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THE REVOLUTION IN HEALTH CARE DELIVERY*

DR. JAY SANDERS**

Good morning. It is a pleasure to be here. I see a lot of old friends, particularly Carla Anderson from MedCenter One. I have never been here before, physically, but I have been here before via telecommunications. So it is a pleasure to be here, physically.

I would like to make a disclaimer, a disclaimer that, perhaps, some of my colleagues will not like: I am almost at the point where I wish we could get rid of the term *telemedicine*. The reason I say this is that the term *telemedicine* has become more than it really is. In fact, naming it telemedicine has attracted all sorts of attention. Some of the attention has not been the best, particularly that relating to whether or not we ought to reimburse for it; whether or not it impacts on certain statutory, legal, and regulatory frameworks that we presently have; and whether we need new rules and new legislation.

Telemedicine is nothing more than the transport of information from one site to another; it is just that the information happens to be health care information. It is nothing more complex than that. The transport process can occur in various modalities. The simplest modality you could include in telemedicine would be the telephone. For example, telemedicine could be a simple audio mode transportation of information from a physician at a rural community hospital calling a cardiologist at a major academic medical center. In this example, the rural physician gives information about a patient and gets an opinion back from the cardiologist as the result of a phone call. The term also encompasses a patient calling the pediatrician about her son who is sick and then receiving information from the physician over the phone.

Telemedicine is only an expansion of the media capability by which we are able to transport information. Why didn't we call the use of the telephone telemedicine? Well, we never used to but today, now that we have the term telemedicine, people are beginning to say that the use of the telephone is, in fact, telemedicine. Consequently, the Federation of State Medical Boards, and certainly some individual state medical boards, are in effect saying that if you use the telephone across state lines, if you do it regularly, and certainly if you charge for it, such activity constitutes practicing medicine without a license across state lines.

* This is a transcript of an address given at the North Dakota Law Review Symposium *Telemedicine: The Intersection of Law, Medicine, and Technology* on February 28, 1997.

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Well, what if the media capability is expanded from an audio mode to include a video mode, a graphics mode, and a data mode. All of a sudden, just because I have added on to the way I am transporting information, people are calling it telemedicine. The reality is that five years from now ninety percent of telemedicine will be done on a multimedia e-mail format, and consultations will be done in real-time using web technology. You won't need high bandwidth; you will be doing this on the internet.

However, the current reality is that there are many software products out there right now that provide multimedia e-mail. Today you can access your e-mail to get a text-based message from your son or daughter from college saying, "send more money." In a couple years, you're not just going to have a text-based message saying send more money, you're going to *hear* your child pleading for some more money, and *see* a graphical picture showing a president on the appropriate currency that he or she wants you to send. In the back, in real time video, you will see the open door to the refrigerator with nothing in it but old pizza. This is the way we are going to communicate. This is what we want, and is what we have come to expect in many areas.

There is no question that this is the way telemedicine and health care information will be transmitted. Whether it is from a data bank at the National Library of Medicine to the living room of the patient or from a primary care physician to a mother at home. It may even include a primary care physician with a patient in his or her office making a store-forward multimedia e-mail formatted consultative request to the specialist at the medical center, who will come in the next morning, access his or her e-mail, and see the particular multimedia consultative request from the primary care physician out at the remote site.

When you start thinking about that type of consultation, you can anticipate why the HCFAs (Health Care Financing Administration) of the world are very, very concerned about reimbursement because the HCFA has never agreed to pay for telephone conversations. As if there is a difference between a doctor being in the room with another doctor transmitting information necessary for patient diagnosis versus the same doctor giving the same information over an audio link called the telephone. Currently, the former is reimbursable but the latter is not. Yet the content of the information being transmitted and the outcome based upon the content being transmitted is the same.

Telemedicine has perhaps become more than it really is. Telemedicine is merely the use of telecommunication and information technology to transmit information. We need to begin to be concerned about the issues of the quality and the content of the information being

transmitted. There has not been enough focus on this in the so-called telemedicine arena today, where the focus has been predominantly on the mechanisms and the mechanics of information transfer.

A simple example is the massive and easily accessible medical information on the Internet. Say you want to find a cure for X disease, chances are you can find it. The critical question is whether the information that you're finding to treat X disease is valid. What telemedicine needs to begin to embrace, much more than it has in the past, is the whole area of medical informatics and trying to find some way to provide the so-called "Good Housekeeping Seal of Approval" on the medical information that is being transported.

If this room today were filled with hospital administrators and they knew that the title of my talk was *The Revolution in the Health Care Delivery System*, they would know exactly what I would be talking about. I would not be talking about telemedicine. In a hospital administrator's mind, the revolution occurring in the health care delivery system is in all the integration that is occurring; all the integrated health care delivery systems; managed health care; and the buying up of primary care physician's practices to a phenomenal degree.

As an example, I have been told that a very special clinic in Rochester, Minnesota, has spent up to \$257 million in buying primary care physician practices in a five-state area. Why? It is obviously to protect their market share, to ensure that when the patients now going into those primary care physicians' offices are referred, they will be referred to this special clinic in Rochester, Minnesota. No longer is simply the fame and the quality of care enough, the market dynamics are such that you cannot guarantee, or expect the same referral dynamics that you had before.

This practice can be seen at Massachusetts General Hospital (MGH) in Boston, the primary teaching hospital of Harvard Medical School. MGH has spent a hundred million dollars buying up primary care practices in the New England area. Since MGH is the referral center, whenever there was a question about a patient, that patient got sent to MGH. Now the primary care practices have to guarantee that the patient will be referred to MGH.

Others, such as the Hospital University of Pennsylvania, Duke, and Cleveland Clinic, are doing the same thing, and I could go on and on. All of these facilities, because of the incredible changes that are occurring in the organizational structure of the health care delivery system, are spending huge amounts of money to protect and expand their market share.

Why do I bring this up? Because it is interesting that in a field such as telemedicine, which is allegedly scientific, we have jumped into this

integration pattern. Everyone is buying up primary care physicians' practices without the slightest shred of evidence that it is the way to go. There hasn't been a single evaluation of this new track that everybody is running on.

Now, if I were to mention to this group of administrators that the real revolution in health care delivery is a much more subtle one, one that Jerry Kasera mentioned in an editorial a year ago in the *New England Journal of Medicine*, they would want more. If I were to say that the real revolution is in telecommunications and information technology, the administrators would either just ignore the statement or they would raise their hand and say, "Where is the evidence that it is going to work?" This fascinates me. They have spent billions of dollars and have gotten multi-year contractual obligations without the slightest shred of evidence that what they are doing now in this integrated health care delivery system will really work. Yet when you bring up the discussion about telecommunications and information technology, they ask, "Where is the evidence?" In fact, the glue that is going to take the bricks and mortars of an integrated health care delivery system and cement them together has got to be information technology and telecommunications.

Think about, from medical and legal standpoints, the exposure that Massachusetts General Hospital has, with close to a billion dollar budget, when they purchase a rural practice in New Hampshire. That rural practice is now part of the Massachusetts General Hospital. Anything a doctor does in his or her office is now the responsibility, from a mal-practice standpoint, of the Massachusetts General Hospital. The physician is an agent of the Massachusetts General Hospital. Yet there is absolutely no, and I mean this literally and figuratively, connectivity between that primary care practice and the Massachusetts General Hospital's information systems, laboratory systems, or billing systems.

This is a picture that appeared on the front cover of a magazine printed in London, England, in April of 1924. We need to try and achieve the vision depicted on this slide. Let me go through this slide with you. It shows a young boy at home, sitting on the edge of his bed, with his mouth open showing his sore throat to his physician. The interesting thing is that the physician is not at the bedside. The physician is at his office looking at that young boy's sore throat through what we would today call a multimedia platform, but in April of 1924 could have only been called a radio.

Let me talk about what this depicts in terms of technology. It depicts the ability to bring health care literally to the patient. This technology is as simple as turning on a radio. The cost of the system is as

inexpensive as a radio. The telecommunication infrastructure is broad based and inexpensive because wherever you are on the planet, you have access to a radio. The technology is well received by the patient. The patient has no problem in the fact that the physician is not physically in the room with him. And, importantly, the physician has no problem at all with the technologies—diagnostic capability, picture quality and interactivity—so that he feels very comfortable in making a diagnosis even though he's not in the same room with the patient.

In addition, there are two critical messages here. First, we have brought service to the point of need. Look at our health care delivery system in this country. Where is medical care provided? Is it provided where I get sick? Absolutely not. When I get sick, I go to my physician's office or to the hospital emergency department. Does my physician come to me? No.

In this picture, service is being brought to the point of need. And why should that be a strange concept? The irony, in terms of the paradigm, is that for every other service industry in our country, we expect and demand it to come to our point of need. If you run out of money today, what do you do? You go to any available ATM and you have access to your funds. You do not have to go to your bank branch to get your money, you just put in four numbers and you now have access to your funds. In the area of shopping, in the area of commerce, in the area of entertainment, all of these are now being brought to the point of need. And yet in two critical areas, education and health care, we still have to go to the service rather than the service coming to us. That has got to change, and it is changing.

The second, and perhaps more critical message provided in this April 1924 slide is the empowerment aspect, which depicts a total change of the power structure within the health care delivery system. Today, as a patient or a physician in a rural community or in an inner city clinic, people are totally isolated either geographically or functionally in terms of access to health care. This no longer has to be true.

I say this because once the communication infrastructure is in place, the patient is at the center of the universe. Whether in a rural community in North Dakota, a rural community in Georgia, or Tromsø, Norway, it really does not matter. With just a turn of the dial on the radio, a patient can access whatever physician they want, wherever that physician happens to be. It could be as simple as turning the dial on the radio.

That is what telecommunications in health care has to provide. In the same way the telephone provides the audio mode, we've got to expand to a multimedia modality. Today, using a multimedia Internet format, we have, in fact, achieved a multimedia mode.

If you worry that the patient turning the dial will not be able to find a ready physician at one or another location, do not believe that. There will be available physicians because every single major academic medical center in this country today is now implementing, or has in operation, one or another type of telemedicine. Medical centers are desperate to stabilize, as well as expand, their market share.

If you worry that dialing Mayo Clinic at 2:00 a.m. will result in your not getting anybody, you will be surprised. If you dial Stanford, if you dial the Massachusetts General, if you dial the Hospital University of Pennsylvania, if you dial Duke, if you dial Johns Hopkins, they will be ready.

Additionally, if I am the primary care provider, for the first time I will no longer be tethered to the geographic location that I happen to be in. I no longer will have to use the specific subspecialists that I have had to use in the past, just because of geographic necessity. For instance, if I did not like the neurosurgeon that I have had to deal with for the last fifteen years because that neurosurgeon was the only neurosurgeon available, I was stuck. Now I can now access whatever neurosurgeon I want anywhere.

I just came back from France where they demonstrated a neurolink. Literally all the neurosurgeons in the country of France are linked on a desktop Windows based platform reading MRIs and CAT scans of patients throughout France. They also have access to whatever neurosurgical subspecialists they want to have access to. If you are a primary care physician, it doesn't matter where in France you are. There is a system like this in the United States, which was actually set up before the French system, in Pittsburgh by a Dr. Julian Bales at Allegheny University. These things are developing right now. This capability, not only in terms of accessing a specialist anyplace, but of having health care in the home, is occurring today. We are finally beginning to develop the vision that was determined in April of 1924.

I show this next slide for its good parts and its bad parts. Let me deal with the bad parts first. This was a system that we set up in 1991 in the state of Georgia. It was the first major statewide telemedicine initiative. The bad part of it was that everybody thought this system required real-time capabilities. I promoted this misconception when I gave talks because I constantly showed this slide and many people left thinking that telemedicine means real-time interactive video. It would require people to spend, literally, \$3,000 to \$4,000 a month, connecting their medical center with a rural hospital on a dedicated T1 bandwidth to get this type interactivity.

Is this type of system required? Sure. But is it going to be the predominant modality by which telemedicine is conducted? No. Once again, telemedicine will be done in a store forward format. It is interesting that some people have difficulty thinking about store forward in terms of doing telemedicine. Those people need to be urged to get rid of the term telemedicine, to get rid of old concepts of telecommunications, and instead look at what the normal way is that we transport our patients for consultation.

From a physical standpoint, we store forward our patients. If I am a primary care physician and I am seeing a patient in the office today and hear a murmur in his or her heart, look at they EKG and chest X-ray, and do an echocardiogram but still don't know what I am dealing with and need the patient to be seen by a cardiologist, what do I do? I stick my medical record under my arm or in an envelope, take the EKG, chest X-ray, and the videotape of the echocardiogram, and I physically send that, either with the patient or through the mail, to the cardiologist. When the patient sees the cardiologist in a week, that information is available. This is physically store forwarding a patient.

With telemedicine, all I am doing is making it much more convenient for the patient and everybody else by electronically store forwarding the patient's information. That is the way most telemedicine will occur.

The type of system on the slide, real-time interactive video, is a very good system. And in certain fields of telemedicine, you cannot practice by store forward: you are not going to do a psychiatric consultation in a store forward modality unless you're asking a question about the side effects of one of the psychopharmacologics that you have given your patient. However, if you are a psychologist doing psychoanalysis, you cannot work in a store-forward modality. It has got to be real-time.

But if I am an orthopedist and I need to see the patient's gait, walking, do I need real-time TV? A lot of people used to think yes. But actually you don't. All I need is a video snippet of the person walking and I can e-mail that to the orthopedist who will see the patient's gait. So in most modalities, store forward is going to be effective.

Never underestimate the power of the human factors issues with telemedicine. The technology is easy; it is the people at both ends of the system which are critical. I must tell you something that if you repeat, I will deny. We recently had an audio conference, of the board of directors of the American Telemedicine Association. There was an overall consensus at the end of this audio conference that at our next meeting, we ought to meet in person. At first we laughed, and then we sort of realized what we were saying; sometimes telemedicine is not going to be

enough, you want to be in person and you want to have the patient in the room with you.

We have found, for instance, that in upwards of ten to fifteen percent of telemedicine consultations, if you analyze the content of the information exchanged to effect a clinical diagnosis, the entire consultation could have been done with a telephone. Why in the world did they use this expensive interactive medium? They just wanted to see each other—see body language, whatever, but they wanted to see each other.

Recognize, if you're not familiar with telemedicine capabilities, that I can literally do a complete examination of the patient by telemedicine even though that patient may be halfway around the world. And with off-the-shelf technology, I can listen to the patient's heart and lung sounds, I can look in that patient's eyes, ears, nose, and throat.

If I am a surgeon, I can be in the operating room of a general surgeon in a rural hospital who is now trying to do his or her first laparoscopic cholecystectomy. The previous three patients the general surgeon had were pigs. He or she was in a laboratory in Cincinnati, at a company called Ethicon, where he or she spent a week learning how to do laparoscopic surgery on three pigs. Now, the surgeon has a human patient. This scenario is happening every single day in this country with all kinds of new surgical techniques, because how does a surgeon, who graduated five or ten years ago get updated training? They operate on animals, and then you are the first human patient. Now there is a much better way to do it.

If you speak to a Dr. Butch Rosser, you should always listen; he is an incredibly dynamic speaker, you will feel like you are at a revivalist church service and at the end of his talk you will want to yell hallelujah. Butch is the chief of endoscopic surgery at Yale University School of Medicine, Department of Surgery. He is also chief of their tele-endoscopic surgical unit. What Butch does is teleproctoring and tele-mentoring in rural hospital emergency rooms, watching doctors do laparoscopic surgery as if he was the first assistant at the operating room table.

The fact that we did not do this in the past is just amazing to me. The fact that we're not doing it in every single operating room in the country today, I would call, and I am saying this from a medical standpoint, malpractice. But that is the reality of the way you and I are being cared for in this country.

I hate to admit this, but I graduated from medical school in 1963. I finished my chief residency in 1970. You could have asked me a question about any kind of disease process in 1970, and I would have given you the most up-to-date answer. I thought I knew everything by the end

of my chief residency. I did not, but I thought I did. I was incredibly up to date.

Am I up to date today? As hard as I try to keep up to date, I'm absolutely not. None of the physicians out there practicing are up to date. They can't be. This is not premeditated, this is just the reality of the explosion occurring in practice. There are physicians out there in rural communities who have been out of medical school for ten years. I can tell you that twenty-five to fifty percent of the database that he or she graduated from medical school with has changed or been modified. And the medication they are treating you with today was very appropriate ten years ago, but is not appropriate today.

As an example, we still see physicians in rural communities and in cities treating patients with mild congestive heart failure, with Digitalis. That was great when I graduated medical school, but it is not the way you treat mild congestive heart failure today. Today we use what is called an ACE inhibitor.

We wanted to do something with the system in Georgia to impact the issue of lack of access to medical care for the patient, which we did. But we also wanted to do something about the lack of access to a colleague for the primary care physician. And we did that also.

We are beginning to get data that shows, interestingly enough, that in certain subspecialty areas the use of telemedicine consultations by primary care physicians is going down for the best of reasons. The consultative requests which were made a year ago are unnecessary, as the physicians now know how to take care of the problem. Because they have had on line interaction with their subspecialty colleague at the time that they saw their patient, they now know how to deal with the problem. This is particularly true in the area of dermatology, and in ear, nose, and throat.

Continuing medical education for the primary care physician, access to the subspecialists for the patient, and importantly, awareness and sensitivity by the subspecialists at the medical center as to what life is like out in that rural hospital is what this type of interactivity has provided.

This slide is the primary care physician at the remote site. Notice that she has an electronic stethoscope in her ear at the same time that the specialist at the medical center is listening to that patient's heart and lung sounds. That is real-time continuing medical education. It is not education similar to what we are doing here today, where someone is standing up at a podium lecturing to people sitting in an audience.

Lecturing is the traditional modality, by the way, of continuing medical education. We spend hundreds of millions of dollars a year doing continuing education and the two things it does not provide are continuity or education. We have never had a single study that has

clearly demonstrated that a physician in continuing medical education actually changes his or her practice pattern or modifies patient outcomes. Why this is confusing to us is amazing to me. The reason there is no change in practice patterns or patient outcomes is because the education occurs at the wrong time and the wrong place.

If I am seeing you right now in a hospital bed and I have a question about what is going on, I can't wait six months to sit at the University of North Dakota lecture hall to be lectured to by a cardiologist. First of all, they are lecturing me about what their interests are, not what my needs are. Secondly, even if they address my patient care needs, it's occurring six months after the fact. I don't retain the information and you, as my patient, certainly don't get any benefit since I have already transferred you off to a cardiologist's office. There has got to be a way for more simultaneous response in terms of the education that is provided.

The system that I know many states are now developing, similar to the system we developed in Georgia, makes all the sense in the world. It is a statewide system. And now, because of the commitment of the State, Governor Zel Miller, the Legislature, the academic community, and the rural communities in addition to the available funding, we've been able to create a statewide health care delivery system with telecommunications and information technology.

The system consists of more than fifty-nine sites. The networking is in a hub and spoke relationship with tertiary care centers networked to secondary care community hospitals, which are in turn networked to primary care facilities. It is a seamless communication infrastructure which enables a patient at any location in the state to be examined. For instance, a patient in northwestern Georgia can be examined by a physician in southwestern Georgia. It doesn't matter where you are in the state; geography is no longer an issue. Distance is totally transparent. It is a seamless infrastructure.

I am hopeful that the telecommunication infrastructure the State of North Dakota will develop will have a totally natural interface with the system your surrounding states are developing, so that it does not really matter whether you are in Grand Forks, North Dakota or elsewhere; the system should allow you to have access to whatever medical care you require.

Internationally there is an explosion of the application of telecommunication and information technologies, so-called telemedicine, to the delivery of health care. For instance, some of the greatest applications are in the country of Norway. Dr. Stinar Pederson, who chairs the department of ear, nose, and throat (ENT) in Tromso, Norway, developed a system a number of years ago to impact the tremendous number of

referrals which were being sent to him from rural Norway. Let me tell you, rural Norway is really rural. It is what the Montanan's call frontier. The Norwegian government was paying lots of money for the transportation of patients with ear, nose, and throat problems.

Stinar set up a telemedicine system geared toward ENT. There have been a number of findings from this system. First, in the beginning, the number of ENT consultations went up dramatically, and then over a period of time, the number of ENT consultations went down. The reason for this is because the primary care physicians who were referring these patients now knew how to take care of them.

A fascinating part of the program is that the government of Norway has saved so much money. I mentioned this at a talk yesterday in Washington, D.C., with Donna Shalala. Norway is now taking some of the saved money and is giving it to the University of Tromso.

The subject of our conference yesterday in Washington, D.C. was primary health care, but a major focus was on how to ensure the survivability of academic medical centers with the influx of managed health care. It might be that a very small way of ensuring the revenue stream for academic medical centers will be for state and federal Medicaid, who do pay for transportation, to take some of the savings achieved through the application of this technology, and provide it to the medical centers.

Remember that the infrastructure to be developed should be used for everything and anything it can. We started with rural hospitals, but we quickly networked with other needy health care environments, such as public health facilities, correctional facilities, and freestanding AHEC facilities. We also networked with the military at their request, so they piggybacked onto the civilian infrastructure in the state of Georgia.

You should be aware that most of the technology we use in this country has never been evaluated. How many of you would be surprised if I told you that the CAT scan was never evaluated from a cost-effective standpoint, neither was the MRI or the ultrasound. Interestingly enough, the so-called Swan-Ganz catheter, the right heart catheter, was never evaluated until very recently. All of these technologies have not only been embraced, but also are reimbursed by HCFA, but telemedicine has not.

The Veterans Administration (VA) hospital system has just announced a Chief of Telemedicine for the entire VA hospital system for the United States. They do not seem to care that there is no data yet. They said, "Look, this has got to work, particularly in the western states where there are huge distances for veterans to travel to get care." Right now, veterans face either an inconvenience or they do not get their care.

As a result, the VA has embraced telemedicine and is going to deploy telemedicine, starting specifically in the western states.

Everything I have said up to this point in time, which is predominantly facility based telemedicine, has got to migrate to the desk of the individual physician.

Perhaps, one of the most untapped multi-million dollar resources in the United States is exporting our medical expertise abroad. We have not even begun to tap that resource. I can tell you that one of the reasons literally every academic medical center in this country has jumped into telemedicine is to access the foreign market. And it is becoming a huge revenue stream for all the right reasons.

Consider the fact that a citizen of the United Arab Emirates, who lives in Abu Dhabi, is sent to either Munich, Geneva, London, or the United States for a dermatologic consultation, at an average cost of \$35,000 per consultation, for a simple maculopapular rash. You can see why the United Arab Emirates, the Kuwaities, and the Saudi Arabians are all looking at telemedicine as a way to improve care for their citizens as well as a way to dramatically decrease their costs. If I charge a thousand dollars a consultation, as the dermatologist back here at the Massachusetts General Hospital or at the University of North Dakota, it is gladly paid by the folks in the United Arab Emirates and it is the highest consultation fee I have ever charged anybody.

We have the capability to create a multimillion dollar industry in terms of exporting our medical expertise abroad. But, perhaps, the most seminal thing that we have to do is to bring service to the point of need. This is a slide of an electronic house call system that was introduced as a project done in conjunction with the Department of Defense in Augusta, Georgia. Exporting is also going on in Kansas, and also now in northern California by Kaiser Permanente. Let me just tell you that it is very easy to do. I know the technical people in the audience always want to leap up and strangle me for saying that, but it really is easy to do.

How many of you here in the audience have cable TV? That is what we use. You may be thinking, "Now wait a minute, how do we use cable TV to get health care into the home, it only transmits one way." No, all your cable TV requires is a reverse amplifier on the coaxial cable, taken through an Ethernet bridge, and you have T1 bandwidth, the equivalent of twenty-four telephone lines. You get full video and interactivity in your living room.

That is what we did. We went into the homes of twenty patients with chronic illness, who had frequent acute exacerbations, and who were constantly being readmitted to the hospital emergency department. We said wait a minute, they didn't come into the emergency department because

thirty seconds ago they got acutely ill, that acute illness began about two weeks ago and they have just been on a downhill spiral leading to this state of extremis. What if we could have gotten them two weeks ago?

Well, we went into the homes of patients with chronic obstructive pulmonary disease, with severe congestive heart failure, with severe asthma, with Type 1 diabetes, and with end-stage liver disease. We found out that we could very simply attach a whole bunch of diagnostic equipment to that person's home television, including: an electronic stethoscope, an EKG, a digital blood pressure cuff and pulse meter, a pulse oximeter (if you're not familiar with that, it is a little clip you put on the index finger or the earlobe which gives your blood oxygen level), and digital spirometry to assess your pulmonary function tests. We are about to employ a blood testing system using a single drop of blood, similar to what the diabetic does at home, to assess their blood glucose. That would not only give blood glucose, but also get hemoglobin, hematocrit, pH, PCO₂, and electrolytes.

I now have a patient with asthma who was just discharged again from the hospital. She has been in a half a dozen times already this winter, in status asthmaticus, and had to be intubated in the emergency department, with grams of Prednisone running through her veins as she was being sent off to the medical intensive care unit.

She's now forty-eight hours after discharge. She accesses the system by turning past the Home Shopping Channel to the Home Medical Channel, where she accesses the system and our nurse or nurse practitioner. Using standardized protocols the nurse can say, "Mrs. Jones, how do you feel?" She says, "Oh, I feel great." That is because of all the side effects of the Prednisone, that is why she feels great. I listen to her lungs and she has a few wheezes that she did not have on discharge. I put the pulse oximeter on and I notice her PO₂ has gone down slightly and, in fact, I do a peak aspiratory flow rate with digital spirometry and notice that her airway resistance has gone up slightly, yet she's totally asymptomatic.

Such a situation is classic for asthmatics. Their clinical symptomatology does not match the actual physical findings. I knew she was going downhill and that she was going to be in my ER again in extremis in a week and a half. I see her at home now and I notice the problem and I can increase her Prednisone or give her some aerosolized steroid, to avoid her being in the ER a week and a half from now.

The more important part is that for the first time, I see my patient in her environment, not mine. She's not in my sterile office where under a managed health care plan I am told I have fifteen minutes, at the most, to see this patient. It used to be fifteen minutes for follow-up, now it has

gotten to the point of fifteen minutes for a new patient. I am exaggerating a little bit, but the reality is, I have always seen her in my environment. And now, all of a sudden, holy smokes, here was my patient at home sitting in her favorite chair, which is a great big puffy chair with pillows and dusty doilies on the armrests. She has done a very nice job in terms of interior decorations of her home; she has a great big thick rug and some plants behind the chair. She must have an exterminator every month because I see a dead cockroach in front of the TV. Her husband, who I have never spoken to or met, is standing at the kitchen door with a cigarette in his mouth.

I asked Mrs. Jones if she smoked and she said no. I never ever thought about asking about her husband who was standing there smoking. She talks to me as she is petting her cat. I will never ever again wonder why Mrs. Jones is a revolving door asthmatic. She is living in an explosive antigenic environment.

As a matter of fact, that is the major reason why we are seeing increased morbidity and mortality in this country. The medical profession ought to get together with the architects in this country, because as our housing construction has gotten better and our houses more air-proof, all the antigens have been concentrated. Our houses used to be less airtight, so there was much more flow of outside air into the home. That is why we are seeing so much more asthma morbidity and mortality in this country.

Now I know what to do with Mrs. Jones. I need to get rid of her husband and I need to change her interior decorator, because that is what the real problem is. It is not that I did not give her enough Prednisone.

I am now working with Siemens and AT&T to develop a health care kiosk. It will be the equivalent of the ATM for health care. It will be a kiosk the size of one of these curtained off areas in which you take your passport picture. You will walk in, there will be a desktop multimedia platform, meaning a PC with a video card in it. It will have all the equipment that I showed we have in the home system, and it will provide from one end to the opposite end of the pendulum in health care.

It will provide the patient immediate access to a CD-ROM database to discuss more about their particular disease. It will provide more information about the disease, or the medicine that they are taking, or whether or not this medicine has a potential drug interaction with another drug there are taking. On the other end of the pendulum, if the patient is ill, they literally will be on line interactively on an ISDN communication infrastructure with their physician or the nurse practitioner at the local HMO and be able to be examined.

Where is this going to be located? It is going to be in every chain drugstore. The first health care provider most patients first see is the pharmacist. That is interesting. When they walk in with their prescription, how long does it take to be refilled? Fifteen to thirty minutes on the average, during which time they are usually asking the pharmacist about their disease or the drug that they are taking for their disease. Usually a pharmacist neither has the time nor the education to deal with such inquiries.

We are going to put these in chain drug stores and in factories to deal with Workmen's Compensation. We're going to put these in the Marriott Hotel chains of the world where, by definition, everybody who's checked in is away from home.

Does this seem farfetched? The reality is all I am doing is bringing health care to the person who needs health care where they are, not where I am. So whether they are at home, whether there are at work, whether there are shopping, whether there are vacationing, they will have health care being brought to them in the same way you can walk up to any ATM anyplace in the world and access your finances.

Everybody will be concerned about confidentiality. Remember the angst we had when the ATM first came out. The public concern was that four numbers were going to separate them from a thief trying to get at their money. Look at how the public has accepted and embraced ATMs because we have balanced the issue of convenience with the issue of absolute security.

I am not going to go through the issue of the quality of the information, I just want to underline the need for us to be equally concerned with the content of the information exchange and not simply the methodology by which we exchange information. I am also not going to discuss licensure issues, because that will be discussed much more adequately by a superb group of people subsequent to my talk.

We are dealing with the issue of connectivity and the cost of connectivity. The recommendations made by the Telemedicine Advisory Committee to the FCC have asked as a basic minimum that the telecommunication infrastructure be built so that every rural based practitioner have local area access, and so that it will not be a long-distance call in terms of cost, but rather will be a local call to access the Internet. As the Internet becomes enriched with a multimedia capability, it is where the majority of telemedicine consultations will occur. It has also been recommended that for every rural based health care facility, there be a minimum of 1.54 megabytes of bandwidth, or the equivalent of a T1. We did not say T1, because we do not want to dictate that the connectivity

occur through telephone lines. If it can occur through satellite or wireless, that is great.

We've also insisted in our recommendations that the availability of that bandwidth occur in a rate-insensitive fashion so that distance does not determine the cost of the bandwidth. This would enable the cost of the bandwidth in rural environments to be equivalent to an urban setting, where I was connecting two urban hospitals with T1 connectivity.

I am afraid that I have run over time. Thank you very much.