Drs. John F. Anderson, David J. Ballard, Carl E. Couch, and Peter A. Dysert II discuss clinical transformation with the editor

On January 5, 2004, Baylor Health Care System (BHCS) formally announced a \$119 million investment to redesign its clinical processes and to link clinical information throughout its network of 11 hospitals, 69 clinic sites, and numerous physician practices. This comprehensive effort is the first of its kind in North Texas. The purpose of clinical transformation, which is enabled by technology, is to improve quality of care, including delivering that care in the safest manner possible. The planning of the project was initiated in 2002. The initiative will be implemented initially in 2004 at the new Baylor Hospital at Plano and in Baylor's Health-Texas Provider Network and will be fully deployed throughout BHCS by 2011.

Upon complete implementation of the system, each Baylor patient will have a secure, single electronic medical record, retrievable by his or her care provider via a handheld or desktop computer. This electronic medical record will benefit patients, nurses, and physicians. In addition, patient information will reside on BHCS's secure information network, enabling BHCS to implement clinical best practices systemwide. The oncology and outpatient information technologies will be jointly designed by BHCS and by Boca Raton, Florida-based Eclipsys Corporation using the company's SunriseXATM software, a clinical information solution based on the Microsoft .NET platform (1, 2). In this interview, 4 physician leaders comment on clinical transformation (Figure).

William C. Roberts, MD: What does "clinical transformation" mean?

Peter A. Dysert II, MD: Clinical transformation is a commitment of BHCS as it moves away from being largely paper based. It includes investments in information system technology and a redesign of the way care is actually delivered, seeking the best and safest outcomes for its patients and the application of evidence-based medicine through partnership with its health care providers. The investments in technology will enable providers to create the ideal patient experience.

John F. Anderson, MD: Anything done in the name of clinical transformation ultimately has to focus on the patient. The phrase "ideal patient experience" really does mean something. The health care process today is terribly patient unfriendly. From the time a patient tries to access a primary care physician to the scheduling of tests, the reporting of tests, and the coordination of care, the system is too cumbersome. Very little is integrated and

Figure. John F. Anderson, MD, David J. Ballard, MD, PhD, Carl E. Couch, MD, MMM, and Peter A. Dysert II, MD, during the interview.

coordinated to the benefit of patients. Even before approaching technology and the technology tools that will be implemented, clinical transformation is about making life simpler, better, and safer for patients and their families.

Dr. Roberts: Its purpose is to improve the quality of care given to patients and to ensure that that care is administered safely. I presume it also allows that care to be provided more efficiently and economically. Is that correct?

Carl E. Couch, MD, MMM: Today there are outside pressures on medicine to improve itself. Publications from the Institute of Medicine have focused on 6 areas that are essential to any medical system.

The first is *safety*: preventing unnecessary errors, preventing unnecessary deaths and injuries, and preventing adverse preventable reactions.

The second is *timeliness*: avoiding unnecessary waits or delays. These often occur because of the lack of information at the point of care. The goal is to avoid delays or waits that are not in the patient's best interest.

The third is *effectiveness*: applying the highest evidence-based medicine, where it exists, to all care, recognizing that that "evidence" changes over time. The goal is to embed evidence-based medicine in all medical processes. Effectiveness also means avoiding the 3 common errors: 1) *giving too little care*, that is, failing to give care where it's needed; 2) *giving too much care*, or giving care when it's not needed or ordering tests when they're not needed, all of which have risks; and 3) *giving the wrong care*.

From the Administration and Office of Clinical Integration (Anderson), Institute for Health Care Research and Improvement (Ballard), HealthTexas Provider Network (Couch), Department of Pathology, Baylor University Medical Center (Dysert), and Baylor Heart and Vascular Institute (Roberts), Baylor Health Care System, Dallas-Fort Worth, Texas.

The fourth is *efficiency*: avoiding waste. Possibly one third of all health care costs in the USA are waste, including redundancy of testing, inability to retrieve information, and ordering tests for the wrong reasons (defensive medicine, for example). Efficient care reduces the cost of health care.

The fifth is *equity*: ensuring that patients of all socioeconomic strata get equally good care. Equity has much to do with access and availability.

The sixth is *patient centrality*. All care must be patient centered. Patients find the health care environment perplexing and often inefficient. Patients base physician quality on our accessibility, our cordiality, our willingness to listen to them, our willingness to address their complaints or concerns, and our willingness to do these things in a manner compatible with their values. The consumer-savvy environment that we live in needs addressing.

The acronym for these 6 essentials is STEEEP™. Clinical transformation will address all 6.

Dr. Dysert: One of the most visible pieces of this project for the patient and the physician is technology. Clinical transformation, however, is not all about technology. We will certainly be far less dependent on paper than we are today. Technology, however, is only an enabler. It is not a solution in and of itself. In some cases, technology may prove to be a barrier. Paper, in actuality, is a technology. In some cases, paper is the best solution, but paper is not the solution to every problem.

David J. Ballard, MD, PhD: Bill, here's an example of the implications of clinical transformation in terms of our current way of doing business compared with how we might do business in the future. Carl and others have led a very ambitious health care improvement effort across the HealthTexas primary care centers over the past 5 years. For the most part, this has been a paper-intensive effort. We currently randomly select 10 patients per month per physician and collect clinical preventive services performance data about 3 months after the patient has seen the physician. We feed that performance back to the physician. The physician works with his or her office staff to redesign care processes within the office to improve performance. We remeasure care every 3 months using this approach. We use a paper-based clinical preventive services worksheet to help support this effort. In the summer of 1999, when David Winter and Carl and others began this effort, the 250 HealthTexas primary care physicians were delivering clinically necessary preventive services 52% of the time; by 2004, those preventive services were being delivered 87% of the time.

There's still tremendous variability in performance across the 50 HealthTexas primary care centers and 250 primary care physicians. The Family Medical Center in Garland has an electronic medical record now, and it has achieved the highest performance. That group by 2004 delivered preventive services 96% of the time compared with the overall HealthTexas average of 87%. Under Cliff Fullerton's leadership, the group has used its electronic medical record linked to clinical process redesign to help support its clinical preventive service improvement effort. The potential of clinical transformation is to rapidly deploy that best practice at the Family Medical Center in Garland to the entire BHCS so that we don't have to take 4 years to move from a 52% to an 87% performance as we expand our focus from preventive services to, for example, chronic illness care.

The clinical transformation effort represents Baylor's single largest investment to date in health care improvement and enabling information technology. The magnitude of the financial commitment signifies the importance of designing safety and quality into clinical care processes. We have been laying the groundwork for this transformation for the last 10 years by establishing processes and an infrastructure that will help us implement this project successfully. Quality and patient safety are fundamental to Baylor's 100-year mission and, now, appropriate information technology is available to further improve our delivery of quality patient care and enable our clinicians to provide the ideal patient care experience.

—JOEL T. ALLISON, PRESIDENT AND CHIEF EXECUTIVE OFFICER OF BAYLOR HEALTH CARE SYSTEM

Dr. Anderson: Ten years ago, measuring clinical preventive services in BHCS had absolutely no priority, nor was it on anyone's radar screen. BHCS, like most hospital systems, has evolved as a large, integrated network of hospitals and acute care facilities. From the patient's perspective, the hospital, and particularly acute care, is very important, but it's only a piece of the process. The real change is the transformation of BHCS from a network of hospitals and acute care facilities and departments to an organization that now focuses on all clinical processes of care such as clinical preventive services, which help prevent cardiovascular disease and help detect cancer early so that appropriate care can be provided. The new focus is complicated by the fact that, for the most part, large payers, including the federal government, do not pay for preventive activities. BHCS is reimbursed mainly for acute care services. Thus, a real dilemma faces BHCS in its transition from a hospital system to an integrated network of caregiving, from primary care through secondary care and early diagnosis and treatment all the way up to acute quaternary care, which is where BHCS developed its reputation.

Dr. Roberts: You've been discussing the overall goals and processes of clinical transformation. Doctoring, on the other hand, is managed one patient at a time. Could you describe how a single patient might begin at a Baylor physician's office, come into the hospital, and then be discharged to repeat the same process at a later time? Also, there are a lot of physicians at BHCS who, like myself, are not computer experts. You must convince them that this transformation is the way to go. Maybe you could start with a single patient.

Dr. Couch: Let me walk through an episode of colorectal cancer screening. Physicians who are treating a patient sometimes don't even think about the preventive aspects of care; they are focused on the illness they expect to encounter. The preventive reminders flowsheet placed in the front of the chart is a useful reminder to screen. The secret is to get the nursing staff engaged in incorporating that screening as part of a standardized checklist. They determine whether an eligible patient has had colorectal screening; if not, they'll flag that deficiency for the physician so that after the current medical problem is addressed, the physician

will remember to schedule the patient for colorectal screening. By having a good system in place, we've been able to improve colorectal screening substantially. One of our primary care physicians detected almost 40 precancerous colon polyps over 3 months that would not have been detected in an earlier period. The consequence was lives saved.

Standardizing the process is the key. Work done by Drs. Peter Dysert, Randlow Smith, and others found that among good gastroenterologists or colorectal specialists at Baylor University Medical Center (BUMC), the suggested follow-up screening date ranged from 1 to 10 years after a normal initial examination. Thus, some patients might have 10 colonoscopies in the next 10 years, and some patients only 1 in the same 10 years. Which is right? What does the evidence say? The most recent evidence indicates that 10 years is probably a sufficient interval after a squeaky clean colonoscopy, and doing it more often is unnecessary unless symptoms appear. Part of clinical transformation is agreeing on the best evidence and then standardizing our approach to patients so that the process is consistent across BHCS.

Dr. Roberts: *What you're saying is that irrespective of the reason for the patient's visit, it might be as important or even more important to ensure that he or she doesn't have colon cancer or gets flu shots or gets the cholesterol level determined. But you take a history on that patient. You dictate that history and it goes into the computer immediately. How will it actually work when this transformation has been completed?*

Dr. Couch: Clinical transformation will not change the interaction between the physician and the patient. The patient is still there for a problem; I'll still need to appropriately diagnose and treat that problem. What a computer could do with respect to colorectal screening is to remind me that that issue needs to be addressed if it hasn't been addressed. The computer can go back and search the data and say that this 65-year-old patient has not had a colon exam in 10 years. A little pop-up window on the screen reminds me to ask him about potentially preventable conditions.

Dr. Roberts: *How do you get the history and physical examination and the laboratory studies on this network so that the data are all there when that patient enters a Baylor facility 5 years from now?*

Dr. Anderson: You've got to begin by being able to identify the patient in multiple sites. I can go online today and rent a car, and they know who I am and where I live. We can't do that today with patients. We can't have 6 definitions of an abnormal blood urea nitrogen level. We need a lot of standardization around basic elements of clinical care. We know what "pneumonia" is, but how do you define it in digital terms?

Dr. Roberts: *How do you get the history and the physical examination into the network? Do you dictate it and it's typed right there?*

Dr. Couch: The answer is multiple ways. Two kinds of information need to get into a medical record: structured data and nonstructured data. A structured data element, for instance, would be a serum potassium level. It can be obtained in multiple locations, but it will go into a single point in the medical record and be retained there. Most laboratory values are structured data. Structured data can also exist within the history and physical examination part of the medical record. Data elements can be created that are structured using uniform medical terminology. "Lumbar syndrome" and "low back strain" may map within those

structured terminologies to the same data element, which can have the same ICD-9 code and yet multiple terms. Similarly, "pharyngitis" and "sore throat" may map to the same terminology and will be allowed to be entered as a structured data element. Structured data elements that everyone uses today are ICD-9 codes, CPT codes, and lab values.

The medical record can be constructed in such a way that the doctor could either use lots of structured data, like drop-down menus and point and click-type selections, or use nothing that's structured, such as through dictation. When dictation goes into a medical record, it's in an unstructured form as text. It's more difficult to retrieve, but it's still possible to search it or use it for future reference. It can always be retrieved as a document. Other unstructured data include outside correspondence, x-ray reports, operative notes, and other kinds of reports that need to be part of the medical record. Other digital data such as voice files and images themselves can be placed in the medical record. The medical record may be very plural. It may have structured elements, it may have unstructured text, it may have images, and it may have other elements, which is not unlike what we have in a paper record.

Dr. Roberts: *How does a physician's dictation actually get into the network?*

Dr. Couch: He can dictate it and never touch the computer himself if that's what he wants to do. As technology improves, he may dictate into an electronic transcribing device or voice transcription and have it immediately appear on the screen. That technology, however, is not quite here yet. He may type it directly into the computer. He may use a portable device and point and click on a structured note. Any one of these methods could be used to enter the data.

Dr. Dysert: To be successful, the system must be flexible. We need to have different technologies. If a physician simply wants to record a sound file, we may or may not ever transcribe it; he or she can do that. The physician side of me says, "The medical record has been hijacked from the providers of care." It is a document that today largely creates value for other people and not for the caregivers. It's an instrument used for reimbursement; it's an instrument used in a defensive fashion to document things from a liability perspective. For the electronic medical record, we won't simply go down the same old road but now with computers. Technology will improve the communication between the patients and the providers. Some of the issues that have been categorized as safety issues can be minimized if we just get people communicating with one another across the episodes of care. A tremendous amount of fragmentation exists in the care process today. We need technology that's going to facilitate communication for the purpose of collaboration in the management of patients.

To think that we can simply take that human interaction and move it completely from my impression to a digital format is a myth. A component of what we do will be amenable to conversion to data, but an awful lot is analog or free text. If you believe in the cortical integration of information, and that's what I believe in (that physicians will continue to require a brain, that computers will not be practicing medicine), I think there's a great deal of value to be delivered to doctors by simply allowing them to integrate that information at the level of their brain and not just at the level of the computer.

Dr. Roberts: *Let's take this patient that you just saw, Dr. Couch. This patient now comes into the hospital. You get a call that the patient is in the emergency department. Let's say it's at night and the patient is not acutely ill. The next morning, at your home, you get on your computer and get updates as to what happened to your patient that night in the hospital. Is that correct?*

Dr. Couch: Yes. Ideally, that will be available.

Dr. Roberts: *When that patient comes into BUMC, where there are a lot of houseofficers, they can pull your previous history and physical examination from the network. How are they going to get their new recordings onto this system? Do they type it there or can they dictate it?*

Dr. Couch: Any of several methods. They may directly interface with the computer, they may dictate, they may point and click. All the different kinds of input devices are going to be available to physicians so that it creates minimal disruption to their work habits.

Dr. Roberts: *Will radiographs, electrocardiograms, radionuclide images, etc., be available on the screen? How will the operative descriptions be put into the record?*

Dr. Anderson: The same way. An operation is just an intervention that is part of the process of care. The operative note could be dictated or structured. The goal is a single, longitudinal patient record that's electronically connected and that has multiple points of data entry. The data are entered in multiple ways at multiple sites by multiple people but around a set of standards that have to be defined.

Dr. Roberts: *If a surgeon excises a nodule and sends it to surgical pathology, will he or she have a mechanism for not only putting the diagnosis on the record but also for viewing the histologic findings?*

Dr. Dysert: We have experimented with making the images available to physicians. There's no reason from a technology perspective why we can't go any of these routes. But, buried in our "why you can go the image route" issue is the same question that is buried in our discussion around what's going to drive people to adopt this technology. There's no way that BUMC is going to be able to perform at a consistent level unless the net result of clinical transformation is improved efficiency and productivity for caregivers. We need simplification; we need to make a process more predictable and efficient. We desperately need technology that automates the tasks that we have to do manually today. The flip side is that if we create this huge demand for more and more data without the tools to automate the process or to simplify it, we've made it more burdensome on the providers of care.

People ask me why doctors won't use a computer. Anything that relegates the physician to the role of being a clerk, whether it's on a piece of paper or on a computer, usually fails. These computer-based processes of care have to be a lot more sophisticated than simply being an electronic version of the piece of paper we have today, and that's a pretty tall order.

While BHCS has made a significant commitment to clinical transformation, we're buying futures in the technology space. Some vendors have components of what we're talking about, but nobody has a product we can buy off the shelf and begin using. A lot of the dominant vendors have a great set of tools to convert observations to data, but they don't have a solution to accommodate what Carl referred to earlier: scanned-in documents or this whole messy thing called text. Because they're not in the

business of selling imaging technology, most vendors don't have a good imaging strategy. BHCS, then, is left to integrate sources of data and technology that support image acquisition, management of text, and management of sound.

Dr. Couch: Suppose I'm doing a history and physical on a patient who already has an electronic medical record. A lot of the components of the history and physical are already there. I could create it new, but I could also add only the information on the present illness or new physical findings, thus saving time.

Another example is *standardized orders*. It's very nice for surgeons who do routine cholecystectomies to have standardized pre- and postoperative orders. With one click, they can accomplish 10 or 15 orders, never forgetting anything because it's been well thought out in advance (a great safety example). If a patient has a special need, an order can be added at the end of the standardized set. To have those things prepared in advance saves time and saves future effort. These are workflow enhancers, and we need a lot of them.

Dr. Dysert: Some of us have been to the Intermountain Health Care Course in Quality Improvement. Physicians in that environment tell us that these workflow enhancers allow them to shift their focus to what is unique about the patient without spending a lot of time documenting things that are already known. Patients can record their relevant past history and the medications they're on directly into the system while waiting to see the physician, saving additional physician time.

Dr. Couch: The simplest electronic medical record will produce tremendous benefits in some areas. The *problem list*, for example. What is this patient's demographic medical history? He's a 62-year-old diabetic man with rheumatoid arthritis who is steroid dependent and who had a previous lung cancer. It's nice to be able to know all of that at a glance. Those fundamental elements need to track with him wherever he goes, whether he winds up in a radiotherapy center or an emergency department. It's nice for a physician to see all of the patient's problems at a glance. Second is *medications*. To know immediately what medicines and what doses a patient is supposed to be taking is a huge safety issue. This "skinny" medical record needs to be totally transferrable with the patient wherever he or she goes. It is particularly helpful in consultations. Just 2 hours ago, I sent a complex patient who has had breast cancer and is a diabetic to a surgeon to evaluate her other breast. Because the surgeon and I were not able to speak directly, I had to copy pages out of the patient's chart and send them with her, hoping that the surgeon will read them. Without that verbal interchange between physicians, those data have got to go with the patient.

Dr. Roberts: *Suppose this initial patient switched to a physician who used another hospital. Would the medical record, which had been generated in a Baylor physician's office or at a BHCS hospital or facility, be available to a physician at a non-BHCS office or institution? Who should own the medical record?*

Dr. Ballard: The commitment is to a patient-centered electronic medical record. It's not just a question of a patient who historically has received all of his or her care from a BHCS facility. We will continue to have patients who receive care from multiple physicians in this community. We'll have this ongoing challenge of how to integrate the information from the Texas Health Resources or the Tenet or HCA hospital versions of the

electronic medical record into the BHCS version of the patient's electronic medical record. We need some community leadership involving physicians, payers, and employers to help us focus on a patient-centered electronic health record at the community level. Some at the Institute of Medicine believe that 15 years from now there will be a common community electronic medical record, but in order to get there, we'll need some focused collaborative effort among the providers across the metroplex.

Dr. Dysert: The short answer, Bill, is that technology is not the barrier today. We have the ability on our portal right now to give all that information to anybody with a user name and sign-on access. The barrier is more the business rules that are in place. Despite its intent, the Health Insurance Portability and Accountability Act is seen as a powerful force constraining access across organizations to the information that's online. The barrier is going to be the business rules, the policies and procedures of the organizations that allow or disallow access.

Dr. Roberts: *I was interested in reading about the Cedars-Sinai Hospital situation. When they initiated their system, they had 8 to 10 years of previous records uploaded. Do you plan to get any of the older records onto the system?*

Dr. Dysert: We plan to continue to make available the information that's available on our portal today. We've got 2 years of information in some medical areas already online. The format of that information, however, is an electronic piece of paper. It's an individual document; it's not structured data. In the current system, if a potassium level is tested more than once, each value is an individual result on an electronic piece of paper. In the future system, that potassium result will be a structured piece of data, and you can grab the potassium level across encounters and compare one result with another using graphs as a capability. One is based on a structured data paradigm, while the other is based on just electronic access to text. We're going to carry forward the textual information now. We'll weigh the economic value of converting that to data. My suspicions are that we're not going to do that. We'll probably just make it available in its current form going forward.

Dr. Roberts: *David, how can physicians who wish to do so participate in this clinical transformation effort and accelerate its success?*

Dr. Ballard: There are many roles, and I want to address at least a couple of them. We have taken interested physicians to a course called the mini-advanced training program course at Intermountain Health Care. Carl Couch and Barb Spreadbury and others have brought that curriculum to Dallas. Currently we are teaching it through what's called "Accelerating Best Care at Baylor." That curriculum is intended to provide physicians and other health care personnel with skills and experience in redesigning and improving care processes. As we move into the clinical transformation effort, it will be very important for an increasing number of BHCS physicians and others to develop these skills and have a sense of confidence in their ability to redesign work flow and improve processes for the betterment of patient care. Through Carl's leadership, we have an educational program in place that will help physicians accomplish that goal.

A second area of physician involvement relates to the technology itself. We're beginning to commit resources to help support physicians who have a deep understanding of information technology and computer science. Under Pete Dysert's leader-

ship, we'll be funding a core physician group that will take the lead in the technologic aspects of designing and implementing the electronic medical record. This group will include physicians—perhaps the more recently trained physicians, who are usually very comfortable with computers—who will be "on-the-job" implementation mentors for their colleagues. We'll have a support system in place so these physician informatics experts will essentially be on call to help a physician in a hospital setting who's stuck about how to use the electronic order entry system. We'll make sure that we have the physician resources in place well before we move into the implementation phase. A major difficulty that Cedars-Sinai Hospital encountered was insufficient physician leadership and implementation support to deploy their order entry system successfully.

Dr. Anderson: Clinical transformation has a huge cultural aspect that's soft to talk about but very real and absolutely fundamental to its success. "Care," the business that we're in, is inherently a clinical process that begins with the patient; maybe the patient is well initially, but eventually a problem develops and the patient develops a need that has to be diagnosed and ultimately treated. The process of care is enormously complex, but it is inherently clinical. Therefore, clinical leadership in the success of this venture is essential. Taking care of one patient at a time will always be the core of physicians' professional lives. The bedside patient care of nurses will always be essential to the process. Their hands-on involvement and the investment of their time are essential for the success of clinical transformation.

The four of us spend a lot of time away from one-on-one patient care. Nevertheless, we're intimately involved and representative of many other physicians in BHCS who are investing more and more time in the ongoing development and management of these clinical processes.

Dr. Roberts: *From my standpoint, clinical transformation is dynamite. When I came to Baylor 11 years ago, I found medical records to be incredibly difficult to go through. A patient in the hospital at BUMC on 11 different occasions had 11 different records. Clinical transformation means a single medical record for a single patient.*

Dr. Anderson: Every day, BHCS generates enough paper filed on its edge to cover the length of a football field!

Dr. Roberts: *For an institution that is very interested in clinically relevant research, clinical transformation will surely make that easier.*

Dr. Ballard: The clinical transformation effort has the potential to dramatically enhance our ability to conduct research across the 60+ ambulatory care centers and the 11 hospitals of BHCS. Something as simple as the *common patient identifier* that we'll establish with this system will help us partner with others who are interested in doing research with us. We'll be able to rapidly identify patients who might be candidates for therapies they want to test. An important part of our collaboration will be in oncology. Our ability to conduct research with Texas Oncology related to the testing of new therapies in cancer will be enhanced significantly through the clinical transformation effort. We'll also be able to dramatically reduce the costs involved in the collection of the necessary data. Currently, those data are collected via pieces of paper through very resource-intensive paper medical record reviews.

Dr. Dysert: Many skills required for clinical research are the same skills required for quality improvement. In effect, quality improvement efforts are a slimmed-down version of the more traditional and more rigorous purely scientific research efforts. Carl, you might describe how North Garland went through a drug recall.

Dr. Couch: Baycol was recalled about 4 years ago. At North Garland, the day that the recall was issued, we generated from the computer a list of patients who were taking Baycol, and we had a letter in the mail to them the next day. Practices without electronic capabilities could not possibly identify their patients that quickly.

The medical record is useful, of course, in various ways. One way is by simply making information available at the point of care. Another is by facilitating workflow. We've got to make it easier for physicians to work smarter, not harder. Quality improvement depends on our ability to have easily generated data on our performance so we can improve performance. For example, most good physicians know how to help diabetic patients improve their glucose control. They make adjustments and work with the patient to get the hemoglobin A_{1c} level down from 9 to 7. Few physicians in the USA, unless they are using an electronic medical record, can identify their patients who have out-of-control glucose levels. These patients need a physician. In a typical medical practice, the physician knows how his patients are doing only when they come in to see him. How nice to be able to query a system and say, "Give me a list of all patients who have not seen me in the last 6 months whose last hemoglobin A_{1c} level was >9." These are the patients who need physician focus. They are the ones who are very likely to have a diabetic complication or a hospital admission in the next year, not the patients whose glucose is well controlled.

Dr. Roberts: *How do you predict a \$119 million cost over a 7-year period with all the training needed for implementation?*

Dr. Dysert: The \$119 million figure attempts to represent the cost of clinical transformation, both the technology and the organizational change for the inpatient piece. We have allocated another \$21 million for the ambulatory part of the project (principally the HealthTexas Provider Network and the BHCS specialist physicians). The issue of "return on investment" is hotly debated today. How do we quantify the return on investment for something that's >\$100 million? Some experts believe that clinical transformation needs to be considered the cost of doing business.

There's going to be an increasing amount of information available on how well hospitals and physicians perform clinically. The information is available on the Internet today. Although BHCS is perceived to be the highest-quality care provider in the area today, in the future we will need numbers to prove to the public that the care provided at BUMC is of the highest quality.

We all experience the almost crushing weight of paper. The science of American medicine, to use Brent James' analogy, has never been better, but the delivery system is stressed under the weight of paper, and the system will break if it does not change. Today's paper-based processes are an incredible burden on everybody. The hope is that the movement away from paper using technology to automate processes can help reduce health care costs, which by 2013 are predicted to be 20% of our gross domes-

tic product. There are clearly economic returns to be made with this project, yet clinical transformation is and will be the cost of doing business. Hospital systems that don't participate are going to have a challenging road trying to compete with providers who have made the transition.

Dr. Roberts: *It appears that if physicians don't get on board with clinical transformation, they're going to drop by the wayside.*

Dr. Dysert: Newt Gingrich indicated that we're not asking health care to invent something that hasn't been invented. We're simply asking health care to adopt what American industry has adopted in the last 25 years—the use of technology to improve the efficiency and productivity of the organization.

Dr. Anderson: Simply hiding behind the complexity of health care doesn't cut it. We all acknowledge that health care is very complex. Experts who have looked at it in great detail believe that most of the processes of care, probably 80%, are very amenable to standardization. The art of medicine comes in that other 20%. No one is advocating a system in which everything is laid out, is prescribed, with no room for doctors to be excellent clinicians like they've been in the past. But there's a lot that can be standardized and simplified. A lot of waste can be taken out of the system, and the system can be much safer. It can be quicker and more efficient for patients, physicians, and all caregivers. It's going to take a huge effort, and it's going to cost a lot of money to make the transition. We can't afford not to do it. It's going to happen, and we've got to participate in it and, indeed, lead it.

Dr. Dysert: Several analogies have compared physicians with pilots. While a plane is in flight, it is on autopilot, on computers. When it takes off and lands, however, it's under the control of the captain. While in flight, pilots have time to focus on other things. There's a side of what physicians do that clearly can be dealt with not necessarily by technology but maybe by technology coupled with nonphysicians. We've seen a growing use of nonphysicians in primary care offices to handle the more routine and clerical things, allowing physicians to focus their time and attention on the important variables in every patient.

Dr. Couch: If I focus on the science of medicine as a team and as a system, then I'm freed up to focus on the art of medicine as an individual.

Dr. Anderson: So much of the data David Ballard has collected is derived from administrative data sets. If improvement is to be made, it's got to come in the area of meaningful clinical data.

Dr. Ballard: We've been working to understand our organizational readiness for the implementation of clinical transformation and have posed questions to physicians. One physician leader opined recently that BHCS had a role in providing feedback to nurses or pharmacists on how they were doing but did not think that BHCS had any role in providing physician-level performance feedback. That's because historically BHCS has not had clinically relevant data to feed back to physicians. That changed recently with our work with HealthTexas in the clinical preventive services area. We've been able through a very resource-intensive investment to support the clinical preventive services effort: we currently review 36,000 medical records a year across HealthTexas.

In the future through the electronic medical record, physicians will have clinically meaningful data when they need it to

make decisions about patient care. That will change the dynamics somewhat in terms of the role that BHCS can play for its physician partners. A lot of the partnerships between BHCS and physicians in the future will relate to our ability to share medical information that allows physicians to provide more effective, more efficient, and safer care for their patients.

Dr. Roberts: *In studying some documents on clinical transformation, I was surprised to see that BHCS is developing some of the software. How did that come about? Is it possible that in the future some of this up-front money will be partially or totally retrievable by your being consultants to other hospital systems in the process of clinical transformation?*

Dr. Dysert: We identified 2 areas that were of strategic importance, not just because of clinical transformation but because they are considered major strategic assets of BHCS. One was our HealthTexas ambulatory practices, which Carl represents, and the other was clinical oncology. Unlike some of our peers, BHCS has a goal of having a “complete solution,” defined as something that works in both the physicians’ offices and also in the hospital. Most organizations have taken one position or the other; not many have had the goal of a single solution in both areas. That’s an incredible challenge. Most products have started in the hospital setting and later moved into the outpatient arena. A group of vendors who started in the outpatient arena are trying to move into the hospital setting.

I can speak to the oncology piece. We’re partnering with Eclipsys to develop their oncology products. Oncology represents a strategic growth opportunity in the marketplace for BHCS because of our excellence in cancer care. The other piece we identified was Carl’s group through the North Garland practice, which now has 5 years of experience with the effectiveness of the electronic medical record in physicians’ offices. We all concluded that the presently available products we looked at could be better. Therefore, we did not want to just be a customer; we wanted to be in a position to influence the design, implementation, and direction of the products.

Dr. Roberts: *Surely BHCS believes it can recoup some of this huge investment by the financial efficiencies that this system will produce and also by the input into the oncology and outpatient development areas.*

Dr. Dysert: When we presented the \$119 million cost to the BHCS board, the document was called the “total cost of ownership.” By using the best consulting talent in the marketplace, we believe at best it’s a break-even proposition financially for BHCS over 5 years. While it will cost BHCS \$119 million to implement, we think the savings will roughly approximate the costs. There is much greater value created for BHCS than just the pure economics. It’s fundamentally the right thing to do.

Dr. Ballard: A detailed analysis was published about the return on investment in electronic medical records in a primary care setting. It showed that, if fewer than a third of their patients were in capitated health maintenance organization–type contracts, physicians lost money on investing in electronic medical records over a 5-year period (3). Currently, the Dallas–Fort Worth metroplex market is almost 100% fee for service, and that’s unlikely to

change over the next 7 years of the clinical transformation effort. The way that BHCS is currently paid to deliver care does not reward us as well as if we provided care under a capitated system. In this clinical transformation experience, BUMC needs to work with payers to harvest some of the savings that will accrue to payers such as Aetna, United Healthcare, Blue Cross, Blue Shield, and Medicare over the next 7 years. We need reimbursement mechanisms that we can implement with payers so we can be rewarded financially for these clinical care cost reductions related to clinical transformation.

Dr. Roberts: *It has impressed me that President George W. Bush in his January 2004 State of the Union speech addressed the clinical transformation issue to decrease dangerous medical mistakes, to reduce costs, and to improve care. He repeated that desire in an April 2004 speech in Philadelphia. That push by the president must be reassuring.*

Dr. Couch: Sometimes we ask ourselves whether clinical transformation is something we have to do. Recently, I met with a large group of BUMC physicians who were skeptical about the changes that will need to occur if we’re going to accomplish clinical transformation. I asked them to consider safety alone and asked the following: if a spouse or loved one were admitted to the hospital tomorrow, how many would feel compelled to spend 24 hours a day at the bedside to prevent errors and to ensure that the right things were done? Almost every physician in the room raised a hand. Many of those bedside tasks have to do with checking, rechecking, and safety: making sure, for example, that the patient gets the right dose and the right drug at the right time. We must have systems in place to ensure that that happens and to give us the same feeling of safety that most of us get when we board an airplane. I don’t worry about its crashing. I don’t worry about whether the pilot has gone through a checklist—I know he has. We need to have that kind of safety in our medical environment.

Dr. Roberts: *From examination of some publications, it appears that the hospital systems or the hospitals that have instigated or are in the process of instigating some type of clinical transformation system were for the most part nonuniversity hospitals. Is that the case and, if so, why?*

Dr. Anderson: That’s a complex question. I’m not sure anybody understands the answer. The traditional medical school environment is a very hospital-centric, faculty-based, specialty-based environment that infrequently focuses on the entire continuum of care. Nevertheless, some very fine medical schools and academic institutions across the country are now looking at clinical transformation.

Dr. Roberts: *Thank all of you very much.*

1. Platt DS. *Introducing Microsoft .NET*, 3rd ed. Buffalo, NY: Microsoft Press, 2003.
2. Baer T, Narkiewicz JD, Tegels K, Thota C. *Understanding the .NET Framework*. Hoboken, NJ: Wrox Press, 2002.
3. Wang SJ, Middleton B, Prosser LA, Bardon CG, Spurr CD, Carchidi PJ, Kitzler AF, Goldszer RC, Fairchild DG, Sussman AJ, Kuperman GJ, Bates DW. A cost-benefit analysis of electronic medical records in primary care. *Am J Med* 2003;114:397–403.