THE BROOKINGS INSTITUTION

CONSUMER-DRIVEN MEDICINE: HOW DIGITAL AND MOBILE TECHNOLOGIES CAN IMPROVE HEALTH CARE

Washington, D.C.

Thursday, October 8, 2009

PARTICIPANTS:

Moderator:

DARRELL M. WEST
Vice President and Director, Governance Studies

Featured Speakers:

ELLEN BLACKLER
Executive Director, Public Policy, AT&T

DR. KAREN RHEUBAN
Medical Director, Office of Telemedicine, University of Virginia Hospital

* * * * *

P R O C E E D I N G S

MR. WEST: I think we will get going. First of all, good morning. I am Darrell West. I am Vice President and Director of Governance Studies here at Brookings, and I would like to welcome you to this forum on Customer-Driven Medicine. This is the week where the Senate Finance Committee is expected to approve its version of health care reform. This will be the last of the five congressional committees actually to act in this area. The action will then move to the floors of both the House and Senate, and we will see what comes out of that process.

But our goal today on health care is a little different. We'd actually like to step back from the specifics of the various legislative proposals and talk more generally about how digital and mobile technologies can improve health care. Quietly over the last few years a revolution has been unfolding in health care that has a potential to put consumers in charge of their medical care. There have been advances in smart phones, there has been the development of remote monitoring devices, the use of electronic medical records, and the rise of social networking sites for people suffering from chronic illnesses. When you take all of these developments together, they form the basis for a new kind of health care system.

Today at Brookings we released a copy of a paper which describes the possibilities for customer-driven medicine. I won't go through all the findings. You can pick up a copy at the back of you haven't already done so. But before we move to our panel, I do want to mention a few highlights from that study. I think one of the problems of our current medical system is that we have a very expensive health care system but only average health outcomes. If you do the 2 by 2 matrices, this is the worst box to be in, high costs and average outcomes. The United States spends over $6,000 annually per patient per capita which is almost double what Canada, France and the United Kingdom spend on each of their patients. But despite these very high health care outlays, we rank forty-second among developing nations in life expectancy, we actually rank behind the Cayman Islands, Andorra and most European nations. And you can look at a variety of other health indicators as well and we generally are in the middle of the pack.

The question is how do we raise quality while also cutting costs? Some people say this is an impossible proposition, that if you cut costs, you're also going to cut quality. I don't think that that is the case. I think what people fail to realize is that we need to use technology to change the organization and structure of health care and change the incentive structure so that people have more positive inducements for

constructive behavior, and I think this is true for everybody involved in health care, from the patient to the physician to hospitals.

When you look at some of the new technologies that have developed, you no longer need to go to doctors for every aspect of your health care. Companies are now making what they call wearable monitors that record vital signs and transmit them electronically to physicians, there are monitors that record blood pressure and heart rate on a continuous basis. In the area of diabetes where there are over 24 million sufferers and diabetes if the seventh leading cause of death in the United States, there are devices that record glucose levels at home and then electronically send them to the appropriate health care provider. When you think about this one simple area of health care innovation, this is the type of thing that puts patients in charge of routine medical data collection. It keeps them out of the doctor's office until they need more serious care, and I think this is the vision of the future. If we want to save costs without compromising the quality of care, there are ways we can use technology to do the routine aspects of records keeping, e-prescribing, making appointments, monitoring health care symptoms, and then when we really do need a physician and higher-quality medical care, then we can go into the system.

Another problem in the health care area is just the simple fact that people forget to take their prescription drugs. There have been studies showing that only 50 percent of patients take their medication as prescribed. Either they forget to take the drug entirely or they don't take the medication at the dosage level that has been prescribed by their physician. Doctors now can send personalized reminders through email, automated phone calls or text messages telling people when to take their pills. If a patient has a memory problem which increasingly is the case with many senior citizens, some companies make what they call digestible chips which can be swallowed along with the prescription. There are no side effects from this chip we are told. And the chip then electronically informs the physician that either the person has or has not taken their medication.

National surveys show that patients would like to employ digital technologies in their medical care and they feel that this actually would save money. There's a very interesting study by Bob Litan of the Brookings Institution a couple of years ago that found Americans could save as much as $197 billion over the next 25 years just through the use of remote monitoring devices. This is especially true in the case of leading chronic diseases. But we need policy changes that help us take advantage of these new advances. It's one thing to have all these cell

phones and smart phones and remote monitoring devices and electronic medical records, but unless we have policy changes that really facilitate and reimburse physicians for using these cost-saving devices, we are not going to be able to take full advantage of these new advances. We need reimbursement changes by insurance companies that pay for mobile health applications and digital communications. In many states physician don't get reimbursed for anything electronic, if they do e-consultations with patients they do not get reimbursed for that. We need to focus on positive health outcomes and preventive medicine as a way to save money. There have been pilot studies in a number of areas and with a number of medical providers that have found cost reductions of 5 to 10 percent so that the potential for cost savings is very substantial.

In the paper I suggest that we need to think about good health rewards for people leading healthy lifestyles. In the auto insurance area we have good-driving discounts. If you haven't gotten a speeding ticket or haven't been involved in an accident over a period of time, then you get a discount on your insurance premium. We need to be thinking about that type of approach to health insurance as well. If you're getting regular exercise and having your annual checkup and not smoking and watching your weight and doing all the things that we know are associated with positive health outcomes, you should be rewarded for that. So I think

there are a variety of ways that we can think about this in a way that will promote better health care and also achieve the national objective of better care at the same time that we're able to cut costs.

What I'd like to do today is now turn to our experts to address issues related to health care innovation and some of the new ideas that are out there that will help inform policymakers when they are thinking about these issues. To address these issues we have brought together two leading voices. On my right I'd like to introduce Ellen Blackler. Ellen is the Executive Director for Public Policy at AT&T. She is a leading writer and thinker on issues related to health care and broadband policy. Then on my left is Dr. Karen Rheuban who is a Senior Associate Dean for Continuing Medical Education and External Affairs at the University of Virginia Hospital. She is a person who has many titles. It would take me 5 minutes to run through all of her titles, but it's a sign of her great accomplishments. She is the Medical Director for the Office of Telemedicine and also President of the American Telemedicine Association. But she informed me right before this event that one of her most important jobs remains being a pediatrician. She is a Professor of Pediatrics at the University of Virginia but also a clinical practitioner, so she actually seeks patients, practices telemedicine and has done a number of very innovative things as well.

I'd like to start with Ellen. You have thought a lot about health care innovation especially in the area of broadband and some of the personalized devices that are developing. What are the opportunities for technology, and then also what are the barriers to wider adoption of new technologies?

MS. BLACKLER: I can talk maybe a minute about some of the technology development that the industry is working on and then about the barriers because that's of course always the problem.

In Darrell's paper he laid out this kind of vision of what personalized medicine could be like, and I brought some toys to show you so that sometimes it's good to get a visual. In the technology industry of course we sell broadband connectivity, wired and wireless and nonbroadband connectivity, so we spend a lot of time thinking of ways you could be using that, so you want to buy more of it. One of the real opportunities that the industry is focused on is in the medicine field. We and some of the other technology companies recognized early on that one of the things that would need to happen is the development of standards for interoperability so that all of the innovators out there could be inventing new applications and new devices that could be used over our network. I'll get out my little box of tricks here.

This is what really looks like a cable modem but is a special device developed for medical applications that collects data from a lot of the remote monitoring device that you hear about and it collects over a new standard called the ZigBee standard which you would never need to know about if you were a real person, and the thing about the ZigBee standard is that it operates at a very low power so lets the devices that would be needed for remote monitoring to have a very small battery and the battery could last a very long time. So the vision is you could put this in your home and it would collect all kinds of information through this little antenna and then either through your typical internet connection it could send the information back to your practitioner weekly, daily in real time however it was programmed to do that.

One of the interesting things that we've been working on with one of our technology partners is this shoe -- which I've practiced saying for 24 hours now. What it does is it senses balance and movement in the foot and it's designed as an independent living tool. I'm sure you're familiar with the data or from personal experience about the fall issue with elderly folks, it's lots of times what is a barrier to living at home and can be the thing that sends people into an institution. So this device serves a couple of purposes. It can be diagnostic. If someone is wearing it you can see changes in their balance over time. Then also if there's an actual

fall and the doctor is asking do you know why you fell, did you trip, did you fall forward, did you fall back, the patient frequently doesn't know or is wrong, and this can provide a lot of data about exactly what caused the fall which helps with the diagnosis going forward. This is something that's under development with one of our technology partners and we're now doing a study where we've got some patients in a facility wearing them to try to get the data on the baseline data that would be used in detection. So if you can envision a patient or a person in the home with access to this kind of technology for blood pressure, weight gain, congestive heart failure if a patient is weighing themselves every day and this were automatically collecting the information and if it reached a certain threshold sending a message back, you would immediately be seeing the change in the patient's status that would require some kind of intervention and avoid a bad outcome.

So this is the kind of thing that is going on out there, it's very exciting, but still have these pedestrian problems. Karen and I were talking beforehand about the frustration for her obviously as a practitioner of seeing these very simple things that could be fixed and yet we're still talking about them 15 to 20 years later. Karen will talk more about that, but I'll just tick through what I think of as the main critical success factors, trying to be more positive than barriers. First is we need this robust

infrastructure. We need a robust internet. We need it to people's homes. We need wireless and wire line. That takes a lot of investment. At AT&T we've invested about $40 million over the last couple of years on our network and another $17 million or $18 million this year so that the companies are out there doing that, but it's difficult to overstate the increase in demand that we're facing, and I have a couple of fun numbers that I would like to toss out there. We like big numbers in health care. Right?

The data usage on the mobile network has increased 5,000 percent in the past 3 years and that's before we have all this stuff out in the field. In 2010 they predict that your average 20 households will be as much internet traffic as the internet in 1995. My new favorite is that as of January, 15 hours of video is uploaded onto YouTube every minute, and that is the equivalent of 86,000 movies a week. So you can see that the scale of the investment needed in broadband is really substantial.

Secondly, we need to keep promoting innovation in the applications and development of the necessary standards for interoperability so that the applications that the practitioners can envision can be developed in any different number of companies. Then thirdly, all of the health care issues that come down to getting paid. Today it's very difficult for doctors who use this stuff to figure out a way to get paid for it.

You have the reimbursement problem. You have the licensing problem. Actually there is still language in a lot of places that requires things to be done in person and there is no reason they need to be done in person, we thought of getting rid of that in-person bias and then actively support reimbursement elsewhere. I'll stop there for now.

MR. WEST: Thank you. I liked that show and tell aspect of your presentation. Karen, you are an expert on telemedicine. First of all, maybe you should explain to us what telemedicine is for people who may not be up on this. Then secondly, what role can telemedicine in access, quality and cost savings?

DR. RHEUBAN: Thank you. It's a real privilege to be here and it's fun to work with Ellen again when in her previous life at the FCC we worked together in broadband deployment, and so it's really a privilege and I'm awed by this group.

I'm a country doctor. I'm a pediatric cardiologist and I spent most of my career driving all over the Commonwealth of Virginia to provide care to children in need. For those of you who live in the metro Washington area, believe it or not, Virginia is a very rural state and we find over and over again that patients in rural communities have limited to no access in their local communities to specialty care so that telemedicine is a tool to provide that type of care. It ranges from live interactive video

conferencing and exchange, face-to-face consultations with a specialist or a subspecialist. It also can be store and forward technologies, images captured and transmitted asynchronously for interpretation by the specialist. And it also includes as we're learning today remote monitoring, home telehealth and on-body mobile devices which can capture data and transmit that data to the appropriate places whether it's a home health agency, whether it's a specialty care provider.

Telemedicine is a terrific tool and I can say first-hand I have used it, I use it every day to provide care to patients throughout the Commonwealth of Virginia. Telemedicine programs exist in every single state and in many nations across the globe. But we face many challenges in getting it integrated into mainstream health care and that's why I'm delighted to be up here. I'll try not to whine too much. The American Telemedicine Association plays a great role in trying to influence policy in that regard.

We face a lot of challenges but we can provide specialty services in probably more than 50 specialties and subspecialties. You can get 24-hour access to clinical services that are not available, and I'll give you some examples. We and others provide emergency access to a stroke neurologist. Stroke is the number three cause of death in the United States. Patients in rural communities don't have access to the

same specialty care for stroke when time is brain. From the onset of a symptom of a stroke, if you can get access to a clot-busting therapy, you can save the brain. So telemedicine programs can provide that type of care and yet Medicare doesn't reimburse for those types of services.

Access to dermatology services, emergency or nonemergent. We know that in many communities that it takes 6 months to get an appointment with a dermatologist. Using both store and forward or live interactive video conferencing, a patient in a remote community can have access to a dermatologist immediately. Cancer outreach. We know that patients in rural communities don't necessarily have access to cancer clinical trials. Digital mammography services. We bring a mobile digital mammography van out to rural and remote communities in Appalachia and provide mammography services, plug into our community health center percents and beam the images back to our mammographers who can provide a report to that patient the same day. How many of us even in urban areas get our mammography report back immediately? These are the types of things that we can do with telemedicine.

Screening at home. You heard Ellen talk about screening for diabetes and blood pressure monitors and weight. There's a lot of data out there that shows that this is a very cost-effective method of providing preventive care, ongoing care and interventions as well. Even remote

telesurgery can be done. So there are a lot of opportunities and we absolutely are desperate for an alignment of policies to make it work. When I say policies, I mean Medicare policies, Medicaid policies, insurance reimbursement by the third-party payers. Private payers in many states don't reimburse for these types of services. And now with health care reform there is so much that can be done and so many opportunities and we can talk about that as the session goes on.

Rural broadband deployment is critical not only to our hospitals, to our community health centers, our health departments, but to the patients' homes as well. We have a lot of opportunities and challenges as well, but this is the wave of the future and I'm really hopeful and optimistic that we get it right. Thanks.

MR. WEST: Each of you have talked about the importance of integrating some of these new advances into mainstream medicine, but yet some of the problems in terms of policies by insurance companies as well as the federal government. I'd like to ask the same question to each of you starting first with Ellen, what do you think the federal government should be doing in this area? We're having this big national debate over health care reform, although surprisingly health IT has been a small part of that discussion. What should the federal government be doing?

MS. BLACKLER: We've been really focused on the idea of the government creating leadership of using these public health care programs so that Medicaid and Medicare are reimbursing for these services and focusing on those kinds of issues and there is so much that is clear that could be done. We were chatting before about the VA has a really good experience and a lot of data to show that this is successful, it keeps out of the hospital, it keeps people out of institutions, reduces the costs, the patients are happy, and yet you can't get the same things reimbursed in the other public programs. I think there is a real what I think of as leadership opportunity in the public programs to lead the way just like they've done in some of the other -- technology with the adoption issue on health records, the incentive payments, there are lots of things that government can do in the way it structures the way these health care programs are delivered. I don't want to steal Karen's number because I know she has good numbers about how little has been spent on telemedicine over the last couple of years. It's shocking, so I'll hand it over to her to shock you.

MS. BLACKLER: We're Click and Clack, the Tappert Brothers. I believe 100 percent in Medicare reimbursement. They say as Medicare goes so goes the nation, so go the third-party payers. In 1997, the Balanced Budget Amendment had a provision for reimbursement of

telehealth services. By 2000, only $17,000 worth of telemedicine services or encounters were actually reimbursed by the federal government. BIPA 2000, the Benefits Improvement and Protection Act, authorized CMS to reimbursement for telehealth services, we can get great statutes but often times the regulations create additional barriers, and in the ensuing 9 years we've now only reached out to receive $2 million per year of Medicare reimbursement for telemedicine because of some statutory issue but primarily regulatory barriers for telehealth. So we have a long way to go if the federal government is only spending $2 million a year in Medicare reimbursement and yet we know there are tremendous cost savings.

We also know that Medicare is spending a fortune on readmission for the same diagnoses. It's gotten a great deal of press with a "New England Journal of Medicine" article in April talking about tremendous expenditures with readmissions in 30 days, 60 days and 90 days. Forty percent of Medicare beneficiaries are readmitted for the same diagnosis and there are billions of dollars that can be saved. Remote monitoring tools can clearly be effective. You can monitor the blood pressure of your patient every day at home, daily weights, oxygen saturation, even EKG monitors. The West Wireless Institute did a demonstration of a Band-Aide that measures oxygen saturation, EKG, even patient falls. These technologies are here now and yet it's not a

covered service and we can't incentivize providers to adopt these technologies if they can't be paid to spend the time interpreting the data and using that data in everyday health care.

Medicaid is another agency that hasn't formally defined telehealth so that the Medicaid programs pay for telemedicine. I know that in 1999 when I approached Virginia Medicaid, the states make the determinations of coverage for Medicaid even though 50 percent of the funds for Medicaid come from the federal government. So we approached Virginia Medicaid armed with the data that because they are by statute required to pay for transportation of patients, it would make great sense for the Medicaid programs to pay for telemedicine services. So we approached Virginia Medicaid and said we have the data, $59 million spent in Virginia and in all the states on taxicabs and ambulances and yet they were not covering telemedicine services. They very quickly adopted it and Virginia stepped to the front of the pack and covered telemedicine services for Medicaid beneficiaries even in urban and rural areas, whereas Medicare only covers it for rural Medicare beneficiaries. So only 21 percent of Medicare beneficiaries can benefit from telemedicine and even then there are some statutory barriers, limitations in terms of who are the consultants and the originating sites. So again there's a large way to go.

In terms of private pay, only 10 states have a mandate for private pay reimbursement of telehealth services, again, major challenges.

As for other challenges regarding the Rural Health Care Program, you may or may not realize that when you look at your telephone bill there's a universal service fund provision and we are greatly appreciative because the Rural Health Care Program of the Federal Communications Commission allows for discounted communication services for specific rural health care providers, clinics and rural hospitals, but that program is somewhat broken as well and needs another relooking. I think we have on the federal level is that we have many silos who have invested in telemedicine but there has not been interagency coordination and collaboration. I could get under the U.S. Department of Agriculture's Rural Utility Service funding for telemedicine equipment for a community that looks rural, acts rural, smells rural in Southwest Virginia in the middle of Appalachia, a county with no hospital, and yet by CMS's definition it's an urban area because of its adjacency to a city in the next state. That community has nothing but community health centers and yet I can't be paid to provide the consultations in that community health center. And until very recently, I couldn't even get discounted telecom to that community health center because it didn't fit under the FCC's

definition of rural. We're pleading for interagency collaboration so that we can bring these services to patients in need.

MR. WEST: Each of you have made the argument that the current system does not encourage or reimburse some of these new advances. I don't know if you've had a chance to look at the health care bills that are winding their way through Congress now. Is there any hope if any of these bills pass that that's going to change in the future?

DR. RHEUBAN: We're always hopeful. I think it still has a long way to go. We've been working to get some of this language in to get those in-person words out and to get to the extent people are doing studies and pilots to make sure that they've got telehealth and remote monitoring, whatever the buzzwords will be. I would say it's a funny issue. Karen probably spends more time on the Hill about it than I do in that no one opposes, but there is so much focus on some of the more controversial big issues that it does in my mind get a little bit lost in the shuffle in spite of the need for cost savings. So it's a little bit of a phenomena that maybe is a function of Congress that something that really doesn't really have any detractors still has trouble getting through the mix.

MS. BLACKLER: I want to point to Gary Capistrant who is the Senior Director of Public Policy for the American Telemedicine

Association. I think he has worn out his shoes up on the Hill in the last several months. Part of our challenge is that we know this is the right thing to do. Our problem is that the Congressional Budget Office continues to score things out of the park when in truth they don't factor in cost savings, they only factor in utilization for the entire population, so that every time we try to address some of these challenges, it's scored out of the park and dropped.

MR. WEST: Could you explain that in a little more detail, the CBO scoring and what the problem is there?

DR. RHEUBAN: CBO puts a price tag on our requests so that even just expanding the definition of rural was scored at hundreds of millions of dollars a year, so in these bills they say, sorry, it's too expensive for just a telehealth provision so that we're trying to address some of the regulatory challenges. Another challenge we face which I didn't talk about is CMS has a regulation related to credentialing and privileging. That's a tremendous barrier for us. It's their Hospital Conditions of Participation Standards, and that CMS requirement requires every one of my hospital, to 800 UVA doctors who are on call for telemedicine 24 hours a day, 7 days a week would have to be credentialed and privileged at every single hospital in our network. That would cost so much money, take so much time, and the truth is these little

hospitals including critical access hospitals that might have 25 beds don't have the staff or the doctors within their own staff to review the credentials and privileges of our subspecialists so that that's a tremendous barrier. We've been working to try and introduce legislation that will direct CMS to relieve us of that burden in addition to many of our other requests which is to expanding the originating sites, we really would love to have the elimination of the rural requirement under Medicare, and to even bring Medicaid into the fold if possible.

MR. WEST: Let's be optimistic. Let's assume that these advances are going to continue and at some point there will be policy changes that will encourage the adoption and reimbursement of this. How would these advances affect people's daily lives? If you're an average family of four in the United States and this stuff were being utilized, how would it affect them?

MS. BLACKLER: I think the poster child for envisioning a lot of this on the telemedicine and remote monitoring side are chronic conditions and certainly in the elderly. Diabetes is a good example, or congestive heart failure where daily things have to be done, daily data has to be collected, but it doesn't require daily intervention by a professional and you don't need a professional to collect the data. I was at an event recently where a little girl with diabetes talked about what she used to

have to do, and she had a little dog-eared notebook where she wrote down her sugar levels and then would bring the notebook to the doctor who would look at it, looking at these numbers on the page and trying to draw a conclusion in that doctor's visit, and her life changed dramatically when not even with a Band-Aide device, she was able to put it in at the end of the day and see a chart so that she could see visually the changes, the doctor could see visually the changes, and this 12-year-old was talking about how it completely changed her compliant behaviors because the line meant a lot more to her than these figures on the page. So if you multiply that by the possibilities, if you think about a patient with congestive heart failure who is weighing themselves every day and possible has cognitive issues and sight issues and are the numbers on the scale big enough and do they remember to do it every day, and if you have a system where they weigh themselves every day and if they didn't they get a phone call. Or the other example we've been using with kids and diabetes is that there are these Bluetooth-enabled meters that can send the reading directly into a database, not that someone would look at it every time, but if the database didn't get that reading, the kid gets a text message on the phone. And the kids always have their phones and it is really increasing their compliance with doing their reading. You could even take it a step further and send them a message depending on a

reading, good job or you need to be more careful today and seeing that those kinds of things really change. So you not only increase compliant behaviors, but you remove these logistical behaviors to people getting care. They don't have to get in the car and they don't have to make the appointment. You've got elderly people who are spending a lot of time on this ministerial business of health care and it removes both the time barrier and then presents the information in a way that's more usable to the person. There is a lot of talk about the personal responsibility element in health care and leading a more healthy lifestyle when for a chronic condition or multiple chronic conditions you, it's difficult to interpret sequential data over time in a way that makes sense to you, whereas some of these pictorial ways of showing the data will be really valuable. I always feel like I'm overstepping when I'm on a panel with a doctor who can really tell you.

DR. RHEUBAN: You're exactly right actually. I want to take you with me everywhere.

I have a lot of patients who have to drive many hours to come to the doctor. It doesn't make sense. It's disruptive for families. Imagine if you have to take your loved one to see a specialist 6 or 7 hours away. It's incredibly inconvenient and it's a hardship. We think these technologies are perfecting for aging gracefully in place at home, and if

you have to go see a doctor, why do you have to travel many hours? We also like to put in a plug for telemedicine being a green technology because you don't have to spend time on the road using gasoline when you can just drive to your doctor's office and connect to the specialist.

We've just launched a high-risk obstetric program. We have only four or five places in the Commonwealth of Virginia where they have material fetal medicine specialists and yet we have women who have premature babies in rural and remote communities, and not even so rural and remote communities, and we've not instituted a program where pregnant women can go to the health department to ask a material fetal medicine specialist. Delivering a premature baby is a huge hardship, a hardship for the family and a cost to society. If we can keep babies in utero, we know just keeping babies out of -- saves $30,000 a week just in neonatal hospitalization, not to mention a lifetime of hardship. So why not use these technologies to provide those types of services to patients? It makes great sense. In Arkansas there is a very robust program called the Arkansas Angeles and they're demonstrated a 26 percent reduction in neonatal mortality using these types of technologies. This is not anything in the future, this is right now, and we just need to align our policies with the right now and those are the types of impacts on families and save families from the burden of stroke when you can intervene immediately as

opposed to missing those golden 3 hours of when you can provide clot-busting therapies to patients when time is brain. I can name specialty after specialty after specialty where these technologies can make a difference.

MR. WEST: I'd like to ask about privacy and security concerns because when we start talking about mobile communications, remote monitoring devices, sending your glucose levels electronically to a doctor, a lot of people are worried about the privacy aspects of that. Is my neighbor going to be able to intercept my heart record or will confidential information get lost?

MS. BLACKLER: That's obviously a critical issue and one that there's a lot of technology solutions for, fortunately. There are very robust rules and I think that has brought a lot of focus on it in a good way. I know people have frustrations with some of the rules, but interestingly, I think if you move to an electronic environment, some of the compliance becomes easier. If you think about the security of a paper record, it's not particularly secure and if we get into a more electronic environment, you've got electronic encryption and you've got ways to electronically track who has access to data. One of the big leakage potentials in a facility is you've got people who are authorized to look at that data, maybe not that particular piece of data, and you have no way of opened what file draw

and who looked in it, and electronically we can do that. We can tell you who looked when, how long they were in, and so in a lot of ways transferring all this stuff to an electronic system provides you better compliance opportunities. I think there is also a lot of potential to manage consent in a more layered way so that patients can be giving specific consent to specific practitioners in particular circumstances and withholding it in other circumstances in a way that is very difficult to do when you go and sign that paper that you don't really even look at when you go to the doctor's office annually. So it's both opportunity and then prevents a whole new kind of risk because you've obviously got different breach problems if it's sitting only in a doctor's office.

I feel a little like, and I'm obviously biased being in a technology company, but in many other areas, financial transactions have been handled, although identity theft is obviously a problem, the world economy moves electronically and I think we need to stay cognizant that these problems can be solved as long as we're focused on them, and I think that's very consistent with these technologies can kind the control back in the patient's hands I think.

DR. RHEUBAN: I agree 100 percent with everything Ellen said. The digital transfer of information is critical as we've moving toward electronic medical records, health information exchange, we're developing

standards of interoperability for devices, and encryption is a major component of that, and patient privacy is obviously critical to all of us. I think we can follow the model of the banking industry and go one step further. It's important, it's critical, and people are working on this all the time.

MR. WEST: Why don't we open the floor to questions and comments from you. We have people with microphones. If you could give us your name, if you're with a particular organization, and we would also ask you if you could keep your comments and questions brief so we can get to more people. Could your identify yourself?

MR. ALTMAN: I'm Fred Altman. In terms of the people at the end who are doing the monitoring, as this becomes a much larger effort, how much reorganization I mean outside of the financial considerations do you need to do in order to handle this?

DR. RHEUBAN: I think your question is a perfect one. Imagine the tons of data that are coming in, so we're going to need computer algorithms to assist us to identify outliers and who's going to be interpreting it and who's sending the information to which provider who's going to respond back to the patient. These are very important questions that have to be addressed.

We're just launching our very first Habitat for Humanity Home Telehealth enabled system in Charlottesville and we're looking at where is the data going? It's going to go our home health agency, but the patients who are living in those homes use providers who are not necessarily our physicians, so we have to make sure we can get that information and coordinate it in a user-friendly, simple process, because you're absolutely right, there is going to be a ton of data and who's going to interpret it, who's going to screen it and who's going to respond to it is a question we have to address.

MR. WEST: My sense is doctors are going to have reconfigure their offices. When you into a physician's office now, they're set up for personal interactions. There is the receptionist who greets you and then they information and they have people running around. I think in the future especially as remote monitoring devices become more common, they're going to have to reconfigure their offices to have people who are monitoring the monitors, and as opposed to reacting to the patient who walk in, doctors are going to have to become more proactive to look at the data. They may have some augmented means to chart whose figures are going outside the accepted boundaries and highlight that information. But that's just how part of the practice of medicine I think will

have to change and it will be interesting to see what the impact is on physicians and patients.

DR. RHEUBAN: In truth I think we're going to have to train a whole new set of health professionals. We have a huge shortage of physicians. We're expecting a shortage of up to 200,000 physicians by 2020, we have an aging population with retiring physicians and we're not opening very more medical schools, and do doctor's offices are very full. People are very busy, so we're going to have to manage this information in as organized a fashion as possible.

MR. TORSE: Frank Torse with Microsoft. Some of our top executives who have taken a very strong interest in health IT and health care and health reform ask me about on a daily basis I think that health reform and other things have been focused on the provider side. How do we get customers and the patients engaged? They think that's still a gap that we have. Of course, probably the most important in this whole thing to make it work, if we don't get the customer in the home or the patient in the hospital or the health care provider engaged using these technologies and getting used to these technologies that the system really doesn't work. How do we get to the patient and to the customer?

MS. BLACKLER: I'll share that when you look at the data of all these studies, there is always a patient acceptance or a patient

satisfaction measure and it's always good. I've never seen a study where there were good outcomes on costs and all this sort of stuff and the patients didn't like it. In fact, Dr. Max Cature who is kind of a mover and shaker in telemedicine, if you've heard him speak always says that they have to convince the doctor. The doctor is kind of like I don't know, it's not going to be good, I've got all kinds of problems. And they say to the patient, Do you want to try this? And the patient says okay. The patient loves it always and always wants to do it again and there is never this kind of resistance on the patient's side. I'm sure we've all the same thing over the last couple of years, I have seen a lot of change with my own doctors in their ability to share information and it's always surprising and pleasant. I've never had a bad experience that was technology based on the medical side, so I think some of it comes from adoption and I think what we see in the internet revolution, when people see can be done, adoption curves just get blown out of the water. So I think as these tools become available you'll see that and people will become interested in a personal health care record. If they really could see their own data I think you'll get people wanting to do that. So you're in that chicken and egg thing now where so much isn't available and it's hard to get people excited about it, but once it starts leaking out I feel like that's going to be the smallest barrier that we have.

DR. RHEUBAN: I think some of it is also training a new generation of health professionals. My kids taught me a whole lot about the internet and I think this next generations of physicians is going to be very comfortable with technology and embracing that with their own patients, and then this generation of patients is also going to be much more comfortable with technology. We do have a long way to go. I will make note that I've seen how many pharma advertisements on TV that have driven patients to ask for a specific drug, so I think insofar as we can promote advanced technologies in health care publicly in the media, I think we will drive adoption as well because patients will begin to ask those questions, but we need the providers to be comfortable as well.

MR. WEST: We have a question over here.

MR. BRICKMAN: I'm Peter Brickman and I'm a health economist from Silver Spring, Maryland. I think you have two challenges. One is the perception in the country that if it's not covered by insurance that it's not available and that impedes both the docs from purchasing and the patients from buying. In fact, on that regard, you're probably better off that it's not a covered service because then you can sell it to patients when they want to have it, particularly through remote access.

The other problem I think you have is the complexity of medicine. There are 7,000 active CBT codes, there are probably several

hundred that are for diagnostic tests and monitoring so that any one specific monitor is going to have a very small market. You're talking about 1 percent at most for most of the specific diagnostic tests. What might be better is that AT&T box, if it were a general sort of switching system or sending system, that entrepreneurs and developers could develop monitoring devices that would feed a standardized box that could send signals so the doctor. It wouldn't have to be a different box for each diagnosis, but you could have a separate monitor, a switching system that accepted a standardized record of some sort to send to a remote location, remote to a centralized doc, and then you could sell the box to patients because they don't want to drive 6 hours to get to a location or they don't want to even go for 1 hour if it has to be three or four or five times a week. But if there is patient convenience, then you can get demand, and then once it starts to get adopted particularly in a generalized fashion, then docs of all varieties can use the system, different specialties could use the same system with just different interpretations on the monitoring signals.

MS. BLACKLER: This box has our name on it of course because I brought it, but it operates on the ZigBee standard which is in the industry we talk about as interoperables, an open standard and anyone can build a device to it. In fact, it was developed by the Continua Alliance which is a group of 200 technology companies, some big like AT&T and

some small like the folks who are developing the shoe -- and that is the vision, that all of these things can feed into this box. There is a lot of interest in the app store model on iPhone and medical applications on the iPhone where anyone is developing applications and if they're compatible they can be downloaded. So I think that is both where the industry is generally and the vision for the medical device technology and that's why you see a lot of focus on the standards and the interoperability. The standards folks, the Standards Committee and the people at ONC are articulating that one of their goals is this technological neutrality and interoperability to allow that kind of thing. I think there's a great deal of concern in the provider community even about proprietary systems largely driven by they don't want to invest in the wrong one and I think that that is where the industry is headed. I would also say that AT&T are thinking about how to work in the electronic medical records field and are moving toward a system. We have a product, not to do too much of a commercial, that allows us to work with whatever medical records system the hospital has and translate that so hospitals don't have to reinvest in something. I think the tech community has loud and clear from the customers that that's a huge risk for them to have to decide in these emergent technologies and what to invest in so that I think we won't see that as a big barrier going forward.

DR. RHEUBAN: I would agree. The Continua Health Alliance has really worked hard to develop these standards of interoperability, and ATA has taken a role in terms of working with the specialties on practice guidelines and standards as well. We think that is the role of an organization such as ours. Fast-forward 10 years, maybe your broadband provider sells your device as well. That's how to get the customers hooked into it as well, for an extra charge you have bundled services, TV, phone, health care access. Why not?

MR. WEST: HBO monitoring device. In the very back on the aisle.

MR. HENSEL: I'm Brian Hensel and I'm a Health Policy Fellow with Senator Jay Rockefeller. You've talked a bit about telemedicine consultations and functional and physiological monitoring, but what about use of Web-enabled phones, iPhones, et cetera? What's the vision for those and what's currently being done?

MS. BLACKLER: Interestingly, back to the other question, a lot of the really exciting stuff that goes on in the smart phone area doesn't go on with us because we're not the device inventor. We have a lot of partnerships with companies interested in doing things and we like to encourage them and prop them up, but in the end a lot of that innovation goes on elsewhere and is compatible with what we're doing. There is fun

stuff that we're involved in. I don't have my iPhone with me, but there's a technology being developed that is a projector that you hook into your iPhone and it takes the image that is on your iPhone and can project it onto any surface so that you can have the X-ray and project it on the wall and do a consultation with people right there, and they're working on getting the resolution to a point that is useful medically and not just to show movies to your friends. So there's really all that kind of stuff going on and that is I think the Holy Grail of what you're trying to get to is that it's seamlessly connected so that it's not hard. We all know that your grandmother is not going to want to figure out that device or certainly even figure out a smart phone, but that for the practitioners there is a lot of opportunity in packing as much into the one device as you can.

MR. WEST: There are an amazing number of applications being developed for smart phones. I was at an M health conference a few months ago and there were various companies that were exhibiting different things that they had. It was mind-boggling just what you can do now through the existing technology. There are physicians who can download your electrocardiogram to their smart phone and give a second opinion. So you're a patient in D.C. and the physician is in California, you just electronically shift the information, they can download it their smart phone, read it and offer an opinion. I think that's the type of thing that is

going to be very transforming about the future practice of medical care. Right now we are limited by geography. When we think we're in D.C., we have to go to a D.C. specialist. I think in the future those types of geographic barriers are going to become less common and we will have access to experts in other areas.

DR. RHEUBAN: Although we do have licensure challenges right now which do exist, licensure is state determined, so other than DOD and VA patients, we are constrained by state licensure so that I can't really provide medicine across a state border unless I get a license to practice medicine in that state which is a very time-consuming process. We have been working with the Federation of State Medical Boards, but we have miles to go on that issue specifically. But in terms of the devices, high-risk obstetric care, a little bit of CT scanning, an EKG, there are tremendous applications that can be and have been developed already. I think it's very important that all of these developers work with the specialty societies to be sure that the application itself is appropriate for the type of service provided.

MS. BLACKLER: I want to add that another high-potential technology is this whole cloud computing opportunity, and I think the opportunity for innovation for that is that a large company like ours can put functionality in the cloud that other people can then innovate off of. I think

of the speech-to-text idea, text-to-speech that has a lot of medical applications that people can simply explain their symptoms, that we are developing the capability to do the speech-to-text translation, have that in our network, but make it available to developers and other products to use. You know how innovation works. AT&T is not going to be inventing every fabulous thing out there, but we have the resources to do some of this underlying technology. So it's kind of a combination of this innovation in the devices, the smart doctor who invents some application that works for this very specific purpose but isn't going to be able to have access to some of this really basic functionality that a company like ours could make available in the cloud. So it's really this combination of business models almost of how you can make the technology available that I think gets to the really fun stuff out in the future. I hate to say out in the future because the only reason it's out in the future is we don't have the medical system set up right. There is no reason why we're not doing this today technologically.

MR. WEST: There's a person right there, second person in who has a question.

DR. ENGLISH: I'm Dr. English. I was in general surgery for some time and am now teaching at Georgetown in bioethics. All of these new capacities are absolutely exciting and wonderful and need to be

done. Presently we have too few general care practitioners even though the nurses are beginning to say this a little bit, as they go back into clinical work as primary care people, we need first adequate baselines, and of course with electronic records developed fully and completely for each patient, even the patient who has 3 or 4 hours to drive, at some point he or she needs to be seen by the medical person and evaluated and having a rectal exam if that's needed to get the basic guidelines to begin with. In order to use the technology that you are exciting us about for specific or recurrent acute problems, you cannot substitute telemedicine without the full store to begin with, otherwise you do what happened when I was in, what shall we say, an HMO part time while I was studying where I saw a patient for 10 minutes. We were required to see four patients an hour which was totally inadequate. But you've got to have the baseline and know about the patient, know about the examination, know whether a breast exam was done, and that all has to be in the system before you can get into this sophistication.

Finally, all physicians should be salaried in order to help the conflicts of interest. We have our own ethical problems in the fact that probably over a third of us have interests in pharmaceutical, insurance and freestanding medical situations which bring in more money. Doctors don't need more money. We've always been well paid. Even in the

Depression my father managed fine. We don't need more money. We need the support to be able to be the kinds of physicians that patients need, and you've got to have time with patients to do that.

MR. WEST: I was with you until you gave that rectal exam argument.

DR. RHEUBAN: First of all, I'd like to say since I'm the Associate Dean for CME, I have nothing to disclose, no conflicts of interest, I don't consult for anybody. But I began my talk to say for me it's all about specialty care because I am a strong believer in the primary care model as well and I agree that 100 percent that patients need access to primary care physicians, and unfortunately our system is set up for disincentivizing that process so that I am 100 percent behind you on your comments. I think there's a lot we can do, and we need to loop the primary care providers into these roles. With the health information exchange, when the patient gets an electronic medical record whether it's a personalized health record by any vendor, it needs to be able to talk to the community health center's electronic medical record, it needs to talk to mine, it needs to talk to the patient's personalized record. That should be a major driver for our government, and it is with the Office of the National Coordinator a very critical piece, but I thank you for your comment because I agree 100 percent. And to the comment that was made earlier

about you don't need to have coverage, I suffer so when I see so many uninsured patients who can't afford even to pay for their own medicine. It's a broken system. I volunteer at the Remote Area Medical Clinic in Wise, Virginia. It was covered in the "New York Times" and covered in the "Washington Post." The Remote Area Medical Organization went to L.A. later this summer, we were down in Appalachia, with 3,000 patients seen over one weekend who have no access to specialty care, limited access to primary care services, 50 percent of those patients actually had health insurance but still they didn't have access to care and they couldn't pay for their medicine. So our system does need to be fixed and I support you for your comments.

MR. WEST: I would have one additional comment to that which is I think we should really save physicians for providing medical care. When I talk to physicians now, they are spending an inordinate amount of time on administrative stuff and paper-keeping. There's a lot of stuff that they do that they should not be doing and I think that's where technology can come in to relieve them of the tedium of stuff that has to get done, they shouldn't be the ones doing it, and it's too expensive a use of their time to be using their time in that way. There's a question right there.

MS. BINDO: My name is Sinata Bindo. I was with Motorola before. I wanted to find out as we bring technology into the health care industry on our mobile phones, do we think the data plans would be coming down because they are so exorbitant compared to the rest of the world? We do invent technology, but we don't use it in the U.S. as much as we do in the rest of the world. As a simple example, just the SMS I think is not heavily used in this part of the world compared to the rest of the world. Do we think that's a barrier to making it as commonly available to the rural areas as possible?

MS. BLACKLER: Yes, I think affordability is a problem for lots of folks generally. We know that on the wire line side and on the wireless side as well. I think interestingly that's one of the things -- we haven't talked much today about broadband. We got excited about health care. There is a growing recognition that just like health care needs a big global overhaul, that we need a big global look at broadband policy and the FCC is doing that right now. An element of that is affordability and they are trying to put together a national broadband plan, so I think we'll see some progress out of that. But I think also if you look at the data I'm sure I'm obligated to say that prices have actually gone down over time for data services. I'm sure that that trend will continue, but I think there is a separate question about affordability. As we know, in rural areas incomes

tend to be lower, people are poorer, and you combine the lack of access with the affordability barrier and the income and you've got a problem. You've got it on telephone service, you've got on broadband and you certainly have it on smart phone data plans.

DR. RHEUBAN: I want to say across the room say a shout-out thank you to Snowe-Rockefeller because Senator Rockefeller established the Rural Health Care Program which is undergoing evolution, but we could not do telemedicine in our rural communities without the Universal Service Fund. I know there's a look going forward for overhauling it, but when we started in 1995 to connect to a community health center in Appalachia, Virginia, it cost us almost $6,000 a month for 1.54 megabits in both directions. With the Rural Health Care Program now we can get that service for under $200 a month, so suddenly it is getting more affordable and if we can fix that program you'd see us all jumping up and down saying thank you, thank you, thank you even more. That is the other major issue for us beyond reimbursement, frankly, is delivery of those broadband communications services, and it's moving forward. The Telecom Act of 1996 really made a difference in terms of getting out the competition and lowering the costs, but there's more to be done as we look at the home as an environment and other previously ineligible entities.

MS. BLACKLER: The FCC has put a lot of focus, thank you to the Snowe-Rockefeller bill, access to the Rural Health Care Facilities and to schools, and the FCC has long had a problem that subsidized basic phone service to individuals, and I think now they are asking is it time to go to subsidizing broadband access for people who are low income and we at AT&T have supported that and I think other people are supporting that, and we may see some progress on that at the FCC.

MR. WEST: Right there is a question.

MR. ROSENBAUM: Nelson Rosenbaum from Consumer Health Advisers. We built a comprehensive consumer health management portal. I'll make two quick comments. I think both of you have emphasized the importance of a comprehensive, longitudinal personal health record. We agree with that. But I think there's absolutely no comprehension of the importance of that on Capitol Hill. In this current legislation I've seen absolutely nothing to support that concept and vision. There is plenty of support for NEMAR (?) but nothing about a PHR. And until that switch goes off on Capital Hill I think we're going to have problems in enhancing consumerism.

Number two, there are lots of state interstices here. I liked your comments about technology trumping privacy concerns, but in reality when you get down to doing health information exchange in different

states, there are lots of mental-health laws and lots of laws about this and that that get in the way of health information exchange, and lots of state legislators get up on a stump and make speeches about privacy and so forth and create a concern and fear that is really in the way of effective consumerism in health information exchange. Whether you want to comment on those or not, I think we have to reckon with those two barriers. Thanks.

SPEAKER: I'm Ryan from -- from a physician's standpoint, I know what you're doing on the technology end for compliance, but that was one of my concerns. My wife and I actually just recently had a premature baby and we were sent home with the monitor and I know the follow-up calls when we weren't monitoring. But what do you see out there in terms of compliance? Are 90 percent of home-monitoring things being complied with or what's your feedback so far?

DR. RHEUBAN: The patients are very accepting of the technology. I've had patients who were even unsavvy say this was so wonderful. I don't want to come back. I want to keep using these technologies. So I think once you engage the patient, I think they will be very, very compliant, and there are reminders in the technology to make them be compliant or to facilitate their compliance. So I think they are terrific tools and I think patients are very, very accepting. One of my first

telemedicine encounters actually was with my congenital heart disease patients and he had just had surgery and I sort of cajoled his mother into coming to a small community hospital and tested the network. The stenographer was there and she had never done a pediatric echo and she's sitting there really nervously and the mother was there and the baby was there. After it was over I said to the mom, "What did you think?" She said, "Tell everyone that I'm not coming back to your hospital if I don't have to." That's how accepting patients are because it's so much better than disrupting your lives for travel and getting timely intervention. So hopefully customers will fully adopt it, and it remains to be seen.

MR. WEST: Right here we have a question. Right there on the aisle.

MR. NOVIK: My name is Dmitry Novik. I have three questions to all of you. The first question is to, I don't remember your name. I'm sorry.

MR. WEST: West.

MR. NOVIK: But anyhow, I had a chance to read your paper before, and my question is this. You said that patients must be in charge of health care. It's absolutely the wrong idea. Doctors must be in charge. It's unbelievable how you can -- so my question is this, do you really think that patients must be in charge in the health care system?

MR. WEST: I would say they just need to be more in charge because right now --

MR. NOVIK: No, you said --

MR. WEST: -- patients are --

MR. NOVIK: -- in charge. More or less. I understand. Now I have questions for you. What about your devices and sensors give some mistakes in the system? It will be terrible. Tell me please how you ensure that all your devices are absolutely truthful. How? Can you create what it will cost if it will for 30 million patients do have this device? For the record, I am a professional. It will never happen. Your devices will never be on the market. It's a wrong investment for AT&T, because you need to be serious, not fantasy. You need to be practitioners and not imaginations.

MR. WEST: What's your last question, please?

MR. NOVIK: I have a question for you. In 1993 I have a very successful demonstration at Walter Reed and Johns Hopkins Hospital with X-ray images transmission with increasing speed by telephone lines because the internet was not available at this time, 100 times quicker and 100 times cheaper of course. Why it was not implemented around? Very simple. Because a doctor in telemedicine, the

main organizing problem is your doctor must have a license in different states. It's crazy. It's a problem. I have a question.

MR. WEST: Please. Give us your question.

MR. NOVIK: My question is this. You are President of the Telemedicine Association. You're a practitioner in this field. What technological problem do you have? Give me one of the most.

DR. RHEUBAN: Very few that can't be accomplished with technology. Compression standards for transmitting images are there. What we need is more funding for some of the technologies even to develop the standards. So I think there isn't anything we can't solve with technology if we have sufficient funding and sound policies to implement it. So all it takes is funding and good policies at federal and state levels, and consumer adoption. But we can do it with technology.

MR. WEST: Excuse me. We have some other people who want to ask questions. May we get a question over here, please?

DR. POPLIN: I'm Dr. Caroline Poplin. I'm a primary care physician. I retired from Bethesda Naval Hospital a couple of years ago. I have one comment, quick, and a question for Dr. Rheuban. The comment is it's wonderful that we can get all this data from patients. The last thing I want in my office is data piling up and I don't have time to look at it. Somewhere in that data is something that I need to know and I don't get it

until the next day and meantime the patient is in the hospital. That's a terrible situation. Along with the data we have to be paid for time to look at the data. There was a study I think in the "Annals of Internal Medicine" about the VA with its great electronic health records, half of the CTs that were done that picked up an incidental aortic aneurism were never looked at by the hospitals even though they got an electronic notice that there was an abnormality on a CT.

The question is have you ever thought of using the Indian Health Service or maybe the Public Health Service for the telemedicine? It sounds like Indian reservations would be the perfect places, and the Indian Health Service has its own pot of money and it's probably not constrained by state licensing standards.

DR. RHEUBAN: Thank you for that question. Actually, the Indian Health Service is very much involved with telemedicine. Dr. Mark Carroll who is a pediatrician is on our board, he is very involved in all the federal policy issues, and they are providing telemedicine services on the reservations. In fact, at our annual meeting he took a side trip to the bottom of the Grand Canyon to launch a telemedicine initiative at the very bottom of the Grand Canyon at one of the little tiny reservations, so that they are very, very involved. The same thing with Alaska. The Tribal Consortia in Alaska have very heavily invested in telemedicine. I might

add that 63 percent of the rural health care funds actually go to Alaska. Again I stated earlier I agree 100 percent with your premise that we don't as doctors have enough time to sit there and look at that data so that we need computer support and people to review the outliers and identify and react to the challenges. I'm behind you 100 percent.

MR. WEST: If I could push her question one additional level and this is where I thought you were going, the legal liability question. If people are using these remote monitoring devices, all the data is flooding into a physicians' offices, they don't have time to look at it, they miss something, they're going to get sued.

DR. RHEUBAN: I agree that we will.

MR. WEST: What do we do about it?

DR. RHEUBAN: We have to be smarter about what we do with the data when it comes in. It's another group of health professionals I think or more nurses or more advanced practiced or more doctors to help us with all of this data. I think there are technology solutions to help us with our problems with technology.

MR. WEST: But if all of that is true, does that mean we are going to save less money because we may just redistribute the expense.

DR. RHEUBAN: It may be an initial greater investment in order to be able to save money long-term.

MS. BLACKLER: To me it goes back to the question someone asked about reorganizing the practices. Mayo talked about this, that there really isn't a system now, and you've got an amalgam of people doing things and there's no system. I think the technology does call out for a better system, methods and procedures, the larger sense of the word system, to manage all of those issues, and in some ways highlights what has always been a failing that if you have this data and it highlighted what the problem was and there was no way to act on it, it's really just highlighting a problem that we have today.

MR. WEST: I think we have time just for one or two more questions. We'll take one right there.

MR. GARVAN: My name is Eric Garvan with a real quick questions. In terms of building infrastructure, what kind of bandwidth do we actually need in order to communicate the images that we are projecting let's say 10 or 15 years in the future? The other thing is, what is the scale of the legacy data that has to be added into the system in order to build the types of records that give an historical picture of a particular patient or group of patients? What is the scale, and then again in terms of building infrastructure, can we even handle it with the bandwidth that we currently have now?

MS. BLACKLER: I can address the bandwidth question and I think the answer is it actually depends on the technology. A lot of the stuff we talked about is not a giant bandwidth consumer. Some of the stuff is. If you're talking about remote surgery using real-time video that has to be high resolution, that's obviously big bandwidth. But if you're talking about store and forward, it doesn't have to be a giant bandwidth, if you're talking about this kind of thing, that's actually not bandwidth intensive at all, and then some of what we talked about was text messaging, and that's not even broadband. There's obviously exponentially increasing need for demand, but I don't think a lot of this is a bandwidth barrier today. I think the other barriers are bigger, which is different than saying Karen needs to be able to buy the kind of connectivity she needs at the places she needs it, but those aren't at speeds that are impossible today, it's just as you say a funding question. We can deliver her that stuff if she had the money to pay for it.

MR. WEST: And scalability?

DR. RHEUBAN: It's going to be a big investment, frankly. Especially as we implement large-scale electronic medical records and personal health records, it's going to be very costly and the federal government is investing a lot of money in interoperability and adoption of electronic medical records, and sort of the equivalent of the Farm Bureau,

there are going to be electronic medical record cooperatives to help people deploy in their offices, but it's going to be a huge investment. In terms of one of the other questions about the bandwidth, compression algorithms can help us, but for live interactive we do need at least a quarter T-1 at a minimum to have something that's acceptable to the doctors and acceptable to the patient. It doesn't work if you're trying to talk to a patient and it's a choppy image. So again as Ellen said, it depends on what the application is, but there are solutions that can be developed to address those challenges as well.

MR. WEST: Especially in the middle of surgery.

DR. RHEUBAN: Right.

MR. WEST: I'm still not convinced on this remote surgery concept. Maybe that's just me.

MS. BLACKLER: I have to take the opportunity to also talk about a network management kind of issue is that some of these things can be managed in prioritization. If you're doing a store and forward, you don't have to do that right away. That bit can go second. But if you're doing real-time surgery, that bit has to go right away. So it's not always just building a bigger pipe, there are lots that can be done with technologies on the compression side and on the network management side, and who knows what else they will invent.

MR. WEST: We have time for one last question right here.

DR. STEWART: I'm David Stewart with CSC. We're talking about collecting all this data and responding to it, but the next step is collecting all this data. How do you use it or where do you see the early adopters taking that data and using it to improve outcomes and make better decisions within health care and improving communities.

DR. RHEUBAN: I'll take the first stab at it. Chronic disease management, I think that is the best application. It's what's costing our government, it's costing patients, it's a huge hardship especially when you're dealing with patients who are at a distance. So I think chronic disease management is the number one place to start, reduce the burden of diabetes, reduce the burden of heart failure, there's a lot can be done and if we can develop sound policies to address what we can do with technology, I think we'll go a long way.

MS. BLACKLER: I would add that I think the folks working on the EMRs, the meaningful use definition, do have their eyes on that in that they have tried to keep in mind the thing they want reported out as they're doing the definitions so that you have useful data at the end of the day that can compare across time and space, people.

MR. WEST: We are out of time, but I want to thank Ellen Blackler from AT&T, and Dr. Karen Rheuban from the University of

Virginia for their insightful comments, and thank you for all of your great questions as well.

* * * * *

CERTIFICATE OF NOTARY PUBLIC

I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

/s/Carleton J. Anderson, III

Notary Public in and for the Commonwealth of Virginia

Commission No. 351998

Expires: November 30, 2012