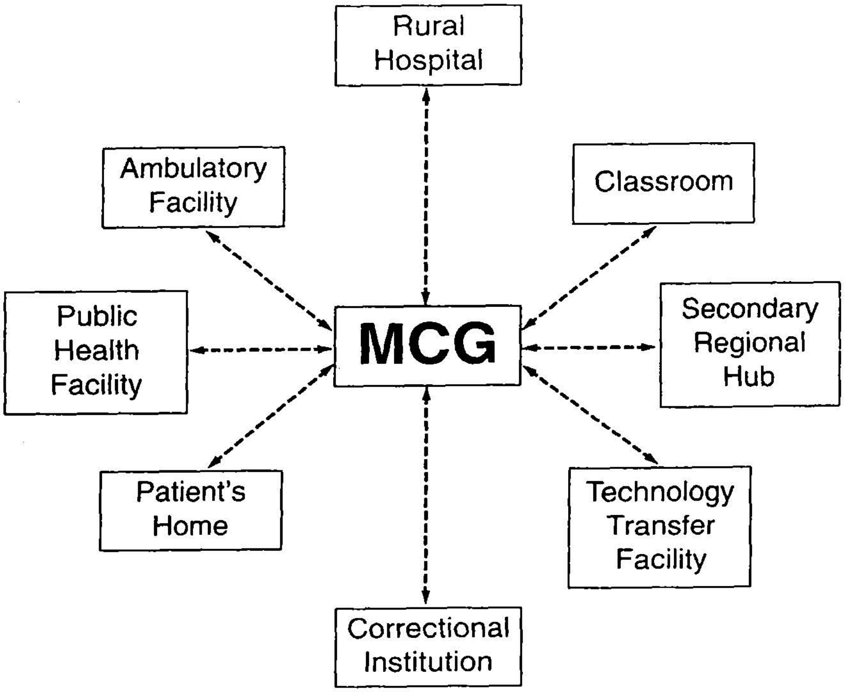
Continuity

Continuing Medical Education

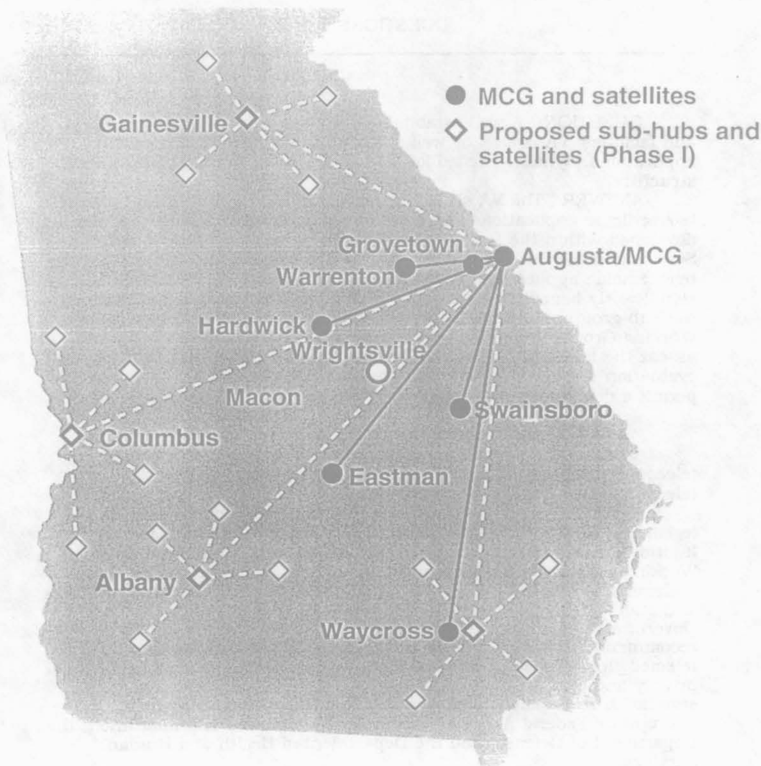
Regionalized Telemedicine Health-Care Delivery System (Existing)



MCG Telemedicine Network



Proposed Regionalized Telemedicine Health-Care Delivery System (Phase I)



Chairman Evans to Dr. John Silva, Program Manager, Advanced Research Projects Agency (ARPA), Department of Defense

QUESTION FOR THE RECORD
COMMITTEE ON VETERANS' AFFAIRS
SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS
VA HEALTH CARE: COMMUNICATION AND INFORMATION TECHNOLOGIES AND RELATED ISSUES
JULY 20, 1994

QUESTIONS 1 & 2

QUESTION: A well-established network of health care providers and facilities, VA is already well suited to use and test telemedicine applications. What is needed for VA to take full advantage of its unique structure?

ANSWER: The VA should become involved in current and planned telemedicine applications demonstrations, particularly those that are developed within the federal government, including Indian Health Service and the DoD. Since the cost of effectiveness and benefit of many telemedicine applications is not fully documented, the VA could significantly benefit by partnering with other Federal agencies, through the sub-group on Telemedicine of Health Information and Application Working Group, to develop jointly a set of objective evaluation criteria to assess the costs and benefits of telemedicine. Pooling data from multiple evaluation sites across Federally sponsored telemedicine projects should permit a deeper and more rapid analysis of those applications.

QUESTION: What action(s) should Congress take to establish telecommunications standards and particularly standards for telecommunication applications?

ANSWER: Congress has recently passed telecommunications legislation that will facilitate the establishment of the National Information Infrastructure (NII). The Health Information and Application Working Group recently sponsored a working conference on "Telemedicine Policy and the NII" that included Congressional members and staff, private sector stakeholders and participants from the Federal Government. Although the formal report is not complete, policy recommendations will be proposed that include standards for telemedicine. These standards should concern patient records, include privacy and confidentiality constraints, and be negotiated by existing standards development organizations in collaboration with the appropriate Federal Agencies including the Veterans Administration, the Department of Defense, and the Department of Health and Human Services.

QUESTION FOR THE RECORD
COMMITTEE ON VETERANS' AFFAIRS
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QUESTION 3

QUESTION: Who will have access to the National Information Infrastructure (NII) and who should bear the cost of universal access?

ANSWER: The Administration's Agenda for Action for the NII identifies principles and goals to guide government action with respect to information technology. One key premise is that the private sector must take the lead in designing, building, and operating the NII - and its health information system. The government can serve as a catalyst and facilitator by establishing the legal and policy framework for standard setting activity but the private sector must bear the majority of the burden for universal access.

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QUESTION 4

QUESTION: If a goal of the National Information Infrastructure is a wide-area, comprehensive, integrated, network of information systems, with hackers already gaining access to even the most secure computer networks, how can the confidentiality of information, including patient medical records, be maintained?

ANSWER: It is true that more effective safeguards are needed to ensure that individually-identifiable information is used only when it is truly necessary and that this information is protected from unauthorized access. This will certainly demand new technologies and new architectures for the physical network and new processes for its secure operation Fortunately, many other users of the NII have similar needs and concerns and will benefit from joint development activities.

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QUESTION 5

QUESTION: Who are the information infrastructure and telemedicine winners and losers likely to be?

ANSWER: Unless universal access can be established early in the development of the NII, many under-served and remote areas of the country will likely not be provided with "on and off ramps" to the NII. The second goal of the Administration's Agenda for Action calls for: extending the "Universal Service" concept to ensure that information resources are available to all at affordable prices. Committees and working groups of the Information Infrastructure Task Force are building consensus on these policy issues to enable agencies to develop and implement policy more quickly and effectively.

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QUESTIONS 6 & 7

THESE ARE REPEATS OF QUESTIONS 4 AND 5

QUESTION FOR THE RECORD
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QUESTION 8

QUESTION: If one benefit of telemedicine is improving access to specialty care from remote locations, what are the financial implications of this for those who provide specialty care and those who operate the facilities where this care has been provided?

ANSWER: This is a highly complex issue and relates to the utility of telemedicine services to local service providers. We believe that there is such an unsatisfied demand for care not yet provided in the current system, that increased remote access will displace little of the demand at existing facilities. The immediate impact therefore should be quite small.

Department of Veterans Affairs Witnesses and Technical Support for House Committee on Veterans' Affairs Subcommittee on Oversight and Investigations Hearing

VA Use of Telemedicine in Providing Care to Veterans

July 20, 1994

Witness:

Robert M. Kolodnor
Director, Medical Information Resources Management Office
Veterans Health Administration

Demonstration:

Robert M. Kolodnor
Director, Medical Information Resources Management Office
Veterans Health Administration

Francis P. Goldstein, M.D.
Associate Chief of Staff for Ambulatory Care
Veterans Health Administration

Ruth Dayhoff, M.D.
Director, Decentralized Hospital Computer Program Integrated Imaging Project
Washington Information Systems Center
Veterans Health Administration

Daniel L. Maloney
Director, Washington Information Systems Center
Veterans Health Administration

Ross Fletcher, M.D.
Chief, Cardiology Service
VA Medical Center, Washington, D.C.
Veterans Health Administration

Joseph De Francis
Cardiology Patient
VA Medical Center, Washington, D.C.

Technical Support

Leonard Bourget, Staff Director, Medical Information Resources Office (MIRMO)
Kay Craddock, RDMS, Cardiology Nurse, VA Medical Center, Washington, D.C.
Kevin Crawford, Technician, VA Medical Center, Washington, D.C.
Elisa Enison, Computer Systems Analyst, MIRMO
Stuart Frank, Computer Systems Analyst, Washington ISC
Rebecca Kelley, Information Resources Advisory Council, Washington Information Systems Center (ISC)
Garrett Kirin, Computer Systems Analyst, Washington ISC
Peter Kuzmak, Computer Systems Analyst, Washington ISC
Christopher McManus, Computer Systems Manager, Washington ISC
Helen Mysiw, Computer Systems Analyst, MIRMO
Susan Richie, Computer Systems Analyst, Washington ISC
Virginia Price, Chief, Executive Support, MIRMO

AT&T Support

Dom D'Amico, Video Applications Manager
Julius Gossette, Jr., Systems Consultant
Roger E. McDaniel, Emerging Markets Video

Office of Public Affairs
News Service

Washington, D.C. 20420
(202) 273-5700

Department of Veterans Affairs

VA Fact Sheet

TELEMEDICINE IN VA HEALTH CARE

The Department of Veterans Affairs (VA), which operates the nation's largest health-care system, is engaged in a wide variety of communication and information technologies designed to enhance the provision of health care to the nation's veterans. "Telemedicine" is a term that can be applied to clinical care and hospital administration, as well as education of health-care providers. In the clinical arena, by sharing information within the health-care system, VA can ensure that all data related to a patient's conditions are accurate and readily available to health care providers. Administratively, a network exists for connecting all VA medical facilities with other VA organizational elements, including a local and network electronic mail system. VA has the capability to transfer systemwide administrative, procurement, fiscal, clinical, benefits and cemetery data and information. Video teleconferencing is conducted to relay time-sensitive administrative information, and for continuing and professional education.

Currently, the following applications are in pilot stages or in use throughout VA's health-care system:

<u>Nurse Tele-Triage</u>
The VA Medical Center in Portland, Ore., was the first VA hospital to establish a nurse triage system in which patients can telephone a nurse to discuss problems, symptoms and medication refills, and to schedule appointments or receive instructions for further evaluation and care.

<u>Cardiac Pacemaker</u>
Since 1982, VA's Pacemaker Surveillance Centers have monitored pacemaker function of veterans by telephone. The system allows for the monitoring of more than 10,000 veterans.

<u>Remote System Access</u>
VA's Decentralized Hospital Computer Program system, which contains patient-related information, can be accessed remotely by health care professionals in different divisions of a VA hospital or by dialing into the system by means of a modem. VA medical centers also can query a national inpatient database to receive a patient profile, information on treatment and hospital admissions and diagnoses. Health summaries can then be requested from the VA hospitals that had previously provided treatment.

<u>Filmless X-Ray</u>
The Baltimore VA Medical Center is the world's first hospital to use filmless X-ray technology -- an all-digital picturing, archiving and communications system. Computer screens display images that can be manipulated by radiologists from anywhere in the

hospital by calling up images on a screen within minutes. Patients are subjected to less radiation, and the need to store X-ray film is eliminated.

Telephone Care by Health Care Providers

One VA study demonstrated that clinician-initiated telephone followup of routine revisits results in less frequent visits, reduced medication use, lower costs per patient and shorter hospitalizations without reducing patient function. A multi-site study has been designed to compare costs and health status between patients treated in customary face-to-face ambulatory care settings with patients whose visits were less frequent but were also augmented by physician-initiated telephone followups.

Patient Data Exchange

VA health care facilities can electronically exchange key clinical information summarizing a patient's medical treatment and status.

Electrocardiogram

ECG waveforms are routinely transmitted over telephone lines via modems from VA outpatient clinics and VA medical centers that do not have cardiologists available to other VA medical centers for interpretation and consultation.

Nuclear Medicine

VA has networks for transferring nuclear medicine diagnostic images using telephone lines through modems to larger VA medical centers for interpretation and consultation by nuclear medicine physicians.

Multi-Media Patient Data

Multi-media mail is being tested between the Washington and Baltimore VA Medical Centers to allow the transfer of nontext information, such as image, voice and waveforms, in addition to the current text-transferring capability.

Teleradiology

More than 50 VA medical centers are transmitting X-ray images, including CAT and MRI studies, from the site where they are taken to a remote site where they may be interpreted by a radiologist or where they are transmitted to another health-care provider for consultation or followup.

Continuing Medical Education

Educational video teleconferencing is available from a central site to all 171 VA medical centers for distribution of educational programs and time-sensitive administrative information. Both one-way and two-way teleconferencing is used for a variety of purposes, including access to expert consultation, clinical rounds, sharing of guest lectures and courses.

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Vol 1, No.1
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A monthly newsletter for the employees and volunteers of the Washington D.C. VA Medical Center

Department of Veterans Affairs

CAPITAL PULSE

VA's Pacemaker Center -- Reaching out to touch patients

Suzanne Martin, R.N., spends her workday on the phone. So do a lot of people. But Martin, who works in the Pacemaker Surveillance Center at the Washington D.C. VAMC, *really* spends her day on the phone, making as many as 35 calls a day to patients whose lives may depend on her.

"It's a fast-paced job and there's some frustration with not doing this face-to-face," said Martin. "You have to be explicit and patient. It's not easy dealing over the phone."

Only a bit bigger than a conventional cigarette lighter, pacemakers fire an electrical current to keep the heart from beating irregularly or too slowly.

Photo by Jay Adams

Barbara Wright, one of the center's pacemaker technicians, left, and Penny Precise, RN, a staff nurse, check on a patient.

The pacemaker's charge is usually not felt, so there is no easy way for the patient to tell if something is amiss. And since pacemakers are a machine, albeit highly sohisticated, things do go wrong. A pacemaker that quits prematurely can endanger a life, while removing a pacemaker that is still active means unnecessary surgery.

Therein lies the need for a surveillance center.

Martin, with three other nurses and two technicians, conducts 31,000 phone pacemaker checks a year on 5,000 patients living in 28 states east of the Mississippi River. Another five staff members provide administrative support.

The center, along with its western counterpart in San Francisco, opened in 1983. The two centers make up one of the country's largest pacemaker surveillance systems.

Working in the center is not a simple job. On any given day, the callers may uncover a life-threatening pacemaker irregularity that requires getting the patient to the hospital immediately. The center also must keep track of thousands of very mobile and sometimes uncooperative patients.

Continued on Back Page

Pacemaker
Cont. from Front Page

A computer-generated list of the names and numbers of those patients who need to be called are given to the callers each day. The callers contact the patients while seated next to a computer terminal and a receiver that traces the beating of the patient's heart and the firing of the pacemaker, said Margaret Duffy, the center's administrative officer.

Transmitters are given to all VA pacemaker patients. During the testing, the patients use the transmitters and their phone to send a "normal" reading through instruments attached to their finger or wrist. Their heartbeat is displayed on the center's receiver as a line of peaks and valleys.

The patient then holds a magnet over the pacemaker and transmits another signal for 30 seconds. The magnet forces the pacemaker to fire at its programmed timing.

By comparing the two graphs and relying on instructive data from the computer about specifications of the different pacemaker models, the caller is able to determine if the generator is functioning normally or if it is slowly losing strength. If the later is suspected, the frequency of calls may be increased.

"We're somebody they can relate to over time. We're someone they can share moments of their life with."

Though the vast majority of checks are without incident, a pacemaker is occasionally found to be completely nonfunctional, as was the case recently with a patient whose pacemaker lead had apparently broken. The patient was told to hold the magnet over the pacemaker to make it fire and to go immediately to the hospital. Without the opportune check, the patient could have died if the pacemaker jolt had been needed to spur the heart.

Judy Crews, RN, a pacemaker nurse specialist, and Kevin Crawford, a pacemaker technician, work together on a patient call.

Though checking the pacemaker is relatively simple, some patients do become confused or agitated during the test. Others have hearing or speech problems that make communication difficult. The callers must be kind but persistent in getting a reading.

In addition to checking on thousands of patients, the center has a 24-hour toll free number for patients with problems. The center is also the testing site for all pacemakers removed by VA physicians, and is the national VA pacemaker registry.

The registry, overseen by computer systems analyst Adele Beyoglu, includes clinical data on 30,000 present and former pacemaker patients. Beyoglu also keeps records on FDA warnings and failure trends of different pacemakers. The registry is so sophisticated, Beyoglu can track down a patient who has a pacemaker with a specific serial number recalled by the FDA.

Although the staff of the center do not usually meet the patients they talk to, the relationships are still important. All patients over 70 are sent birthday cards and families receive sympathy cards when a patient dies.

The callers also become an integral part of the patient's life, familiar with their relationship with their family and their economic situation.

"We're somebody they can relate to over time. Sometimes they need our support. And some of them are quite isolated," said Judy Crews, R.N. We're someone they can share moments of their life with." ★

<u>Story by Holly Fletcher, the medical center's Public Affairs Director</u>

Department of Veterans Affairs
CAPITAL PULSE
Washington D.C. VAMC
50 Irving Street N.W.
Washington D.C. 20422
(202) 745-8000

Director: Timothy B. Williams

Editor: Holly Fletcher
Photographers: Jay Adams, Lorraine Anderson
Graphic support: Learning Resources Service

Exchange of Veterans Affairs Medical Data Using National and Local Networks

RUTH E. DAYHOFF[*] AND DANIEL L. MALONEY

Washington Information Systems Center
Department of Veterans Affairs
8403 Colesville Road, Suite 200
Silver Spring, Maryland 20910

THE VETERANS HEALTH CARE SYSTEM

The Department of Veterans Affairs (VA) operates the largest health care system in the federal sector, consisting of 172 medical centers, 228 outpatient clinics, and 117 nursing homes. As the largest procurer of medical devices in the United States, vendor-independence and standards are critical to the VA. The VA employs 12,000 physicians and 60,000 nurses with contracts for services from an additional 18,000 physicians. It trains more than half of the practicing physicians in the United States and has over 750 sharing agreements with other hospitals. It serves as the primary back-up to the U.S. Armed Forces medical programs. Telecommunication within the VA has grown to fill a critical role in the provision of high quality care to 1.5 million inpatient veterans and 20 million outpatient veterans per year.

The VA has developed an infrastructure of computer hardware, software development tools, compatible hospital information systems, a full-featured electronic mail system, and a wide area network connecting its sites to support the exchange of medical data. This infrastructure allows the development of a variety of modes of data exchange to suit the range of medical needs within the VA facilities. These include use of electronic mail for messages, security sign-on to remote systems, request/reply protocols for predefined sets of data, CD-ROM and optical patient card networked workstations, and clinical surveillance systems with automatic input across the wide area network into national registries. The hospital information system used by the VA has been extended to create a powerful distributed local area network system to integrate image, text, and other types of medical data. Multimedia extensions to the VA's electronic mail system will soon allow images and other binary data to be included in mail messages. Further extensions of the local imaging networks to produce more widely distributed imaging systems are possible in the future as an aid to extended clinical consulting.

LOCAL NETWORK HOSPITAL INFORMATION SYSTEMS AT VA MEDICAL CENTERS

The VA uses a hospital information system (HIS) developed and maintained by its own staff called the Decentralized Hospital Computer Program (DHCP). DHCP is written in ANSI standard MUMPS and runs on a variety of hardware platforms. DHCP is in the public domain and is used in virtually all 172 VA medical centers.

[*]e-mail: dayhoff.r@forum.va.gov

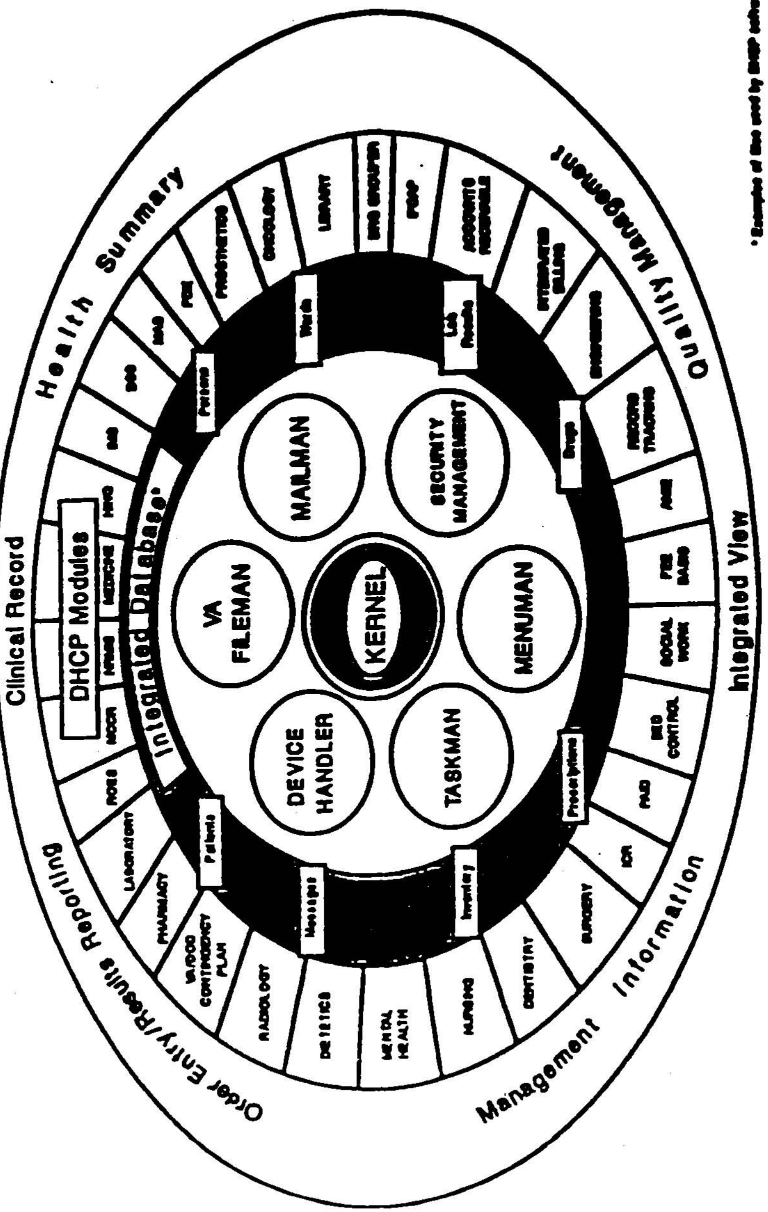

FIGURE 1. Department of Veterans Affairs DHCP computer system: Software development tools and applications.

* Examples of files used by DHCP software

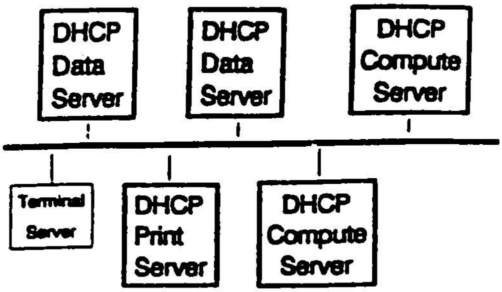

FIGURE 2. DHCP 80486-based network hospital information systems, one type of DHCP hospital information system local area network.

(VAMCs), as well as in derivative form by the Department of Defense, the Indian Health Service, other government agencies, and private hospitals worldwide. This internal system development approach provides compatibility among systems in all of the VA facilities that enables the development of distributed applications involving the exchange of data between facilities. It also allows the VA to enhance its HIS to meet constantly changing user requirements and to provide leadership in innovative hospital information system functionality.

The VA's DHCP system is different from multivendor systems in that it is an integrated system based on a central set of software development tools. These tools, produced by the VA, include the VA File Manager, a powerful database management system that includes extensive software development facilities; the VA Kernel which provides vendor independence, and various tools for menu management, output device control, security, and task scheduling; and the VA Mailman package which provides electronic mail and data transfer capabilities, and cooperates with the Kernel to provide remote procedure call capability. All of DHCP's many software modules, such as the laboratory, pharmacy, radiology, surgery, medicine, health summary, clinical record, and local and regional registry modules, are based on the VA tool kit and adhere to its rules. A modular architecture is used to allow easy integration of new technology as it becomes available (FIG. 1).

The hospital information systems at VAMCs typically run on Digital Equipment Corporation (DEC) VAX minicomputers in a VAX cluster architecture or on a network of Intel 80486-based microcomputers (FIG. 2).[1,2] Data processing is distributed among the machines in a client-server fashion so that the application software and the databases are located on different network nodes. The Distributed Data Processing protocol (DDP) is used to communicate MUMPS data between nodes across Ethernet.

THE VA'S NATIONAL NETWORK

The VA has a critical need to communicate with its distributed facilities including 172 medical centers, 228 outpatient clinics, 117 nursing homes, 189 veteran centers, 58 veterans benefits administration regional offices, 112 cemeteries, record center and depository, three data processing centers, and three supply depots. To connect over 600 major facilities, the VA has installed a wide area packet switched network known as the Integrated Data Communications Utility (IDCU).

consists of 23,000 miles of fully digital optical fiber network with four backbone nodes and 22 tributary nodes (FIG. 3). It provides flexible redundancy and system management services. The IDCU wide area network (WAN) supports a number of protocols including asynchronous, 3270 BSC, SDLC, X.25, async-to-3270, and M-2780. Sites typically communicate at 4,800 or 9,600 baud rates, although it is possible to achieve rates up to 56,000 baud using X.25 or direct lines. In the future, rates up to 1.544 megabits per second will be possible using frame relay. Overall, traffic is approximately 21 gigabytes per month. DHCP systems communicate across facilities using the VA's electronic mail software. Users with access privileges from one facility may access another facility's HIS system directly using one of the IDCU asynchronous connections. Systems may also communicate using TCP/IP over the IDCU network.

THE VA'S ELECTRONIC MAIL SOFTWARE

One of the key components of the VA's software is an electronic mail package called Mailman which provides both local and network distribution of messages, programs, file structures, and patient or other data. Each VA medical center hospital information system runs the Mailman electronic mail software. There are 85,000 VA Mailman users nationwide using Mailman for communications and reporting. Mailman complies with the Internet mail standard Simple Mail Transfer Protocol (SMTP). Adherence to standards is a mainstay of DHCP software development.

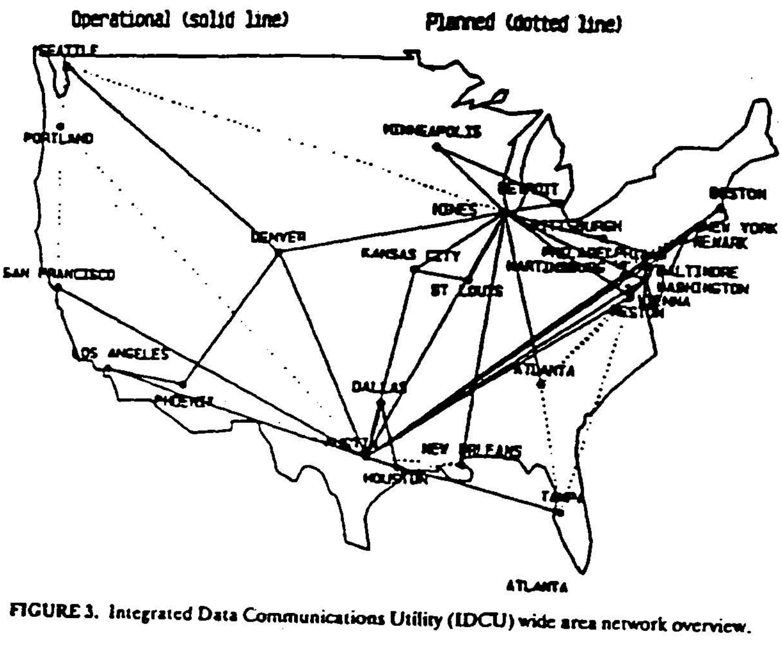

FIGURE 3. Integrated Data Communications Utility (IDCU) wide area network overview.

A national mail system called FORUM serves the needs of the VA's central office and information system centers. This system uses a component of the mailman software, "network mailman," which allows messages to be sent from one facility's network to another. FORUM also has connections to outside electronic mail systems such as Internet, BITNET, and the Wang mail system used in the VA's central office. The national FORUM system has 20,000 active users with 1636 mail groups, performing 186,000 signons per month. About 300,000 messages are delivered locally, and 3,000,000 lines of message text are read on a normal working day. The network mail facility sends 98,000 messages and receives 29,000 per month. It is also able to communicate with non-VA systems, receiving 9,940 incoming messages and sending 1,219 outgoing messages per month.

The Mailman package allows users to send, receive, copy, respond to, and organize electronic mail. It has entry points which allow DHCP applications to send bulletins or messages without user intervention. It allows users to send messages to groups of users, with all replies visible to the entire work group. Messages can be stored on the system and retrieved by message subject, message number, sender, or date. When needed, messages can be sent as confidential, as information only, or encrypted with a password. Any DHCP system printout can be directed to a mail message that can be sent to any mail user nationwide. Mailman also provides the ability for users or other applications to send messages to software applications, thus providing remote procedure call capability.[3]

Filegrams are used to move data between systems over Mailman electronic mail. A filegram template is created to define the data fields to be moved from the originating file to the remote system. Any data stored by reference is resolved at the time of message creation. This facility has been used by the Indian Health Service to synchronize patient records across several treatment sites.

Enhancements are currently being tested to allow transmission of other types of data objects, such as images or EKGs, as an integral part of a mail message. This project will enhance Mailman to use Multipurpose Internet Mail Extensions (MIME), the new Internet standard for non-textual message parts, in our continuing efforts to adhere to international standards.[4,5] These objects are managed by the same object file structures used by the DHCP Imaging System described below.[6-8] A mail message may contain pointers to data objects as one of its body parts. The necessary commands to send the associated data object to the receiving network node via FTP are automatically generated and executed. For image objects, an imaging workstation at the receiving facility displays the images simultaneously with the textual message information. In order to conserve network resources, the Mailman software performs checks before sending a data object to determine if the receiving site already has the data object as part of a previous message.

USE OF LOCAL ELECTRONIC MAIL FOR CLINICAL CARE

The VA's electronic mail system is used at the Long Beach, California V Medical Center for communication of medical consults.[9] A user enters the reque for a consultation into the electronic mail system. A medical consult secreta forwards the request to the appropriate physician, paging him or her if it is a emergency. The message is saved in a subspecialty specific mailbox that is used track the number of consults performed per month. Thus, physicians do not need waste time trying to reach each other by telephone for routine issues.

USE OF WIDE AREA NETWORK ELECTRONIC MAIL FOR EXCHANGE OF CLINICAL DATA

Transfer of Medical Records between Facilities

At the time of hurricane Hugo, patients were evacuated from the Charleston, South Carolina VA Medical Center to the VA Medical Center in Columbia, South Carolina.[10] However, many paper records were not put into the ambulance in time to go with the patients. Therefore, various patient data including registration data, laboratory results, and radiology reports were rapidly transmitted from the Charleston VAMC to the Columbia VAMC where the patients were. Records were transmitted up until the last minute when the hurricane hit and the Charleston VAMC systems were brought down. When the need for particular data was anticipated, it was sent by Charleston without request. Charleston also responded to requests from Columbia and vice versa. Finally, the physicians and staff at Columbia logged directly into the Charleston DHCP system.

Not all VA medical centers provide all types of care. For example, transplant patients are often referred to larger VAMCs for treatment. Mailman is used routinely for transmission of laboratory results to the transplant facility where patients are sent for treatment.[11]

Transmission of Data to Automated Consolidated Mail Outpatient Pharmacy

The VA has established a Consolidated Mail Outpatient Pharmacy (CMOP) to provide veterans with prescription medications by mail, thus avoiding patient waiting at medical center pharmacies.[12] The CMOP software feeds mail-out prescription data from DHCP over electronic mail to centralized highly automated prescription dispensing equipment. At the same time, workload tracking information can be provided to VA management.

Pilot Remote Clinical Data Access

Patients in the Seattle area may receive care from the Seattle VAMC or they may go to the American Lake VAMC less than a one-hour drive away. Each VA facility has its own DHCP system. A pilot trial of remote access to patient demographic and health summary data was performed by staff at these two VA medical centers in Washington state.[13] Communication was through the IDCU network. Each user was assigned security codes to allow access to the remote DHCP system. Users were given menu options to allow viewing of health summary data (including laboratory, pharmacy, and radiology data for patients selected individually by identification number or name). This activity was technically good: it did not consume many resources, the communication lines were clean, it provided rapid access to a wide range of clinically relevant data, and it allowed ad hoc queries. However, usage was kept down because of the difficulties encountered by low-frequency users in remembering their remote access codes. The pilot study concluded that this specific method for VA networking between centers should not be extended because of the awkward security implementation that required too many security access codes. They recommended the use of the Patient Data Exchange (PDX) software described below to transfer health summary data when requested, even though ad hoc queries would no longer be possible.

Patient Data Exchange Facility

The Patient Data Exchange (PDX) software module is designed to allow medical centers to request and receive data including demographics, episodes of care, medication, and diagnostic evaluations from other medical centers. This information can then be integrated into a coherent composite record at the receiving site, greatly enhancing the quality of care provided for the patient.

PDX has three modes of operation. In its first mode, it provides for the creation of hospital groups which exchange data relatively freely. When data is requested by staff at a hospital that is a group member, the data is automatically returned with no human interaction at the sending site. PDX uses Mailman to deliver the data within 12 minutes of the request entry. The reply is returned as a mail message that can be displayed on the screen or printed, or the data can be uploaded into the local DHCP system. In the second mode, the requesting hospital is not a workgroup member. In this case, the remote site will be sent a bulletin requiring human interaction by the information officer to allow the information to be provided. In the third mode, an unsolicited transmission may be sent by a site to another medical center. This is used when a patient transfer occurs. In any mode, all requests are recorded, patient identification is required, and patient data is only sent to medical centers. When a facility has designated a particular patient's records as sensitive, these can only be transmitted by an authorized user. In the future, the PDX facility will be supporting the HL7 message structure and will allow the transfer of clinical record data from the Health Summary package.

SYNERGISM BETWEEN PATIENT SURVEILLANCE AND NATIONAL REGISTRIES

A patient surveillance system actively collects data and maintains a patient-related record. Disease- or treatment-related data can be extracted from the surveillance system and stored in a registry system. A national registry is used to identify patterns across a population. The information can be fed back to treating physicians to allow early detection of problems, and treatment based on the latest findings. The registry can aid clinical evaluation of follow-up care for problems identified through the registry and treated in the patient population.

Pacemaker Surveillance and Registry Systems

There are two VA pacemaker surveillance centers which have been in operation since 1983, handling a total of 8,000 patients located throughout the eastern or western half of the United States.[14] All pacemaker patients are monitored periodically to detect impending pacemaker failures, especially in batteries or leads. A device allows pacemaker patients to transmit an electrocardiogram (ECG) over the telephone line to a monitoring center. The technologist at the center uses two computer systems. One system records the ECG waveform information as it is received over the telephone line from the patient's transmitter. The second system, the DHCP pacemaker surveillance system, records details of the monitoring episode of the patient. It provides the VA technologist caller with automatic warnings of known bad leads and failure modes based on actuarial tables of lead survival. It also provides patient-related information such as indications that a patient is deaf or needs assistance.

In the case where the staff technologist is unable to read the waveform or an emergency condition is suspected, the on-call consulting physician can access the information system and can even receive the waveform by fax if needed. On-call physicians handle approximately seven calls per week; these tend to be emergency situations where the consultation is critical to the patient's immediate treatment.

The VA's National Pacemaker Registry, which has been in operation since 1980, contains information about all 33,000 registered VA pacemaker patients, details about each pacemaker installed, and follow-up records. Data can be automatically sent to the registry from the surveillance systems via electronic mail. Using the registry database, reports are automatically produced monthly indicating the survival curves for each manufacturer and model of pacemaker generator and lead. This information has proved extremely useful in the ongoing follow-up and treatment of patients throughout the country.

Immunology Case Registry

The VA treats a large number of HIV/AIDS patients and recently produced software for the Immunology Case Registry to meet its needs for both clinical care and management. Clinicians caring for HIV/AIDS patients have little time for the many reports that must be filed. The Immunology Case Registry software package is designed to collect data needed for day-to-day clinical care at each VA medical center and to automatically extract data needed to meet reporting and planning requirements.[15] Data related to admissions, clinic visits, medications, laboratory tests, and radiology procedures are automatically sent via electronic mail messages to a national HIV registry used to produce reports and to estimate future resources and staffing.

Security protection for the immunology databases is tight. The information that identifies the HIV status of a patient is stored in a separate file from the main patient file. Any links to the main patient file are encrypted. All access is audited. Routine reports do not identify the patient by name or social security number, nor do they indicate the HIV status. An encrypted unique identifier is used in the registry, which is not decipherable at the national level.

USE OF CD-ROM AND OPTICAL PATIENT CARDS FOR THE EXCHANGE OF MEDICAL DATA

CD-ROM

VA facilities normally operate independently of each other, with no shared electronic patient record. However, a large number of VA patients are seen at more than one site. The VA is in the final prototyping stages of use of CD-ROM technology to distribute patient data to its facilities.[16] The VA has defined a minimal patient dataset consisting of demographic data and information identifying episodes of care, medications, and diagnostic evaluations. Every three months, a CD-ROM is produced that contains DES encrypted records of the accumulated visits for all VA patients at all VA medical centers for one year. There are 2.57 million individual veterans active at any time. CD-ROM readers will be connected to servers on the DHCP networks at the medical centers, allowing retrieval of patient data within five seconds of a request.

Screening of Medications Prescribed by Different Medical Centers

It was noticed that a number of patients had duplicate prescriptions filled at different VA medical centers. Prescriptions filled at different medical centers should be checked for contraindications. A study is being done combining use of the CD-ROM minimal patient database and on-line PDX inquiries to screen for duplicate medications. A hospital can search through names of its patients, checking each on the current CD-ROM database. Approximately 10% of patients have been seen at more than one facility; of those, 10% were at more than two facilities, and so on. These patients are identified in an on-line list at the medical center. One to two days before one of these patients is scheduled for an outpatient clinic visit, a PDX inquiry is made to the other medical centers. Active prescriptions can be reviewed by a physician or pharmacist at the time of writing or filling a new prescription.

Optical Patient Data Card for Data Exchange

The VA has developed an optical patient card prototype and a workstation which can be located on the DHCP local area network to read and write the card.[17] The card receives extracts of the DHCP system data for each patient visit, including 14 data fields containing both administrative and clinical data. The card will be read upon arrival of the patient at the facility. The data on the card will be downloaded to DHCP where it will be available for use. Alpha testing of this capability is expected this year.

IMAGE AND TEXT DATA EXCHANGE IN A DISTRIBUTED ENVIRONMENT USING A LOCAL AREA NETWORK

The VA has recently implemented a unique distributed system which manages medical images as an integral part of its HIS.[18] Imaging workstations located throughout the hospital capture and display a wide variety of medical images including cardiology, bronchoscopy, gastrointestinal endoscopy, hematology, surgical pathology, surgery, dermatology, and radiology images. The goal of the VA' DHCP Imaging System is to provide image and text data in an integrated manner that facilitates the clinician's task of correlating that data and making patient-care decisions in a timely and accurate way. This system is oriented toward providing the treating physician with a complete view of patient data, and at the same time allowing consulting physicians to have access to that image and text data.[19] Its potential as a tool to aid communication and consultation among physicians is enormous—whether in the same department, in different medical services, or at different sites.

The DHCP Imaging System uses a local area network to connect imaging workstations to multiple magnetic and optical disk image file servers running Novell Netware and to the DHCP hospital information system running MUMPS. Thus, the workstations are the clients of two different types of servers and support two separate networking protocols (FIG. 4). The entire suite of DHCP applications runs on the imaging workstations with all patient text data being accessed from the HIS patient data server. Information about each image file is obtained from the HIS text server and is used to access the image file. The HIS server supplies information about the image object, including control information about the imaging software, the list of

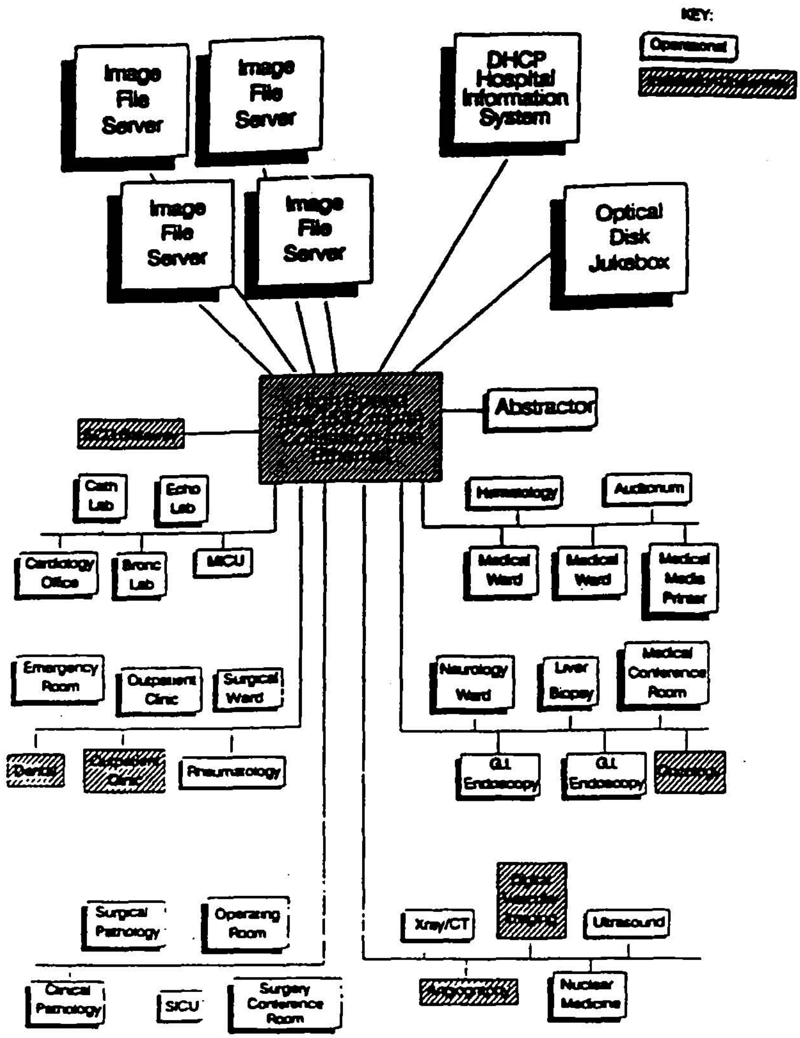

FIGURE 4. DHCP Imaging System installation status (Washington, D.C. VAMC). Imaging workstations located throughout the hospital access images and text data from network servers.

components making up the object, and their attributes. The imaging workstation HIS software uses this information to access the image file servers and to control the image display. All images and patient text data are available from any workstation in the medical center to users with security access.

The local area network uses Ethernet in a star concentrator/hub topology. All of

FIGURE 5. DHCP imaging workstation in the medical intensive care unit at the Washingto D.C. VA Medical Center.

the workstations on a floor are connected to a concentrator (3COM Multiconnec located in the floor's wiring closet. A single piece of thinnet (10 Base-2) coax cab (RG-58 A/U) runs from each workstation to its port on the concentrator. Th concentrators are connected via fiber optic cable (62.5/125 micron) and run ver cally in the wiring closets to the hub (CISCO AGS+) located in the computer roor External fiber optic transceivers are used to connect the concentrators and hub to th fiber. Each concentrator and each server is connected to a separate Ethernet port c the hub. A bridge passes MUMPS DDP packets between the imaging netwo segment and the HIS server segment.

The DHCP Imaging System is currently being alpha tested at the Washingto D.C. VA Medical Center.[30] The imaging workstation platform used in the prototyp installation is based on an AT-compatible 80386 system containing an imaging boar with a graphics co-processor and four megabytes of onboard memory. The use of tw high resolution, multisync monitors allows the simultaneous display of images wi clinical text (FIG. 5). The workstation meets clinicians' needs for true color displa of up to 16 million colors per pixel to handle pathology, dermatology, and endosco images; for variable resolution, both spatial and color/gray scale; for digital ima capture on the workstations; and for hospital information system data display.

Workstations are located in a number of departments and patient care are: Image input workstation locations include the cardiology department, the gastroi testinal endoscopy laboratory, the bronchoscopy examination room, the surgic pathology reading room, the hematology research laboratory, the liver biopsy reading room, the dermatology clinic, the emergency room, the rheumatology research laboratory, the operating rooms, and the radiology and nuclear medicine departments. There are image display workstations in patient treatment areas and conference areas including the clinical wards, emergency room, outpatient clinics, and intensive care units. An image printer is located in the medical media department. Images are generally collected by consulting services to meet their own needs as well as the needs of the referring physicians.

The implications of this capability as an aid to communication among physicians in a hospital setting are being investigated.[21] System accesses have been recorded to help measure the usage of images by physicians in different services. Images are viewed both by the collecting service when producing procedure reports and consultations, as well as by treating physicians from a variety of other hospital services. Images are collected to meet the internal needs of the collecting department and the needs of treating physicians. FIGURE 6 indicates the frequency of image viewing based on the hospital service of workstation users. The services that acquire images perform 55% of the total image accesses. Treating physicians such as medical service, nursing, and surgery account for 35%. FIGURE 7 indicates the amount of image viewing done by services other than the service that collected the images. Interservice or intersubspecialty viewing accounts for approximately half of the image viewing. Most image viewing involves multiple physicians, either during conferences, rounds, morning report or consultations. Thus the image access data does not fully reflect the number of physicians viewing the images.

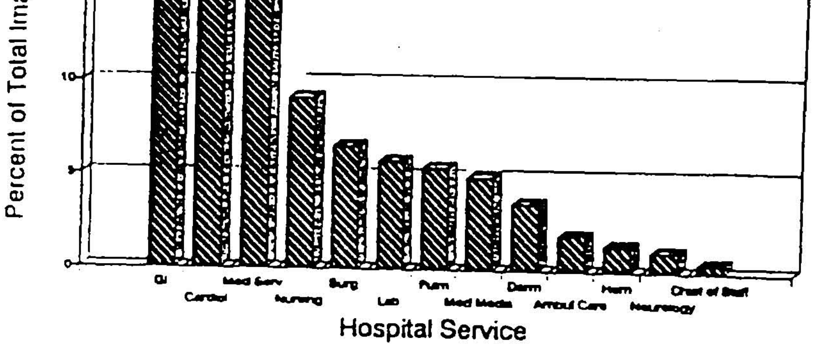

FIGURE 6. Frequency of image viewing based on the hospital service of workstation users.

EXCHANGE OF IMAGE AND TEXT DATA BETWEEN LOCAL AREA NETWORKS

In the fall of 1992, the Baltimore VA Medical Center will be installing two imaging systems: the DHCP Imaging System and a commercial radiology PACS system. An interface between the systems will allow the bidirectional exchange of both images and text between networks using a gateway server system.[22] ACR-NEMA messages will be exchanged as files written on the gateway file server. ACR-NEMA standard request-and-send message sequences are used. This interface will allow exchange of demographic data, admission and location data, radiology orders, order status, images, and radiology reports.

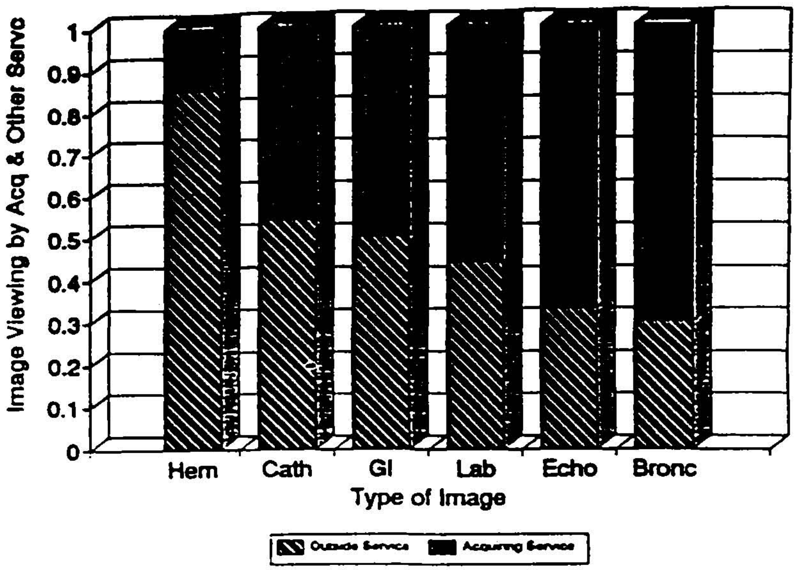

FIGURE 7. Image viewing by services other than the service that collected the images.

EXCHANGE OF IMAGE AND TEXT DATA FOR SUPPORT OF REMOTE TELECONSULTATION

The ability to transmit images between VAMCs could meet a variety of existing staffing and consultation needs, as well as reduce the cost of outside peer review. It would allow subspecialty physicians at a remote location to provide consultation with physicians at any VAMC. Image transmission offers a promising extension to the VA's quality control procedures. Sites where one or two physicians must cover night and weekend call schedules could use teleconsultation to reach on-call physicians at their residences, allowing staff to provide rapid response at lower cost.

Transmission of image data consumes network resources and can be a lengthy procedure. Faster communication lines can be used to reduce transmission time, but costs may increase. Image compression techniques can be used to reduce image file sizes. However, care must be taken to avoid degradation of image quality, a feature which is often difficult to assess. A 14,400-baud modem can transfer a 750-kilobyte image, uncompressed, in about seven minutes. A 56-kb switched dial-up line or ISDN line can transfer the same file in under two minutes, but the cost is more. Frame relay will be able to communicate at 1.544 megabits/sec, requiring about four seconds for the file transfer.

We have examined three mechanisms for transmission of integrated image and text data outside the local area network.

1. Use of the newly developed extensions to Network Mailman that allow binary data to be included as a body part of a mail message. Mailman electronic mail software is an excellent tool for this purpose because it can transmit reports from any DHCP package; security is built in. TCP/IP is used to transmit the image data over the IDCU network between VA medical centers. A consultation request and reply is analogous to an electronic message exchange. The sender controls the data flow and can determine the data that the recipient needs to have. A record of the request and data sent is created. Mailman provides the capability to forward mail to another individual for additional consultation. Other Kernel tools provide the ability to integrate data received with the database at the remote site.
2. Use of a protocol such as ACR-NEMA or PDX consisting of a request message asking for data to be sent and a reply message containing the data. This mechanism is well suited for transmission to non-VA institutions that do not run Mailman or to small portable VA systems for use outside the VA medical centers. Such a mechanism provides good security in that it allows control of the data flow by the requestor and sender with security checking before release of data. The two-way protocol enhances reliability.
3. Use of a widely distributed system where the remote workstation behaves the same as a local workstation. This can be done simply through virtual extension of the Ethernet using switched or permanent data circuits at rates from 56 kilobits/sec to 1.544 megabits/sec. We have used this mechanism to provide remote support of the imaging system. It has the advantage that no software changes are needed; this is ideal for field support. It allows ad hoc query and the use of our standard image abstract menus for user selection of image data to be viewed. Security issues are more difficult than with the previously described mechanisms, as the entire computer industry is finding.

DISCUSSION

To meet the needs of a widely distributed organization, the VA has established an infrastructure that allows a variety of types of exchange of data across its facilities. It has approached this problem by setting standards governing the use of electronic mail for the transfer of messages, software, and data to and from all DHCP packages. Software developers of packages that exchange data have local and wide area networks in place with application programmer interfaces to aid software development. Data exchange between VAMCs typically involves exchange between two essentially identical DHCP systems (with respect to the transfer). For example, data goes from the DHCP Pharmacy package in medical center A to the DHCP Pharmacy package in medical center B. Users are presented with familiar user interfaces. The VA's approach could be extended for use by other institutions; however, each clinical software system would require a standard interface to allow data to be sent across a network. Electronic mail over wide area networks could be used, but mail message formats for the exchange of data must be defined. First steps in this area have been made by European developers using EDI or EDIFACT.[23,24] Others have proposed the use of HL7, MEDIX (IEEE P1157 Medical Data Interchange), or ASTM messages within an electronic mail envelope.

A number of mechanisms of remote access to medical data have been described in this article; each has its own benefits. The selection of a data access method for a particular application depends on a number of factors, including the need for rapid user interaction with the data; the need for the user to perform ad hoc data queries; whether user access to a predefined set of data is adequate; whether the user requires simple or transparent access to data; whether the user needs an integrated view of data located at more than one site or system; the amount of data to be transferred; and the sensitivity of the data.

Some VA applications use a request-reply message protocol which allows the system to check security privileges and then supply predefined data to the remote system. The remote system can then provide integration with its own database if this is desirable.

Other VA applications allow the use of remote systems as though the user were local. The user's access privileges are verified, and the user is allowed to browse among data just as on site users may. This approach reduces user training needs and improves ability to locate the required data because the customary user options are employed.

In a truly distributed system, the workstation gets data from a variety of sites or network locations transparently to the user, who can then use the integrated data without manual reorganization.

CD-ROM distribution represents a mechanism for distribution of large quantities of data to multiple sites. Patient privacy can be protected with data encryption and security access devices. Because CD-ROMs are released periodically, the data requires verification against current databases at the time of clinical use. However CD-ROM access times are rapid, and the amount of data available can be enormous

Remote access is required for different data types, including text, image, and graphics data at the present time, and audio and video data in the future. All of these types of data are being integrated into the VA's hospital information system Integration is a primary goal of the VA because it provides excellent decision suppor to the physicians. The VA's existing DHCP hospital information system supports thi: type of integration easily because it is based on a common set of software tools anc runs on a common software platform.

SUMMARY

Remote data exchange is extremely useful to a number of medical applications. I requires an infrastructure including systems, network and software tools. With sucl an infrastructure, existing local applications can be extended to serve national need: There are many approaches to providing remote data exchange. Selection of a approach for an application requires balancing of various factors, including the nee for rapid interactive access to data and ad hoc queries, the adequacy of access t predefined data sets, the need for an integrated view of the data, the ability t provide adequate security protection, the amount of data required, and the tim frame in which data is required.

The applications described here demonstrate new ways that the VA is reaping benefits from its infrastructure and its compatible integrated hospital information systems located at its facilities. The needs that have been met are also needs of private hospitals. However, in many cases the infrastructure to allow data exchange is not present. The VA's experiences may serve to establish the benefits that can be obtained by all hospitals.

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