

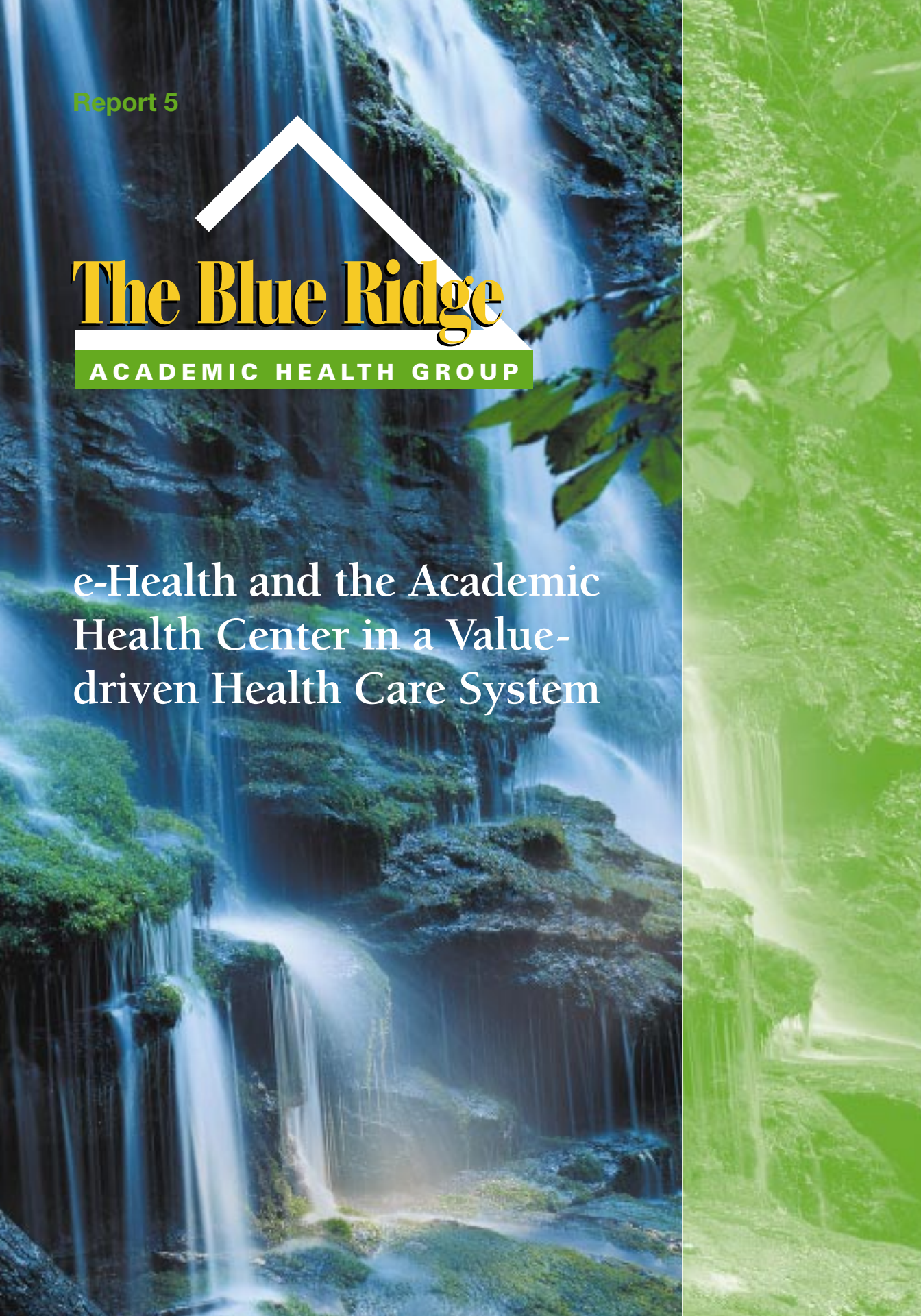
Report 5



The Blue Ridge

ACADEMIC HEALTH GROUP

e-Health and the Academic
Health Center in a Value-
driven Health Care System



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Fax: (804) 243-6078, E-mail: ebs9g@virginia.edu.

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For questions about this report, contact: Don E. Detmer, M.D., University of Virginia,
Phone: (804) 924-0198, E-mail: ded2x@virginia.edu.

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The Blue Ridge Academic Health Group

Report 5

e-Health and the Academic
Health Center in a Value-
driven Health Care System



Mission

The Blue Ridge Academic Health Group seeks to take a societal view of health and health care needs and to identify recommendations for Academic Health Centers (AHCs) to help create greater value for society. The Blue Ridge Group also recommends public policies to enable AHCs to accomplish these ends.

Members

David Blumenthal, M.D., Professor of Medicine and Healthcare Policy, Harvard Medical School; Director, Institute for Health Policy, The Massachusetts General Hospital

Enriqueta C. Bond, Ph.D., President, Burroughs Wellcome Fund

Robert W. Cantrell, M.D., Vice President and Provost, University of Virginia Health System

Don E. Detmer, M.D., Dennis Gillings Professor of Health Management, Judge Institute of Management Studies, University of Cambridge*

Michael A. Geheb, M.D., Senior Vice President for Clinical Programs, Oregon Health Sciences University

Jeff C. Goldsmith, Ph.D., President, Health Futures, Inc.

Michael M.E. Johns, M.D., Executive Vice President for Health Affairs; Director, the Robert W. Woodruff Health Sciences Center, Emory University

Peter O. Kohler, M.D., President, Oregon Health Sciences University

Edward D. Miller, Jr., M.D., Dean and Chief Executive Officer, Johns Hopkins Medicine, The Johns Hopkins University

Jeff Otten, M.A., M.B.A., Chief Executive Officer, Brigham & Women's Hospital

Mark Penkhus, M.H.A., M.B.A., Chief Executive Officer, Vanderbilt University Hospital

Paul L. Ruffin, M.B.A., Vice President, Cap Gemini Ernst & Young U.S., LLC

George F. Sheldon, M.D., Chairman and Professor, Department of Surgery, School of Medicine, University of North Carolina at Chapel Hill

Katherine W. Vestal, Ph.D., Vice President, Cap Gemini Ernst & Young U.S., LLC

Invited Participants

Andrew Vaz, Vice President, Cap Gemini Ernst & Young U.S., LLC

Dennis Gillings, Ph.D., Chairman and Chief Executive Officer, Quintiles Transnational Corporation

John P. Glaser, Ph.D., Vice President and Chief Information Officer, Partners Healthcare System

Jordan J. Cohen, M.D., President, Association of American Medical Colleges

Staff

Cap Gemini Ernst & Young U.S., LLC

Danielle Federa, Senior Manager

Jacqueline Lutz, Associate Director

Sanjay Pathak, Senior Manager

University of Virginia

Charlotte Ott, Senior Executive Assistant

Jon Saxton, J.D., Policy Analyst**

Elaine Steen, M.A., Policy Analyst

*Chair

**Editor

Introduction

The advent of the Internet has been almost universally heralded. It has been compared to most of the important technological milestones in human history, from the capture of fire to the development of electricity, the steam engine, and the telephone. The Internet's dynamic, even explosive, growth is often described using biological metaphors (e.g., "a squirming, protoplasmic nexus of informational activity" (Valovic, 2000, p. 24)) that suggest the development of a nascent hypertrophic organism of uncertain but highly promising ontogeny.

Indeed, the Internet, as a technology platform, is having a significant, even revolutionary, impact on communications, on the flow of and access to information, on the speed and efficiency of many types of transactions, and on connectivity between and among an ever-growing mass of electronically networked individuals, organizations, and systems. It is affecting everything from the behavior of individuals to the conduct of commerce. "The Net" has spawned whole industries and transformed others. It has created new categories of jobs and career paths, while making others obsolete. It has affected

many aspects of our culture, from language to customs to the meaning of symbols. Its ubiquity crosses national borders and political boundaries. It has created untold thousands of virtual or cyber communities and has forever transformed many real communities. It sparked "irrationally exuberant" activity in the nation's stock market, catalyzing the creation (and more recently some destruction) of new wealth.

Novel applications of Internet-based technologies are found or created almost daily. And several public and private initiatives, including the government sponsored Next Generation Initiative (NGI) and the private-sector sponsored University Consortium for Advanced Internet Development (UCAID) are currently working to develop vastly enhanced networking technologies, applications, and new Internet platforms for a variety of commercial, governmental, research, and communications applications (National Research Council, 2000).

This nascent technology, perhaps somewhat like a developing nervous system, is vectoring in multiple directions, creating new connections through multiple signaling pathways, and triggering adaptive (including protective and competitive) responses of many kinds. It is impossible to predict at this early stage what this evolving system will eventually look like, how it will function, or even whether it will proliferate into an "Internetwork" of Internet platforms. It is quite possible that the Internet's proliferation will be such that it will never be completely comprehensible; that what we now call the Internet will give way to simply ubiquitous connectivity among increasingly intelligent agents endowed with one or

There is little doubt that within 20 years the Internet will become as ubiquitous and invisible as today's phone or electrical networks.

— Don Tapscot, *Blueprint to the Digital Economy*, 1998

another or a combination of continuous, at will, and/or contingent, “with permission” data sharing. In any case, it is relatively certain that the Internet as a technology platform will continue for the foreseeable future to grow and to spawn unprecedented and increasingly ubiquitous connectivity among networked users and systems.

Relative to other industries, AHCs and other health care organizations are proving to be slow adopters of Internet technologies and capabilities. Few health care policy-makers or leaders would dispute that the Internet holds great promise for enhancing health care, health sciences research and training, and drug and device development. Yet very few AHCs or other health care organizations have prioritized the development of Internet-based resources or technologies. Most have not identified these as critical to their core missions, competencies, or competitiveness, at least over the next three to five years.

The Blue Ridge Group reviewed a great deal of evidence and sought the input of thought leaders concerning these and related observations. Convinced that the Internet has brought and will increasingly bring technology and resources of great value to health research, training, and care, the Blue Ridge Group provides this report as a resource to health sector leaders and policy-makers.

The report first provides a brief context describing three essential trends in the health care system. It then surveys the status and trajectory of Internet technologies, resources, and commerce in the health care sector. Finally, a series of

findings and corresponding recommendations and implementation guidelines provide guidance for leaders and policy-makers seeking to understand and prioritize the evaluation, adoption, development, or enhancement of Internet-based health care, research, and training resources with a five to ten year horizon.

The Blue Ridge Academic Health Group

(Blue Ridge Group)

The Blue Ridge Academic Health Group (Blue Ridge Group) studies and reports on issues of fundamental importance to improving our health care system and to enhancing the ability of academic health centers (AHCs) to sustain optimal progress in basic and clinical research, health professions training, and patient care. Four previous reports described opportunities to improve AHC performance in a changed health care environment and to leverage AHC resources in achieving significant improvements in health system access, quality, and cost. The Blue Ridge Group provides guidance to AHCs that can improve financial performance, enhance leadership and knowledge management capabilities. It encourage AHCs to contribute to the development of a more rational and comprehensive, but affordable and value-driven health care system (Blue Ridge Group 1998a, 1998b, 2000a, 2001). In this, its fifth report, the Blue Ridge Group considers the prospects for and barriers to the adoption, development, and deployment of Internet technologies within the health care sector in general and, in particular, in support of the essential mission areas of the AHC.

Exhibit 1:

Recommendations

e-Connectivity

- AHCs and other health care organizations should be engaged in ongoing, governing board and leadership-level evaluation of operational and administrative capabilities and the opportunities presented by new Web-based technologies to enhance, revise, or redesign current service and business processes and patient care capabilities.
- Evaluation, planning, and implementation capabilities for Web-based operational and administrative systems should be a core competency within all health care organizations. In the short or near term, health care, research, and training organizations should prioritize development of Internet-based capabilities that strengthen local or regional market position, and services that are reliable, scalable, customer-friendly, and flexible.
- AHC leadership should explore opportunities across and among academic centers for shared investment in, or outsourcing of, Web-based operational and administrative systems.

Education

- AHCs should actively investigate the opportunities and challenges for the development of online curricular and pedagogical resources for students and faculty.
- Medical and other health professions schools should prioritize strategic evaluation and planning designed to maximize the impact of online curricula and resources for health professions training.

e-Research

- AHCs should aggressively pursue opportunities for the development or acquisition of online clinical trials design and management.
- AHC faculty must become thought leaders and innovators in the new environment.

Provider Empowerment

- AHCs should institutionalize and formalize the capacity to support the development and implementation of Internet-based technologies that can enhance and extend care. AHCs must conduct trials and demonstration projects and expand their research agendas to facilitate exploration of the question: How is health care going to be transformed because of new Internet capabilities?
- As an important basis from which to expand and assert AHC leadership in Internet health care innovation, AHCs

should embrace health informatics as a full fledged professional specialty in medicine, nursing, and public health.

- AHCs and other health organizations should vigorously support the efforts of the National Committee on Vital and Health Statistics (NCVHS), the National Committee on Quality Assurance (NCQA), the Data Council of the U.S. Department of Health and Human Services, the President's Information Technology Advisory Committee (PITAC), and related efforts to create and maintain a national health information infrastructure necessary to the burgeoning demand for fast, secure, and reliable information transfer and processing.
- AHCs and other health organizations should vigorously advocate for the Department of Health and Human Services to take leadership in overseeing and coordinating information technology initiatives aimed at optimal development of a national health information infrastructure for the twenty-first century.

Public Knowledge and Empowerment

- AHCs should take a leadership role in identifying, making available, and assuring quality health care information for their patients and the public over the Internet.

Universal Coverage and Value-driven Health Care

- AHCs and other provider organizations should explore opportunities to vastly improve relationships with payors through online transaction and information processing. AHCs should also explore opportunities to better manage and/or outsource in-house HR functions.
- AHCs should seek to work closely with payors and employers as well as policy makers to ensure that the evolution of consumer directed medical and benefits management strategies and payment systems track and report information on quality, outcomes, and other metrics of care necessary to informed consumer choice of plan and provider.
- AHCs should continue to advocate for and seek opportunities to guide public policy that is more supportive of e-health care, including addressing limitations on reimbursement for telemedicine, state barriers to e-health, and universal access to the Internet. Progress in these areas is vital to achieving universal coverage and the transition to a value-driven health care system.

Framing Health System Change

Over the last several decades, dynamic forces and trends in three areas have been particularly important in shaping our health care system. The first is the historic transformation of the health care system from a predominantly decentralized cottage industry of professionals and related local institutions, relatively insulated from traditional market forces, to a more centralized, bureaucratic industry subject to the forces of a highly competitive marketplace. This transformation is still in progress and its end point is not known. E-commerce and the trend towards standardized market transactions may yet redirect health care away from bureaucratization towards organizations and practices with more varied and permeable boundaries. Characteristics of the changing environment are:

- The consolidation of large numbers of solo and small group practitioners into large provider and managed care organizations;
- The transformation of many solo and small group physicians into salaried workers;
- The closing and consolidation of many local and regional hospitals and medical centers;
- The loss by physicians of many of the perquisites and much of the autonomy of the traditional professional;
- The shifting of risk away from payors/insurers towards providers and consumers via capitation and other risk-shifting practices;
- Turbulence in sustaining managed care models, including the failure of major physician management organizations;
- Increased outsourcing of both clinical and administrative services; and
- Federal cost reduction policies, especially the Balanced Budget Act of 1997, mandating substantial reductions in payments to hospitals for care services through the year 2002.

These and many other forces are changing the health care system and affecting the delivery of care at every level.

The second trend is the evolution of the clinical relationship between physician and patient from a hierarchical and paternalistic model to one that is more egalitarian and cooperative. This change corresponds as well to the increasing role of self-care and the fast-evolving possibilities for both better population health management and increasingly customized individual care enabled by new knowledge and technologies.

Over the last five decades, the traditional clinical model of the physician as the indisputable expert in the provision of care and the patient as a passive recipient of care has been changing. Diverse forces have influenced this change. Starting in the 1950s, Dr. Spock's books on managing child care and health led the popularization and proliferation of health and family-care guides and programs. The Women's Health Collective first published the influential book, *Our Bodies, Our Selves*, in the 1960s, helping to empower women to better understand and care for their bodies.

As the counter-cultural '60s and early '70s gave way to the increasingly market-focused '80s, public policy favored greater individual attention to, and responsibility for, healthy behaviors. Dr. C. Everett Koop set a new standard for healthy behavior advocacy in the newly created post of Surgeon General of the United States. A broader patient advocacy movement emerged in the '90s in response to problems encountered in the now competitive health care market place. Pharmaceutical and other health care and insurance product and services companies have enhanced

the trend towards consumer and patient empowerment through new self-care and home health care technologies and the aggressive deployment of direct-to-consumer marketing of drugs and devices. The roles and responsibilities of providers, payors, patients, and consumers continue to evolve as new knowledge and technologies enable both broader and more customized dissemination and utilization of health data, information, and technology.

A third major dynamic influencing health system development is the continuing struggle over universal access to quality, affordable health care. Universal health care insurance and the costs to individuals and society of inadequate access to care are issues that have occupied American politics and public policy throughout the twentieth and now into the twenty-first century. Periodic attempts to enact universal insurance coverage have failed, but important steps have been taken towards expanded access to quality, affordable care. National prosperity in the post-World War II years established employer-sponsored coverage

as the norm for larger employers. The enactment of the Medicaid and Medicare systems in the 1960s served to provide coverage and access for many of the most vulnerable in the population.

Despite these policies and programs, about 15.5 percent of the population remains uninsured even as the United States has sustained the highest per capita health care spending of any industrialized nation. As a result, problems with health access and costs have seldom been absent from local or national agendas. Following the Clinton Administration's failure to achieve universal coverage, neither public policy nor the managed care industry have addressed the continuing lack of affordable health coverage for as many as 43 million Americans (U.S. Census Bureau, 2000).

The Blue Ridge Group is on record in support of policies that can transition our national health care system towards a value-driven model of universal coverage and population health management, through a combination of public and pri-



vate mechanisms (see Exhibit 2, Blue Ridge Group, 1998b). With universal coverage for care scientifically proven to be effective, health care organizations could compete to manage and improve the care of populations. This would catalyze the development of new population health management strategies, drive competition to develop better ways to measure and reward quality and efficacy of care, and create more value for the health care dollar.

The Blue Ridge Group believes that the trends described above suggest **three fundamental principles** that support progress towards a value-driven health system. These are:

- **Standardization** of health industry data, connectivity, and communications, attendant upon the industry-wide rationalization of provider and payor systems. Cost reduction and productivity enhancements have dominated early standardization efforts. Harder to define and establish, quality and value-driven care and delivery standards – including privacy standards – are steadily gaining prominence.
- **Empowerment** of providers and patients in the care process through access to new health and care-related information and technologies, and the growth of self-care, remote care, and customized care capabilities.
- **Universalization** of health insurance coverage for scientifically proven effective treatments, with ongoing pressure to improve access, quality, and value of care for all.

Standardization, empowerment, and universalization are principles that the Blue Ridge Group believes can guide health care leaders and policy-makers in evaluating and employing Internet technologies and in leading the transition to a value-driven health system.

Exhibit 2:

The Value-Driven Health System

A value-driven health system is grounded in the principle that a healthy population is a paramount social good. It is a health system that promotes and improves the health of the population by providing incentives to health care providers (both public and private), payors, communities, and states to optimize population health status and rewarding cost-effective population health management. Such a health system would achieve better health outcomes and improve the health of citizens over the long-term while achieving cost savings for all stakeholders.

Two kinds of incentives exist within a value-driven health system. First, there are incentives for individual citizens (patients), health care professionals, health delivery organizations, payors, and communities to seek and maintain health. Health insurance premiums, reimbursement rates, and grants to communities can all be structured to reward behaviors and strategies that advance health. Second, providers compete for populations to manage on the basis of quality and efficiency (where quality is defined in terms of health of the community or region as well as health of individuals). To do so, however, requires a fully insured population (universal coverage) so that population health management strategies can be implemented. It is anticipated that in a mature value-driven evidence-based system, universal coverage will be less expensive than in the current system.

The development and adoption of common standards is vital to the growth and maturation of most modern industries and services. Common standards enable multiple actors on a shared platform to add new value and forge competitive advantage. They enable the efficient and effective utilization of data and information necessary to modern commerce and communication.

The Internet has emerged as a common platform upon which a vast array of new communications and connectivity technologies can be developed and deployed. The Web has become the preferred connectivity technology because of the early and virtually universal acceptance and use of standard underlying software languages. Hypertext Markup Language (HTML), and its latest incarnations including Extensive Markup Language (XML), allow Web sites to be linked and their contents (digital data) to be transmitted to one another through a relatively simple and easy to use Web browser. Browsers can be employed on everything from dedicated terminals, to desktop and portable computers, to cell phones and other devices, thus enabling unprecedented and relatively inexpensive communication among users, systems, and sites.

Also important to the power of the Internet as a common platform is the increasing use of sophisticated database coding. For instance, object-oriented, relational databases enable the discrete labeling and identification of every element in a database. This labeling enables the data to be utilized, analyzed, and manipulated with almost unlimited flexibility and power.

Data sharing and processing is one of the most daunting issues in the changing health care industry. Many record keeping and clinical assessment and reporting systems, including relatively sophisticated computer and software systems, proliferated over the course of the twentieth century. But most developed as proprietary systems and were designed to address local and/or payor specific recording and reporting needs but not to facilitate communication with other systems. With an estimated 30 billion eligibility, claim, laboratory, and referral transactions per year alone, the health care industry is notorious for the difficulties encountered in deriving and sharing data among payors, providers, laboratories, and patients. The rapid transition to a competitive, cost-driven health care environment accelerates the need for standardized information systems that can connect and communicate ubiquitously and transmit data easily, efficiently, and securely. The Administrative Simplification sections of the Health Insurance Portability and Accountability Act of 1996 (HIPAA, P.L. 104-191) represent the government's first attempt to set transmission standards for health data whether for government purposes or not.

The volume of transactions is only the first hurdle. A second major hurdle in the implementation of standardized health-related data systems is the diversity and complexity of the records that are created and utilized in support of the care process. These include medical histories, diagnoses, examination notes, treatment records, prescriptions, test and lab results, regulatory compliance reports, insurance eligibility, billing and collection functions, scheduling, referral data, hospitalization

records, and so forth. Some of these records are generated at dedicated computer-aided patient intake stations, some on paper forms. Some records are jotted down by hand by the health care professional, and some are transmitted by facsimile or dedicated electronic pipeline from provider to payor.

The average medical center or health care system uses at least six different clinical and administrative systems. The complexity of the record creation and record keeping functions, and the multiple administrative and delivery situations that give rise to them, have so far defied standardization. One initiative devoted to tackling this problem is the W3-EMRS Project. It is developing an Internet-based system to access multiple heterogeneous electronic medical record systems (Kohane et al., 1996).

Farthest along in electronic transmission are insurance-related transactions. Two-thirds of health claims are processed electronically; the majority of these are pharmaceutical claims. Eighty-seven percent of hospital claims are submitted electronically. However, many of these are transferred on tape media, and the vast majority flow through dedicated, proprietary lines and from legacy systems that are extremely expensive to maintain and cumbersome to operate. Even with electronic submission, relatively few claims can be adjudicated electronically, creating industry-wide problems with the management of billions of denied and delayed claims (Goldsmith, 2000).

A third daunting issue in the development of common standards in health data pro-

cessing is the need to ensure that new computer-based health records and systems are secure and can provide optimal safeguards to protect the privacy of patient data. Security and privacy of medical information is and must be a priority of both industry and government. HIPAA-mandated action to establish proper standards either by the Congress or by the Department of Health and Human Services (HHS). HHS has released regulations that create and enforce standards for obtaining, holding, transmitting, authenticating, and utilizing sensitive health data.

The Web is also enabling new capabilities for extending connectivity and care into the home and other remote environments.

The HIPAA-mandated rules now force all health care organizations, data handlers, and their business partners and affiliates to adopt stringent policies and technological safeguards to protect sensitive health data. Standard transactions and other electronic individually identifiable information transmitted between business partners will require encryption. A universal digital signatures security system, with tiered security access and clearance, likely will be mandated for use by all individuals with

access to covered or potentially sensitive data, including providers, trainees, staff, patients and their families, as well as employees of vendors, business partners, and affiliates. The new rules will likely be both technically complex and expensive to implement, requiring the employment of sophisticated technologies and elaborate security processes. For the present, the regulations will not affect those who continue to use paper transmission.

A fourth daunting issue in the development of common standards for health data processing is that not all health system stakeholders have equal incentives to adopt common data processing standards or efficient connectivity systems. Payors often derive financial benefit from delays in making payments caused by the complexities and inefficiencies in claims authorization and processing. Providers have few incentives to establish electronic connectivity to patients that can alter work flows and increase workloads without commensurate remuneration, proper staffing, and new mechanisms for risk management. Patients who desire direct

and easy connectivity to payors, employer benefits plans, and providers also demand complex and failsafe privacy safeguards to protect personal health information.

While HIPAA is designed to help address such payment system and other structural impediments to efficient and secure electronic processing, unequal and often “perverse” incentives are rife in the health system and should not be underestimated (Kleinke, 2000).

The Web, in particular, is spawning a universe of devices and capabilities designed for use in the recording, processing, analysis, reporting, and transmission of data in almost every conceivable environment for health care practice, administration, research, and teaching. Traditional vendors, such as IDX and McKesson/HBOC, as well as upstarts like Healtheon (created by the billionaire Internet entrepreneur, Jim Clarke and then merged into WebMD), MedicaLogic (which recently acquired Medscape), Athenahealth, ProxyMed, and MD Technologies, all are either migrating existing systems online or are designing entirely new, Web-based sys-

tems for use in all aspects of practice management and administration. New software is increasingly enabling the conversion of pre-existing or legacy content into the newer standardized code, while more and more original content is being entered and created online or in digital formats easily migrated online.

This mass migration towards Web-based information technologies and systems is driven by the possibility of significant cost savings and productivity gains, with vastly more effective and efficient record keeping, including data mining, transmission, and communication among providers, payors, and patients, and the streamlining or improvement of many other elements of the administration and management of care. The Web is also enabling new capabilities for extending connectivity and care into the home and other remote environments. Already, the wired world of the Internet is rapidly being augmented, and in many areas virtually replaced, by wireless technologies that provide sophisticated mobile capabilities suitable to the full spectrum of care, teaching, and other non-static and remote environments. Increasingly intelligent systems and devices are aiding all decision-makers, from the patient to the provider to the payor to the researcher, by enabling the conversion of complex data into accessible information and knowledge. As sufficient connectivity bandwidth is installed, the goal of universal connectivity is moving closer to realization.

Both the proliferation of Web-based technologies and the rapid rate of evolution, improvement, and invention of these new capabilities create planning and deployment challenges for the health care organization. Web-based technologies are in the early stages of development and will continue to develop at a rapid pace for the foreseeable future. While the Web provides a common standardization platform, there are many vendors and technologies providing a variety of pathways for system migration, from the incremental to the global. Appropriate decision-making concerning the adoption and deployment of these new technologies requires health care organizations to acquire the knowledge or expert assistance necessary to appropriate organizational planning and prioritizing. Most health care organizations at this point have some experience with Internet technology. Most utilize electronic mail (e-mail) systems and operate Web sites that serve both in-house and external connectivity functions. Information technology (IT) managers and support personnel are virtually indispensable to all significant health system operations.

Findings

- The Internet, through the World Wide Web, provides health care organizations with the ability to standardize data utilization and transmission, and to integrate disparate clinical and administrative systems. This migration towards a single, standard platform enables unprecedented development of health e-connectivity, communication, and commerce.
- The Web is a technology platform that will become increasingly important to the efficient and effective administration and operation of health care organizations. The Blue Ridge Group predicts that within ten years, Web-based technology will be indispensable to the ability of health care organizations to operate effectively and competitively in the health care industry.

Recommendations

- AHCs and other health care organizations should be engaged in ongoing, governing board and leadership-level evaluation of operational and administrative capabilities and the opportunities presented by new Web-based technologies to enhance, revise, or redesign current service and business processes and patient care capabilities.
- Evaluation, planning, and implementation capabilities for Web-based operational and administrative systems should be a core competency within all health care organizations. In the short or near term, health care, research, and training organizations should prioritize development of Internet-based capabilities that strengthen local or regional market position, and services that are reliable, scalable, customer-friendly, and flexible.

- AHC leadership should explore opportunities across and among academic centers for shared investment in, or outsourcing of, Web-based operational and administrative systems.

Implementation Guidelines

Web-based technologies are sufficiently advanced that health care organizations can profitably focus on the following domains:

- Managing internal business and operational processes – there are significant opportunities for cost savings, operational improvement, and process reform in the areas of administration, human resources, claims processing, customer relations, and marketing.
- Managing internal patient care processes and improving patient/provider decision-making – there are significant opportunities for improving capabilities in evaluating the efficacy and efficiency of care, and in communicating and sharing data with patients and third-party payors.
- Managing health data privacy, confidentiality, and security – there will be significant requirements for implementation of HIPAA-mandated security standards, processes, technologies, and rules; both legacy health care information systems and newer vendors will be important partners in complying with these regulations.

Health Professions Education

Physician training standardized around a scientifically and evidence-based curriculum has been well established since early in the twentieth century, following Abraham Flexner's detailed report of the shortcomings of most training programs to that point. Nearly 10,000 randomized clinical trials results are now published annually, providing an ever-growing base of evidence for clinical practice and professional education (Chassin, 1998). Communication of generally accepted clinical and scientific content has been standardized through broad dissemination of a core curriculum and approved texts and reference works. Standard pedagogical, clinical, and training protocols have been widely adopted and refined.

One of the most daunting ongoing challenges in medical education is the amount of information, skills, and knowledge that must be assimilated by medical students and other health professions students. The quantity of scientific and clinical knowledge has grown tremendously over the last century. The rate of growth of biomedical knowledge is increasing with advances in technology, the growth of the research enterprise, and the opening of whole new areas of inquiry, especially in genomics, structural biology, and many other emerging fields. Some fields are advancing so quickly that it is difficult to keep published texts, and even journals, up to date.

Along with the increase in the amount and complexity of medical information that must be assimilated, is the pedagogical challenge of finding the best methods to facilitate the learning process. Schools that traditionally imparted basic science and

skills information to individuals through large lecture classes increasingly have moved to adopt group seminar formats that allow a focus on individual and group problem solving.

Pedagogical approaches also have changed in the clinical setting, which has been made more challenging because of managed care and changed reimbursement scales. With hospitalization rates and lengths of stay falling, medical educators have been hard-pressed to provide students with the patient exposure necessary to ensure thorough clinical training. Many schools have experimented with substituting volunteer and paid actors for real patients in order to present medical students with live subjects from whom they can learn and practice the many skills involved in taking histories and diagnosing health problems.

Increasingly, students are expected to utilize expert information, technology, and decision support systems. There are experiments in training students to learn and share skills and expertise in teams, including teams where more responsibility is allocated to skilled and advanced nurses, physician assistants, and other allied health professionals. Biostatistics, epidemiology, behavioral modification, health services research, and bioinformatics all are gaining a more prominent role in health professions education.

The advent of the Internet and growth of the Web is transforming medical and health professions education. A broad range of medical and public health information is widely available online, increasing the

student's access to new and existing knowledge. Among the resources readily obtainable from public and commercial sources are professional journals, reports, and presentations (sometimes live) from professional and scientific meetings, a full range of major medical reference works, and databases. In addition, health professions students have access to search engines that enable extensive and sophisticated information searches, to continuing medical education courses and materials, as well as to supplies, devices, and equipment they might require.

Medical, dental, pharmacy, and nursing school educational resources increasingly are being moved online. Health sciences libraries are migrating publications, catalogues, and most other library resources and services online. Many schools have moved significant elements of their curricula online for ready access by students and faculty. An online private company, [medschool.com](http://www.medschool.com) (www.medschool.com), has staked out a significant Web presence as a self-described "e-learning health care hub and virtual community offering access to the highest quality medical education for students, educators, physicians, allied health professionals and sophisticated consumers . . . that augments the current medical educational system and addresses critical needs in health care education." Additionally, thousands of Web sites are maintained by medical students, organizations and schools, pre-med preparation companies, medical textbook publishers, and many others with information on virtually any medical-school related subject or topic.

Similar advances are being made in continuing medical education (CME). Many

medical schools now offer online courses where physicians can earn CME credits. The private sector is also playing strongly in this field. CMEWeb.com, for instance, now provides more than 1100 hours of online accredited continuing medical education testing and processing.

Advances are also being made in schools of public health and nursing. The Rollins School of Public Health of Emory University, for instance, has developed [eLearn™](http://eLearn.com), a suite of programs to deliver electronic materials via the Web. The school offers a Career MPH degree, a 42 credit-hour program in which students participate in both traditional face-to-face classroom sessions and on the Web. The eLearn system enables students and faculty to interact via chat rooms, an electronic whiteboard, and Internet video conferencing. The program is designed to allow working professionals to complete an MPH degree in approximately two and a half years.

Nursing schools long have been innovators in distance learning. Many are rapidly adding innovative and extensive online learning programs. At Duke University School of Nursing (DUSON), for instance, nurse practitioner and clinical nurse specialist students can participate in Web-based courses and programs, including MSN degrees in Nursing Informatics, Health Systems and Leadership Outcomes, and Clinical Research Management. The DUSON is also one of a growing number of schools with an informatics program, emphasizing clinical informatics tools for the improvement of patient health outcomes.

Most expert observers see these developments as only the very beginning of capabilities that will likely revolutionize education and training in the health professions over the next two decades. The better_health@here.now project of the Association of American Medical Colleges (AAMC) is the most sophisticated forward-looking assessment of medical education resources and technologies that are currently deployed, under development, and projected by experts. This visioning project concludes that medical education in the year 2010 will be suffused and enhanced by a host of new Internet-based technologies and capabilities. Among the projections for the future:

- A set of refereed multimedia cases that cover core medical concepts will be used for instruction at most medical schools.
- Lecture time will be replaced by small group sessions that build on independent study of Web-accessed information and resources.
- Intelligent information systems will provide learning materials that continuously adapt to learners' needs and accomplishments.
- Procedural skills will be taught first on a digital simulator.
- Patient simulations (i.e., virtual patients) will be core experiences in widespread use for the evaluation of clinical skills and medical decision making.
- Continuing education will be personalized—delivered by online modules based on physician performance needs with his or her own patients.

A Tufts University Medical School project that anticipates many of these capabilities, is likely to significantly influence the development of online medical education resources. Launched in 1995, the Tufts online Health Sciences Database is a unique and powerful online curriculum

Medical, dental, pharmacy, and nursing school educational resources increasingly are being moved online.

resource that combines the capability of a digital library with a course delivery system and a curriculum management system. The Database contains an image database (e.g., micro slides), course syllabi (including some textbooks), video clips, lecture slides with audio, and self-assessment quizzes to monitor progress. More than 60 percent of the first and second year curriculum is online. An object-oriented database provides flexible, expandable, and integrated content that can be utilized, searched, updated, and customized.

The Database provides students with integrated course materials that can be accessed and utilized in a variety of formats. Faculty and students can build on and refine course materials. All users can share materials with one another and with users outside the institution. As the Tufts curriculum and others migrate online, the opportunities for sharing and cross-fertilization in the elaboration of pedagogical tools and biomedical knowledge and skills will increase exponentially. The AAMC hopes to form a consortium to connect such resources and facilitate their fullest development.

The Internet's influence is overestimated for the next two years – but underestimated for the next 10.

– Bill Gates, 1999

Internet-enabled enhancements to health professions education will drive educators to rethink and even re-conceptualize traditional pedagogical methods. Internet-based curricula will soon be capable of providing customized elements of the basic curriculum that are directed and updated by intelligent online teaching systems; in fact, most non-experiential learning is likely to be accomplished over the Internet. What will be the implications for faculties and students? Will the educational model move from memory-based to process-based learning? Will faculties be reduced in size? Will faculty size remain stable with curricula leveraging online learning to enable faculties to spend more time providing individualized clinical mentoring and counseling, critically assessing and guiding the development of professional values and ethics? Will the criteria by which students are selected change to focus differently on certain character traits, intelligence, adaptability, communication skills, leadership attributes, ability to interface both with technologies and between digital and biological systems?

What will constitute a school under these circumstances? What would it mean to matriculate? If much of the basic curriculum can be conducted interactively online, will hospitals or health plans or other organizations stake a claim to the necessary hands-on health professions training? If curricular material can be packaged into intelligent learning systems, will commercial companies, like the Kaplan test preparation organization or privately owned for-profit professional schools, become leaders in the development of such systems, with a legitimate claim of being able to provide or host the training? Could any or all of this apply to residency and other advanced training?

The Blue Ridge Group believes that the best scenario is that new Internet-based capabilities will serve to strengthen the existing system of health professions education, enriching the curriculum and enabling more individually, culturally, and technically nuanced training of a diverse cohort of students. Faculty can be freed of more mundane and repetitive tasks and have more time for trainee contact and mentoring, and to pursue unprecedented opportunities for curricular and pedagogical innovation.

Education Findings, Recommendations, and Implementation Guidelines

Findings

- The Internet is a platform that will become integral to medical and health professions education over the next ten years. Universities and an array of organizations and commercial enterprises will develop online educational resources and programs. Most medical and other health professions schools will move substantial elements of their curriculum online. There will be new competition from the private sector to provide educational materials and services to the students, universities, the health professions, health care organizations, and the general public.
- Increasingly, health professionals will need to know both their clinical specialties as well as how to utilize information technology in their research and practice. This has implications for how schools must train health professionals and researchers.

Recommendations

- AHCs should actively investigate the opportunities and challenges for the development of online curricular and pedagogical resources for students and faculty.
- Medical and other health professions schools should prioritize strategic evaluation and planning designed to maximize the impact of online curricula and resources for health professions training.

Implementation Guidelines

Medical schools should work closely with the AAMC, the Liaison Committee on Medical Education (LCME), the Liaison Committee on Graduate Medical Education (LCGME), specialty boards, specialty societies, and other relevant health professional education associations to maximize the utility of curricular innovation and to ensure the integrity and quality of online educational resources and programs.

Through the first seven decades of the twentieth century, basic biomedical (including behavioral) and clinical research were almost exclusively the province of AHCs and their affiliated hospitals, a few private hospitals and treatment centers, and philanthropically supported care and research centers. The pharmaceutical industry also conducted and sponsored basic and clinical research, but focused primarily on applying discoveries to the drug development and marketing process. Over the century, standards for the conduct and reporting of research were developed through the auspices of the National Institutes of Health (NIH), the National Science Foundation (NSF), and other federal agencies, professional societies and associations, and private foundations, all of whom have cooperated to ensure the quality and integrity of the research enterprise. As popular trust in and support for biomedical research grew, so did federal dollars allocated to the NIH, NSF, the Department of Defense, and other agencies to support sponsored research.

Beginning in the late 1970s, the explosive emergence and growth of the biotechnology industry signaled the maturation of biomedical science to the point where it could generate and support a national and international marketplace with a constant and widening spectrum of new products. As the biotechnology and pharmaceutical industries captured unprecedented financing and found or created huge new markets, competitors increasingly looked for ways to accelerate, lower the costs, and improve the efficiency of the drug and device development process. The traditional university-centered biomedical and clinical research enterprise came under

intense pressure to provide better administrative support and vastly improved efficiency and industrial responsiveness for their clinical trials and technology transfer capabilities. Most AHCs have not been able to achieve the levels of operational effectiveness and productivity in clinical research desired by industry.

Into this competitive fissure grew a new industry of contract research organizations (CROs) competing to provide the biotechnology and pharmaceutical industries with efficient and effective drug and device development services. Many in the biotech and pharmaceutical industries also added new research and development capabilities, and all hired leading scientists and some of the most promising younger scientists away from traditional academic careers. As universities have struggled to improve industry-sponsored development and clinical research services, the new CRO and biotechnology industries have proven effective competitors. While universities conduct the vast majority of sponsored basic research, it is estimated that universities now conduct only about 30 percent of industry-sponsored clinical research, down from 70 percent two decades ago (Rich, 2000). The rapid development and consolidation of the highly competitive and well-capitalized biotechnology, pharmaceutical, and CRO industries continues to put a premium on improving the efficiency and efficacy of drug and device development.

The Internet is proving to be a very compelling and promising medium through which to expand and further enhance biomedical research and the drug and device development process. In basic research, the Internet has been widely employed by

researchers to increase the speed and efficiency of the transfer and sharing of information. Collaborators can more easily and quickly share data, feedback, and results. Peer review panels now save weeks or more in the manuscript review process by being able to post reviews and otherwise streamline study section administrative processes online. Bioinformatics appears poised to assume a larger role in academic medicine, nursing, and public health. Significant programs now exist at Boston University, Northeastern University, Stanford University School of Medicine, University of California at Santa Cruz, and Washington University in St. Louis, among others.

The Internet is also serving as an excellent platform for databases that allow researchers virtually unlimited access. Major online databases include the National Library of Medicine's MEDLINE, an index of the entire biomedical serial literature since 1966; PubMed, a search engine hosted by the National Center for Biotechnology Information; GENBANK, the major database of DNA sequences, hosted by the National Institutes of Health; and OMIM, Online Mendelian Inheritance in Man, hosted by Johns Hopkins University. Many other important databases are available online, both free and by subscription. These online resources have become basic tool sets and forums for collaboration in biomedical research and for rapid growth in the field of bioinformatics, where AHC leadership is central.

Yet, the research community struggles with the implications of this efficient new medium. For instance, in 1999 Harold Varmus and colleagues at NIH proposed the creation of an Internet repository,

The Internet provides a robust platform for addressing and managing virtually all aspects of clinical trials.

E-Biomed, for the posting and disclosure of both peer and non-peer reviewed research results and papers (Varmus, et al., 1999). The proposal envisioned an international repository where researchers worldwide could share results and discoveries with unprecedented speed, receive feedback, respond to queries and criticisms, and in many other ways open-up, accelerate, and improve the research publication, review, and dissemination process. While well received by many researchers, the proposal was met with a torrent of criticism from many others and from journal publishers, professional societies, and other quarters. Much of the criticism stemmed from the fear of the damage such speedy dissemination could do to the integrity of the research review process and to public trust in the research enterprise. A scaled-down version of the original proposal is now being implemented. Researchers and policy experts are monitoring the program carefully to learn if and how the research review and dissemination process can be enhanced through such a repository.

While academic researchers and physicians continue in their vital role at the leading edge of discovery research and clinical innovation, the pharmaceutical industry is assuming unprecedented leadership in defining and driving the future of treatments for disease and disability. Research and development spending by the pharmaceutical industry, which reached \$26.4 billion in the year 2000, is now 50 percent higher than the \$17.8 billion sponsored research budget of the NIH (Drews, 1996). Pharmaceutical industry spending will accelerate clinical research and drug and device development over the next ten years. The industry has approximately 500 biological targets for drug development. With advances in molecular biology and the successful mapping of the human genome, within a few years there will be up to 10,000 such targets, vastly expanding the universe of treatable conditions and the efficacy of treatments. The industry is targeting currently untreatable conditions, especially cancer, and lifestyle drugs, such as Viagra.

The roles that AHCs will play and the extent of their participation in the surge

of pharmaceuticals development are a matter of some uncertainty. AHCs have lost significant ground in their traditional role of conducting clinical trials to test the efficacy of therapeutics. As suggested above, AHCs have been only partially and inconsistently successful in improving their capacities to reliably conduct efficient and effective clinical studies. Most centers are plagued by administrative difficulties, especially in recruiting and retaining sufficient trials participants, in records management, and in timely management of human subjects and other regulatory requirements. Nevertheless, AHCs remain a compelling locus for such studies, if they can solve the critical administrative and process issues. AHC faculties are well suited to the complex challenges of arbitrating and translating information to and from clinical practice.

Perhaps most compelling is the gradual but unmistakable shift from in-hospital treatments as the dominant site for dramatic improvements in life expectancy to outpatient management where medications taken chronically help the greatest numbers. Indeed, with joint replacements



and similar treatments the hospital is now increasingly the site for quality of life improvement and palliative treatments rather than life-saving care. The new medicine will increasingly be “high-tech, low-touch.”

The Internet provides a robust platform for addressing and managing virtually all aspects of clinical trials. A partnership between Quintiles Transnational Corporation and WebMD to develop clinical trials capability in a Web environment illustrates the ability of the Internet to support new levels of connectivity, collaboration, and commerce in medical research and pharmaceuticals development. The Quintiles/WebMD partnership is creating an integrated set of Web portals that will enable online design and management of clinical trials. Web portals dedicated to patients, investigators, and research sponsors enable customizable connectivity and collaboration among any and all participants. These portals will manage:

- Recruitment of physicians and patients;
- Feasibility assessments;
- Study design and protocols;
- Data collection, processing, and management;
- Labs and clinical supplies ordering and tracking;
- Real time information on status of trial and access to educational materials, news, and study documents;
- Clinical monitoring and audits;
- Ethics, human subjects, and regulatory requirements;
- Adverse event reporting; and
- Online training, including Web casts.

Project management modules, extensive data mining capabilities, automated news and reporting functions, comprehensive security and privacy safeguards, all connected to data warehouses, will accommodate the needs of investigators, patients, payors, and sponsors. This system will also be able to support and integrate with other functions up and down the production chain, from research, to development, to sales, to quality control and assessment. The implementation and refinement of this system is expected to have a significant impact on the costs, management and success of clinical trials.

The development of this level of online capability is beyond the reach of most AHCs and other health care organizations. But AHCs can partner with organizations building such capabilities if AHCs acquire or create appropriate electronic or Internet-based administrative and data management capabilities.

Findings

AHCs have been unable to achieve levels of operational effectiveness expected by industry and have lost significant ground to contract research organizations in their traditional role of conducting clinical trials in support of drug and device development. New models show that the future of clinical trials design and management is online. AHCs can remain strong research and development partners if they aggressively acquire relevant Internet-based administrative and operational capabilities.

Recommendations

- AHCs should aggressively pursue opportunities for the development or acquisition of online clinical trials design and management.
- AHC faculty must become thought leaders and innovators in the new environment.

Implementation Guidelines

AHC leadership should seek strategic partnerships for online connectivity and collaboration with contract research and pharmaceutical organizations.

Health Provider Empowerment

As reviewed above, the Internet is spawning Web-based technologies with unprecedented capabilities for connectivity and data exchange between providers, payors, patients, and other parties. Integrated Web-based practice management programs, in use by some physicians and organizations, are expected to migrate to a majority of providers by the year 2010. Online practice management should enable the realization of significant efficiencies and cost savings in the utilization and transmission of care-related data. Providers and payors will achieve new levels of accuracy and timeliness in the processing of eligibility and insurance claims. Providers and provider organizations will realize new levels of administrative effectiveness in the management of medical records and patient flow. Patients should reach new levels of customer satisfaction with easier and more reliable scheduling, billing, and medical record keeping, and with enhanced connectivity for the purposes of communicating with or accessing resources and information from providers and payors.

The complexity and diversity of health care practices hinders the development and adoption of a broadly accepted or indispensable model for care delivery and management. Instead, the Internet is serving as a common platform for the development of a wide spectrum of new proprietary clinical care and process related capabilities. Since they are being developed on a common platform, they will be able to share data and connectivity in the delivery and management of care among providers, payors, pharmacies, patients, and other parties.

As a group, physicians have been slow to adopt Internet-based technologies in their clinical practice – or to adapt clinical practice to new Internet-based or enhanced technologies. Surveys of physician Internet usage vary, but on the whole indicate that anywhere from 50 to 85 percent of physicians now have access to computers at home or in the office. The vast majority utilize the Internet, but not to support of clinical care. Typically, physicians use the Internet the way others do – for e-mail, news, entertainment, and for information searches on both professional and personal topics. Measures of physician utilization of the Internet for clinical or patient-related topics show usage to be relatively low.

A recent online survey conducted by WebSurveyMD.com sampled a cohort of physicians with online access. Only 27 percent believed that the Internet would help reduce health system costs over the next five years. Fewer than 50 percent believed that the Internet would help improve physician-patient communication. Twenty percent use the Internet to communicate with patients, 19 percent to consult with colleagues. Of most interest to those surveyed, was the potential of Internet-related technologies to extend care to patients at remote sites (WebSurveyMD, 2000).

Many analysts attribute low physician Internet utilization to practitioners' individual and collective reticence to change long-standing practices, resistance to new technology, or even professional arrogance. These explanations miss the point. Limited utilization of the Internet for care-related activities is primarily a function of the lack of demonstrated utility

and value of Internet technologies to the care process. To date, only a few Internet or Web technologies have been developed that seem capable of providing the physician with new capabilities, efficiencies, practical benefits, margins on productivity, or cost savings in the actual provision of care that would justify their adoption. Among these, Allscripts (allscripts.com), ephysician (ephysician.com), and several other vendors have pioneered the development of portable or hand-held wireless electronic prescription capabilities that enable physicians to create electronic prescriptions in the exam room.

Prescriptions can then be sent electronically to the local retail, mail order, or Internet pharmacies, printed in the office, or for the most commonly prescribed medications, dispensed in the physician's office. On a separate track into the physician's workflow, MDeverywhere (mdeverywhere.com) and Pocketcode (pocketcode.com) have developed wireless charge capture devices for use by physicians at the point of care.

Many other technologies promising in-office and care-extending benefits are being developed. Providers are likely to get products that enhance care delivery, but only incrementally, because of operational, technical, legal, and professional hurdles. Technologies that enhance clinical care will gain momentum among providers and payors, and are likely to become integrated within clinical practice environments over the next decade. Examples include clinical decision support and care monitoring, especially to remote environments.

Clinical decision support will become technically feasible as both search engines

and clinical practice guidelines become increasingly sophisticated. Decision support in medicine requires an extremely complex set of capabilities, including computer terminals or appliances that are easy to use, portable, and can access and display data and patient records in real time. Also required are extensive and sophisticated databases that include up-to-date research and clinical findings and protocols. Rendering all of this information available and useful to diagnosis and treatment requires search engines and software that can process and analyze the data in ways that are useful to the clinician in the clinical setting.

Several organizations and companies target specific diseases and conditions for clinical decision support and guidance. The diagnosis, treatment, and management of conditions such as asthma, heart disease, and diabetes are supported by increasingly sophisticated products and applications. I-Trax (Itrax.com) has had some early success with pediatric provider adoption of its Asthma Watch System. Health plans are increasingly looking to such solutions for monitoring and guiding the care of their members. The managed care company, Humana, Inc., has begun utilizing an online coronary artery disease (CAD) management product developed by CorSolutions, Inc. (ecor-solutions.com).

Taking a more general approach, Stanford University created and spun-off as a private company, e-SKOLAR.com, a Web-based clinical care support site that it describes as a "knowledge service provider." The site is designed for use by physicians and other providers to conduct

rapid searches across multiple medical references. Users can access the most up-to-date medical information and clinical decision support at the point of care. e-Skolar.com also promotes the concept of physician-initiated in-context learning, providing the opportunity to earn continuing medical education credits in a “learning while doing” model. e-SKOLAR.com grew out of Stanford SKOLAR, M.D., a powerful search engine developed by an interdisciplinary team of faculty members and students from the schools of computer science and medicine.

Another start-up, EBM Solutions (ebmsolutions.com), in a partnership with Vanderbilt University’s medical center and five other AHCs, developed a package of Web-enabled evidence-based disease-specific practice guidelines designed for use by both the professional and the patient. Guidelines allow both provider and patient to view care options best supported by reported research and evidence compiled and reviewed by the six AHC partners. Connectivity tools are being designed to facilitate communication and information exchange, including compliance reporting between patient and provider.

A number of companies provide and are developing diagnostic and testing devices for use at the point of care and remotely. I-Stat (I-Stat.com) provides blood analysis tools built into a portable device for use at the point of care. IGEN International (IGEN.com) is a well-established diagnostic and life sciences company developing a product capable of performing a wide range of diagnostic tests both at the point of care and remotely.

Internet-based or enhanced telemedicine capabilities are poised to move from the status of esoteric technologies of marginal utility, to mainstream care management tools. Already, many pathology and radiology practices routinely employ the Internet to transmit images and data. Various telemedicine systems are employed to connect providers to patients in homes, assisted living and skilled nursing facilities, and correctional institutions.

Limited utilization of the Internet for care-related activities is primarily a function of the lack of demonstrated utility and value of Internet technologies to the care process.

Home health care is beginning to emerge as a market with increasingly sophisticated and practical technologies of interest to payors, providers, and patients. Remote monitoring and other connectivity products have the potential to reach millions of patients, especially those with chronic diseases and conditions who represent the highest cost cohort in the health care system. Cyber-Care (cyber-care.com), American TeleCare (americantelecare.com), Medtronic (medtronic.com), and several other companies have developed and are refining systems that connect the home and other remote locations to the

provider. Terminals enable audio, visual, and digital communication, as well as the reading, monitoring, and transmission of health metrics such as blood pressure, blood oxygen levels, weight, heart rate, glucose levels. Regularized, ongoing monitoring of these and other metrics, along with visual and voice communications, should allow providers to better manage patients' health, increase patient compliance, and help prevent both over and under-utilization of care.

While these and other initiatives are pioneering new ground in health e-care, there are significant technical, operational, legal, privacy and security, reimbursement, and quality assurance issues with which both vendors and e-care utilizers must contend. Migration of clinical decision support and other clinical functions online can be accomplished only with operational accommodations in all clinical settings. Hospitals, physicians, other providers, administrators, and staff must be open to incorporating new capabilities, learning new skills, adjusting patient flow, and helping to test and refine new technologies.

Electronically enhanced or extended care creates legal issues and responsibilities in the areas of professional licensing, provider, vendor, and payor liabilities, privacy, reimbursement, ethics, and other areas (Silverman, 2000). HIPAA rules now regulate all health-related electronic data. All health sector participants must develop capabilities for compliance. Remote consultation, technologies enabling new diagnostic and treatment options, and practice innovations of many kinds will

all require payment adjustments and accommodations by both public and private payors. New technologies will require and enable unprecedented quality assessment and assurance measures for use by providers, payors, employers, regulators, and patients alike.

Growing employment of the Internet for clinical care will require ongoing research and investment in a national health information infrastructure that includes technologies and standards that provide for vastly increased capacity, speed, reliability, and security for data analysis, processing, utilization, and transmission (National Research Council, 2000). At the national level, several entities have begun to analyze and project these needs and to make recommendations for meeting them.

These include: the National Committee on Vital and Health Statistics (NCVHS), the National Research Council (NRC), the National Committee on Quality Assurance (NCQA), the Data Council of the U.S. Department of Health and Human Services (HHS) the President's Information Technology Advisory Committee (PITAC). Lacking, however, is an official body, office, or individual that can provide overall leadership or coordination of national policy and resources for a national health information infrastructure (National Committee on Vital and Health Statistics, 1998). HHS is widely seen as the appropriate locus for strategic leadership of health IT issues, particularly "aggressive involvement in the area of national networking" (Shortliffe, 2000).

Provider Empowerment Findings, Recommendations, and Implementation Guidelines

Findings

- Internet and Web-based technologies that can enhance or extend clinical care are still in early stages of development and adoption. Internet-based technologies as yet do not provide practical solutions that address the needs of the vast majority of providers overburdened by administrative tasks and with too little time to spend with patients – though many technologies are gaining incremental acceptance. Over the next decade, such technologies are likely to become increasingly sophisticated, enabling AHCs and other provider organizations to improve care-related operational processes, clinical decision-making, patient, provider, and payor connectivity, and the efficiency and effectiveness of care.
- Significant technical, operational, legal, privacy and security, reimbursement, and quality assurance issues remain to be addressed by federal and state authorities, vendors, and those who would employ e-care solutions.
- AHCs have much to contribute as centers for innovation, collaboration, and nationwide advocacy in the development of Internet-based capabilities that can enhance or extend care.

Recommendations

- AHCs should institutionalize and formalize the capacity to support the development and implementation of Internet-based technologies that can enhance and extend care. AHCs must conduct trials and demonstration projects and expand their research agendas to facilitate exploration of the question: How is health care going to be transformed because of new Internet capabilities?
- As an important basis from which to expand and assert AHC leadership in Internet health care innovation, AHCs should embrace health informatics as a full fledged professional specialty in medicine, nursing, and public health.
- AHCs and other health organizations should vigorously support the efforts of the National Committee on Vital and Health Statistics (NCVHS), the National Committee on Quality Assurance (NCQA), the Data Council of the U.S. Department of Health and Human Services, the President's Information Technology Advisory Committee (PITAC), and related efforts to create and maintain a national health information infrastructure necessary to the burgeoning demand for fast, secure, and reliable information transfer and processing.
- AHCs and other health organizations should vigorously advocate for the Department of Health and Human Services to take leadership in overseeing and coordinating information technology initiatives aimed at optimal development of a national health information infrastructure for the twenty-first century.

Implementation Guidelines

- AHCs should create high-level working groups to identify and support on an ongoing basis, the evaluation, development and testing of Internet-based clinical capabilities within and between their centers. Clinicians, departments, and/or clinical delivery services that are willing and positioned to participate should be identified and enlisted in these efforts. Appropriate IT, legal, and administrative resources must be committed to these efforts.
- AHCs should begin by identifying processes that need to be fixed or strengthened within the overall clinical and business strategy. AHC leaders should not allow strategy to be controlled or driven by technology. AHCs are most likely to make progress in this arena by focusing on basic and incremental steps while working with new technologies to improve quality, cost, and delivery of care.

From the point of view of the patient and the public, there has been remarkable development of Internet-based health care resources. The Internet is providing access to health information in unprecedented volume, depth, and breadth. But beyond simply providing information, hundreds of online commercial and non-commercial initiatives are deploying new capabilities for health care services that enable individuals to engage more effectively in managing their health, insurance coverage, and care. As these capabilities become more broadly and equally accessible, patients and health consumers are increasingly empowered to participate in managing their care. The Blue Ridge Group also predicts that over the next ten years, there will be dramatic increases in the growth of patient competence in self-care and remote care.

The first stage of patient and public access to health information came with the explosive growth of consumer-focused health information portals. Among the early leaders with a strong academic pedigree were Intellihealth (originally a joint venture of Johns Hopkins Medical School and Aetna U.S. Health Care), DrKoop.com (with health care content provided in part by the Dartmouth College Medical School), and the Mayo Clinic's own Health Oasis site. Among the private concerns that emerged strongly were HealthCentral, HealthGate, and OnHealth, each of which has developed a significant portal that provides a broad range of easily navigable resources and information. Another leading portal, Medscape.com, began as a physician-focused site providing professional news, articles, and research resources along with

connectivity to other professionals.

As market trends and consumer interest escalated, Medscape partnered with the television network, CBS, to create CBS Healthwatch.com, a portal for customers and patients.

It is WebMD, however, that has come to epitomize the commercial health care portal. Through a series of major strategic alliances and acquisitions, WebMD has achieved an unparalleled size, scope, and market presence across almost the entire spectrum of e-health services and capabilities. But WebMD's ambitions to become the major portal through which all forms of health care information, data, and transactions will flow have also become a significant management problem that recently caused the company's share price to plummet and its leadership team to experience significant turnover. It remains to be seen whether this model of health portal and transactional gateway can flourish.

Also sponsoring major Web-based health information portals are many governmental agencies (e.g., the National Institutes of Health; nih.gov/health/ and clinicaltrials.gov), professional associations (e.g., the American Medical Association; ama-assn.org), pharmaceutical companies (e.g., drugstore.com), health maintenance and other provider and payor organizations (e.g., Kaiser Permanente; KPOnline.org), philanthropic and policy organizations (e.g., the Kaiser Family Foundation; kff.org), and university medical centers. HealthWise, a non-profit health-promotion organization and publisher of popular self-care guides, has become a leading vendor of online consumer oriented, evidence-based self-

care guidelines and information, which can be licensed by managed care organizations, health plans, hospitals, and employers for use with their members and employees.

A different model, and equally important to the diffusion of better health knowledge and the empowerment of patients and the public, has been the development of online communities of interest centered around diseases and conditions or cohorts. Online communities have a wide variety of sponsors, from individuals to dedicated, disease-specific advocacy organizations, to the major health portals. These online communities have played very important roles in the evolution of expectations for health knowledge acquisition and interactivity both between providers and patients and among patients and others with shared disease or other health-related experiences and interests.

Yet research shows that consumers want even more. In most other service and consumer industries, the level of informational access that has been achieved in health care has been supplemented with important follow-on transactional capabilities that enable levels of service and commerce that have so far not developed in health care. As a result, health portals continue to move towards consumer customization and the integration of health-related products, services, interactivity, and information. Consumers increasingly can go online with any of the major portals not just to find information, but to purchase health products and pharmaceuticals, maintain personal and family health data, track and assess personal health status, join discussion forums, and identify and

communicate with health care professionals, insurance companies, health plans, or employee benefits managers.

For example, DiabetesWell.com and DiabetesManager.com provide integrated packages of information and services to diabetes patients. Both provide: e-mail access to medical professionals; daily e-mail updates and news; local lab referrals or online help for testing and complications; online glucose monitoring with data displays and graphs; a secure Web page to track treatment; medication; access to a personal food plan developed by a registered dietitian; a personal fitness plan created by an exercise physiologist; and online education. Both sites encourage the patient to pull their physicians into online care management through these dedicated online services.

Women's Health Interactive (womens-health.com) is typical of Web sites providing health information for specific cohorts (other widely targeted cohorts include the elderly, children, and teens). This site provides information, research, chat rooms and a variety of related resources on the range of women's health issues. Resources include guidance and links to clinical, insurance, and other services.

Beansprout.com is an example of the trend towards integrating both health and related services to particular cohorts of consumers. Beansprout is targeting parents of young children with an online service that connects parents, pediatricians, child care professionals, and dedicated childcare resources. The American Association of Retired Persons sponsors a Web site providing comprehensive coverage of issues of importance to senior

citizens, including a health site, aarp.org/healthguide. Seniors can find a wide range of articles, books, research, and legislative advocacy materials on health care, fitness, nutrition and wellness, care giving, health insurance, Medicare, Medicaid, managed care, long-term care, and other issues.

One of the greatest challenges for patients and the health-interested public is evaluating the quality of health information and care they receive. An increasing number of health care portals are providing information and guidance in evaluating providers and the quality of care.

DoctorQuality.com and Quackwatch.com are two examples of initiatives to provide guidance on health information and care. DoctorQuality.com is a growing online service that provides information and resources of use to providers, payors, and the public in understanding and improving quality of care. For consumers, this site gathers and provides data on doctor ratings and hospital errors, and provides patients with best practice guidelines to help in understanding and managing disease. DoctorQuality.com has collected public data for all U.S. hospitals, including volume of cases, regulatory and accreditation status, and services available. For U.S. physicians, DoctorQuality.com collects data including physician's background and training (such as board certification), years in practice, and any sanctions against their license (such as convictions, substance abuse, or fraud). Reported performance data is collected from physicians, hospitals, third-party sources (such as managed care plans), or publicly available state or federal data.

Quackwatch.com is a nonprofit organization with a Web site run by a physician whose purpose is to identify and debunk health-related frauds, myths, fads, and fallacies. This site works with volunteers to investigate questionable claims for medical procedures, cures, products and outcomes as well as misleading or illegal health products marketing. Patients and those interested in health can receive regular e-mail updates on various issues and concerns, submit questions, or report questionable claims and practices.

Sites such as these are now augmenting the thousands of informal networks of individuals who share experiences, anecdotes, gossip, rumors, facts and information of all kinds in Web site chat rooms and forums. Many health care organizations and providers are well aware of the importance and power of such informal networks in affecting patient and public perceptions and steering patients towards particular therapies, practitioners, or institutions.

An increasing number of health care portals are providing information and guidance in evaluating providers and the quality of care.

The World Health Organization (WHO) is pursuing a novel course to enhance the credibility of health information offered worldwide. The WHO applied to the Internet Corporation for Assigned Names and Numbers (ICANN) to become the registrar of a new top level domain (TLD)–health. Within the ICANN framework, new top level domains may be restricted or unrestricted. A restricted TLD, empowers the sponsoring organization to set policy on how the TLD is allocated and used, including who may apply for a registration within the domain, and what uses may be made of those registrations. As registrar of the .health domain, the WHO would have the ability to require domain name holders to adhere to a common set of standards for online health content and services. Though not yet successful, this effort illuminates the importance of establishing worldwide standards of care.

Efforts such as these to promote standardization and evaluation of care are controversial and complex, but inevitable. There are many unresolved difficulties in defin-

ing, tracking, measuring, and assessing health claims and information, professional competence, patient compliance, and clinical outcomes. Nevertheless, the objective of defining, measuring, and enforcing standards in all of these areas has long been embraced. Professional societies, national and state regulatory and accrediting bodies, and not uncommonly, the courts, all have had a role in developing, promulgating, evaluating, and enforcing professional ethics, truth in advertising, product safety, and practice standards. Individuals and communities too have always formed opinions and points of view about practitioners, institutions, products, and information. That the Internet is now serving as a platform for the migration and further development of this process online should not be surprising. The vast data-generation and -handling technologies coming online guarantee that there will be unprecedented, ongoing development of resources to assess quality, safety, performance, outcomes, and other health care metrics.



Public e-Health Knowledge and Empowerment Findings, Recommendations, and Implementation Guidelines

Findings

The proliferation of Internet health care information provides patients and a health-interested public with extraordinary new access to health-related information that can be used to better understand health and improve patients' participation in the management of their health and care. However, few patients or consumers have the knowledge or experience to assess the quality and utility of much of this information. Research suggests that patients and the public need and prefer local, hospital or provider recommended sources of reliable health information.

Recommendations

AHCs should take a leadership role in identifying, making available, and assuring quality health care information for their patients and the public over the Internet.

Implementation Guidelines

AHCs should create or seek partnerships in a Web site or sites that provide their patients and public with relevant, reliable, timely and trustworthy health information and educational materials. AHCs not yet ready or able to create their own sites can often partner in the editorial and quality control of e-health content for Web sites otherwise available to patients and the public.

The vast data-generation and -handling technologies coming online guarantee that there will be unprecedented, ongoing development of resources to assess quality, safety, performance, outcomes, and other health care metrics.

The Internet enables significant advances in standardization and empowerment in health care. Standardization allows data to be shared across systems, users, and sites, contributing to the de-balkanization of health care. This, in turn, enables the development of unprecedented improvements in the speed, accuracy, and cost of health care, information utilization, and care management. The empowerment of patients and providers through the creation of new technologies and the diffusion of new knowledge provides opportunities for gains in professional-directed and self-managed health and care. Both are necessary to progress towards a more cost effective and efficacious health care system.

By themselves, standardization and empowerment are not sufficient to the development of a health care system that provides quality, affordable health care services for the entire population. The actuarial, resource utilization, and other metrics required to provide the best value and outcomes in managing health services for a group or population depends upon the ability to define, measure, and then work with the group. Both nationally and locally, a progressive, value-driven health system remains unworkable absent an inclusive system of universal coverage for health services. Although the Internet as a platform may or may not help catalyze movement towards universal access to affordable health insurance coverage, it is proving to be a platform upon which both public and private payors are learning a great deal about value-driven health services.

Since the early 1960s, the Medicare and Medicaid programs provide coverage for health care services for many of the most

vulnerable in the population. Employer-based health insurance systems provide coverage for most of the non-poor and non-elderly employed and their families. Yet, consistently since the 1960s, about 15 percent of the population has not been covered by any of these programs. In its most recent report, published September 28, 2000, the U.S. Census Bureau reported 42.6 million uninsured at the end of 1999, down from 44.3 million in 1998 – a drop of 3.8 percent. This was the first drop recorded by the agency since it began counting the uninsured in 1987, lowering the percentage of uninsured Americans from 16.3 to 15.5 percent. The bulk of the decline was attributed to the expansion of employment-related health insurance. Nevertheless, projections suggest that the number of uninsured could grow significantly during a substantial downturn in the economy (U.S. Census Bureau, 2000).

The rapid transition over the last decade from the traditional fee-for-service insurance system to a managed care model has served, if nothing else, to provide unprecedented public and professional exposure to the choices and trade offs necessitated by a more cost-sensitive health care market place. Managed care organizations and self-insured employers have developed increasingly sophisticated systems for managing utilization, population health, patient education, and actuarial risk (often shifting it to providers). Providers are learning more efficient utilization, patient education and care, and risk (including population health) management. Patients and consumers are becoming more aware of the costs and consequences of unhealthy behaviors and environmental conditions; they are becoming more informed buyers of health care products

and services; and they are becoming more active participants and advocates in managing their health and care.

Despite these gains, it is fair to say that few providers, payors, or patients are very happy with the state of the health care system. Providers have had to cope with new productivity and efficiency demands and sometimes drastically reduced payments for services. Health care workers and professionals universally report less satisfaction and more stress in their work environments. Both payor and provider organizations have been forced to engineer significant changes in benefit plans, product lines, payments systems, regulatory and compliance rules. Many payors and providers have had to reorganize, reduce, or eliminate services, infrastructure, and staff. Patients and the public have been dissatisfied with many cost reduction policies that sacrifice provider choice and perhaps service quality. All have been affected by rising drug and device prices. Making all of these challenges and changes more difficult is the absence of clear policies or system goals, except perhaps the goal of cost containment, to guide planning and decision-making at the national or even regional or local levels.

The Blue Ridge Group believes that the widespread dissatisfaction from all quarters with the existing system indicates that the health care system must and will continue to change. Absent significant national policy initiatives, the market place and consumer pressure are likely to be the two strongest drivers of system change. HMOs, insurers, self-insured employers, and other payors face challenging and conflicting cost control and consumer pressures that are increasingly difficult to

manage. Many payors are working to manage this conflict by leveraging the Internet to develop health coverage that provides new levels of information and choice to consumers and patients. About 20 percent of payors currently enable members, employers and/or providers to conduct online transactions (First Consulting Group, 2000). Along with greater information and choice, it is likely that payors are also going to introduce new coverage models that require and enable consumers to assume increased responsibility for managing the costs and administration of their care (Goldsmith, 2000).

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Blue Cross/Blue Shield of California (blueshieldca.com) subscribers can access health benefits information, research providers' backgrounds, choose care providers and provide quality assurance and customer satisfaction feedback. Their MyLifePath.com site also offers the full range of consumer health news and information. Blue Cross/Blue Shield of South Carolina provides online access to a variety of information and functions for members, employers, providers, and brokers. Members can use the online My Insurance Manager to check claims status, inpatient and outpatient eligibility and

authorization status, the status of bills, and how much they have paid towards their deductible. Payors like Highmark Blue Cross/Blue Shield of Pennsylvania (highmark.com), are also starting to sell health insurance directly to consumers online, thereby removing the middle man/insurance brokers (many of whom are scrambling to Web-enable their businesses). Employer-payors are increasingly taking advantage of the Internet to manage or out-source human resource functions.

By moving these capabilities online, payors can use the Internet platform to further customize information, services, and functions while collecting, tracking, and analyzing extraordinary new data resources by which they can reduce costs and manage care. They can customize and deliver interactive disease management resources to high-risk subscribers, track variability in patient risk and cost in delivery systems, and promote informed choice concerning invasive versus non-invasive or alternative therapies. By linking patients with their physicians, either with automatic alerts or manual querying, they can head off emergency room visits and other costly inefficiencies or mistakes. And of course in connecting directly with providers and employers, payors can accelerate claims and eligibility review, instantaneously make payments, and automatically bill patients' credit cards for co-pays.

By employing an Internet platform, payors have an opportunity to introduce improved efficiencies and new levels of customer satisfaction. Based on estimates from other industries, e-enabling administrative and transaction processes could yield cost savings in the billions of dollars. For instance,

the retail banking industry put the costs for manual teller transactions at \$1.07 per transaction. Moving transactions to the Internet reduced these costs to \$.10 or less. Traditional paper systems for claims processing cost an average of \$7 per claim to submit. The same claims submitted over the Internet cost \$.30. Potential savings from electronic management and transactions for the payor industry have been estimated to be \$18 billion (Darlington, 1998).

As payors and employers Web-enable subscriber information and functions, they are looking for opportunities to meet consumer demand for choice while bolstering their own risk management strategies. The traditional model for employee health benefits is built around employers providing a finite set of benefits options (sometimes only one) from which their employees can choose. Employees often are not satisfied with the limited choice of coverage and providers. A new model would have employers simply providing a defined contribution to the costs of coverage (plus perhaps catastrophic coverage), empowering the employee to pick and choose from a broad menu of benefits and options offered by an employer retained e-broker, or to go out into the market place and choose their own plans. Health plans would compete for employees' dollars as employees build custom-designed virtual health plans or choose among health networks on the Web.

The theoretical appeal of defined contribution systems is hard to argue with, since it appears to fit both consumer desire for empowerment and payors' and employers' desires to control costs and share or shift risks to those who incur

the costs. Nevertheless, this will not be an easy system to implement. Among the complex issues to be addressed are:

- The implications of risk pool fragmentation, and whether new concepts of risk and new group-identity structures must or can be developed;
- Affordability and cost stability for consumers;
- The future of medical management and ability to track utilization, claims, and other data;
- Customer service and consumer protection;
- Identifying incentives to improve care coordination;
- The cost of catastrophic umbrella/out of network coverage; and
- Information and data management challenges in supporting an open benefits market.

So while there is a significant opportunity for payors to recast their businesses, for employers to reduce their benefits costs, and for employees to achieve new levels of health market choice, there are also daunting implementation challenges. These challenges ensure that there will be an incremental transition towards defined contribution, employee and consumer choice coverage models, likely extending through the next decade.

Nevertheless, change in this direction could have significant implications for the health care system. Progressively empowering consumers with increasingly sophisticated information systems by which to participate in a competitive market place for health care coverage could have a significant impact on consumers' and patients' knowledge, experiences, and

expectations. It is possible to foresee a variety of future developments.

For instance, the example set by employer contributions could be extended by popular demand to federal and state payors. There are already many advocates for the creation of Medicare and Medicaid defined contribution programs, for the expansion of the Federal Employees Health Benefits Program (FEHB), and for tax credits for individual and family health coverage purchases. Unexpected complications and problems with establishing fair and open markets in coverage options could create a consumer backlash against the market-based approach. Would the generalization of the defined contribution model result in increased cooperation or competition between public and private sector payors and programs? How much of a regulatory framework would be required and how truly "free" could or would such a market be? These and many other critical public policy issues would have to be addressed before a defined contribution model could be implemented.

The movement towards a defined contribution model is also likely to refocus and perhaps intensify the continuing debate on universal coverage. It could well lead also to the development of new knowledge and new information systems that will provide the online technical and data foundations for revolutionizing underwriting and creating new mechanisms for extending coverage universally.

Universal Coverage and Value-driven Health Care

Findings and Recommendations

payors and employers as well as policy-makers to ensure that the evolution of consumer directed medical and benefits

Findings

- Payors and employers, along with specialized vendors and other health care organizations, are using the Internet to provide new levels of information, service, and functionality to consumers, patients, providers, and others in the management of health care and insurance coverage. There will be gradually increasing opportunities for AHCs and other provider organizations to adopt or outsource HR and benefits management capabilities for their employees.
- In order to better manage risk and cost, payors and employers are exploring “defined contribution” strategies that leverage advancing information technology and consumer/employee desire for maximum choice of benefits and providers.
- While it is impossible to predict with certainty, the trajectory of payor and employer online technologies, capabilities, and strategies suggests that many new and important tools could be created for use by both public and private payors to enhance the technical and data foundations necessary for progress in extending coverage universally.

management strategies and payment systems track and report information on quality, outcomes, and other metrics of care necessary to informed consumer choice of plan and provider.

- AHCs should continue to advocate for public policy that is more supportive of e-health care, including addressing limitations on reimbursement for telemedicine, state barriers to e-health, and Internet access issues. Progress in these areas is vital to achieving universal coverage and the transition to a value-driven health care system.

Recommendations

- AHCs and other provider organizations should explore opportunities to vastly improve relationships with payors through online transaction and information processing. AHCs should also explore opportunities to better manage and/or outsource in-house HR functions.
- AHCs should seek to work closely with

Conclusion

The Internet is rapidly becoming a major force in the transformation of health care. It enables the standardization of health industry data and allows connectivity for transactions and communications. It empowers providers and patients in the care process and is likely to contribute significantly to the development of insurance coverage that provides universal access to quality healthcare.

For AHCs, the Internet and Internet-based technologies serve many functions and can be employed to support core missions in research, education, and patient care. In turn, AHCs and their faculties are well positioned to play critical roles in shaping and enhancing online health resources and capabilities. The Internet is spawning many of the tools and technologies necessary to the establishment of a value-driven health care system. AHCs and other health care organizations are well advised to take full advantage of this extraordinary opportunity.

It is not the strongest of the species that survives, not the most intelligent, but the one most responsive to change.

– Charles Darwin

About the Blue Ridge Academic Health Group

The Blue Ridge Academic Health Group seeks to take a societal view of health and health care needs and to make recommendations to academic health centers to help them create greater value for society. The Blue Ridge Group also recommends public policies to enable AHCs to accomplish these ends.

Three basic premises underlie this mission. First, health care in the United States is experiencing a series of transformations that ultimately will require new approaches in health care delivery systems, education, and research. Second, the recent upheavals in health care have been largely driven by financial objectives. Yet the potential exists for fundamental changes in health care to improve health and manage costs. Analysis and evaluation of the ongoing evolution in health care delivery must address this impact on the health of individuals and the population, as well as on cost. Third, AHCs play a unique role in the U.S. health care system as they develop, apply, and disseminate knowledge to improve health. In so doing, they assume responsibilities and encounter challenges other health care provider institutions do not bear. As a result, AHCs face greater risks and opportunities as the U.S. health care system continues to evolve.

The Blue Ridge Group was founded in March 1997 by the Virginia Health Policy Center (VHPC) at the University of Virginia and the Health Market Unit leadership at Ernst & Young, LLP (now Cap Gemini Ernst & Young, CGE&Y). Group members were selected to bring together

seasoned, active leaders with a broad range of experience in and knowledge of academic health centers in the United States. Other participants are invited to Blue Ridge Group meetings to bring additional expertise or perspectives on a specific topic.

Blue Ridge Group members collectively select the topics to be addressed at annual meetings. Criteria for selection of report topics include relevance to AHCs' operations, consistency with AHCs providing value to society, the likelihood of being able to make specific recommendations that will lead to productive action by AHCs or other organizations, and the ability to frame useful recommendations during two-day meetings.

Before each meeting, an extensive literature review is conducted. During the meeting, participants reflect on emerging trends, share experiences from AHCs, and hear presentations on specific issues. Most of the working session is dedicated to a discussion of what AHCs can and should be doing in a particular area to achieve visible progress, or a discussion of what public and private policy and philanthropic organizations can do to facilitate the efforts of AHCs to fulfill their societal mission. The results of the group's deliberations are presented in brief reports that are disseminated to targeted audiences.

About the Core Members

David Blumenthal, M.D., M.P.P.

Director

Institute for Health Policy

The Massachusetts General Hospital

Professor of Medicine and Professor of Health Care Policy

Harvard Medical School

Dr. Blumenthal is director, Institute for Health Policy and physician at The Massachusetts General Hospital/Partners Health Care System in Boston, Massachusetts. He is also professor of medicine and professor of health care policy at Harvard Medical School. Dr. Blumenthal previously served as senior vice president at Boston's Brigham and Women's Hospital, as well as executive director of the Center for Health Policy and Management and lecturer on public policy at the John F. Kennedy School of Government at Harvard. Dr. Blumenthal is a member of the Institute of Medicine of the National Academy of Sciences and serves on several editorial boards, including *The New England Journal of Medicine*, *American Journal of Medicine*, *Journal of Health Politics, Policy and Law*, and the *Bulletin of the New York Academy of Medicine*. He serves on advisory committees to the National Academy of Sciences, the Institute of Medicine, the National Academy of Social Insurance, and several foundations. He is currently executive director for The Commonwealth Fund Task Force on the Future of Academic Health Centers and Chairman of the board of the Massachusetts Peer Review Organization. Dr. Blumenthal is also the founding chairman of the Academy for Health Services Research and Health Policy, the national organization of health

services researchers.

Enriqueta C. Bond, Ph.D.

President

Burroughs Wellcome Fund

Dr. Bond is the president of the Burroughs Wellcome Fund. She formerly held a number of research and administrative positions at the Institute of Medicine, National Academy of Sciences; Department of Medical Sciences, Southern Illinois University School of Medicine; and the Biology Department at Chatham College. Dr. Bond also serves on several advisory committees and boards, some of which include the Council of the Institute of Medicine and the National Center for Infectious Diseases, Centers for Disease Control and Prevention. She has authored and co-authored more than 50 publications and reports in science policy.

Robert W. Cantrell, M.D.

Vice President and Provost

University of Virginia Health System

Dr. Cantrell is vice president and provost for the Health System at the University of Virginia. He is the former president of the American Academy of Otolaryngology-Head and Neck Surgery. As a captain in the U.S. Navy, he served as chair of Otolaryngology-Head and Neck Surgery at the Naval Regional Medical Center in San Diego, California. Dr. Cantrell was also the Fitz Hugh Professor and chair of the Department of Otolaryngology-Head and Neck Surgery at the University of Virginia School of Medicine. He also has been a consultant to the Surgeon General of the U.S. Navy and to the National Institutes of Health (NIH). Dr. Cantrell is a member or fellow of 33 otolaryngological societies

and has taken an active leadership role in many, including the American College of Surgeons, the American Society for Head and Neck Surgery, and the American Broncho-Esophagological Association. Dr. Cantrell received the Mosher Award for clinical research, has published numerous articles, and lectured nationally and internationally.

Don E. Detmer, M.D.

*Dennis Gillings Professor of Health Management
Director
Cambridge University Health
University of Cambridge*

Dr. Detmer heads the health policy and management center within the Judge Institute of Management at Cambridge University's business school. He chairs the Board on Health Care Services of the Institute of Medicine and is a board member of several organizations, including the China Medical Board of New York, the Nuffield Trust in London, and the *American Journal of Surgery*. He has authored numerous scientific publications. Dr. Detmer earned his medical degree at the University of Kansas after undergraduate studies there and at Durham University of England. He conducts his work with the Blue Ridge Group through a professorship at the University of Virginia where in the past he served as vice president and provost for Health Sciences and University Professor.

Michael A. Geheb, M.D.

*Professor of Medicine and Senior Vice
President for Clinical Programs
Oregon Health Sciences University*

Dr. Geheb is professor of medicine and senior vice president for Clinical Programs at Oregon Health Sciences University. Dr. Geheb has also served as professor of medicine, and was the first director and chief executive officer of the University of Alabama at Birmingham Health System. Prior to that, Dr. Geheb was associate dean for Clinical Affairs, and director of Clinical Services at the State University of New York at Stony Brook University Medical Center. Dr. Geheb's professional associations include the American Federation for Clinical Research; the Board of Directors of the University Hospital Consortium; and the American Board of Internal Medicine's Board of Directors. Dr. Geheb is co-editor of the textbook *Principles and Practice of Medical Intensive Care* and co-editor for the *Critical Care Clinics* series. He also speaks frequently to national audiences on health care policy issues related to academic productivity and financial models for academic clinical enterprises.

Jeff C. Goldsmith, Ph.D.

*President
Health Futures, Inc.*

Dr. Goldsmith's consulting firm assists a wide range of health care organizations with environmental analysis and strategy development. He is a director of Cerner Corporation, a health care informatics

firm, and of Essent Healthcare, a hospital management firm, as well as a member of the Board of Advisors of Burrill and Company, a private merchant bank in biotechnology and health sciences. He is currently an associate professor of medical education at the University of Virginia. He is a former lecturer in the Graduate School of Business at the University of Chicago. He has also lectured on health services management and policy at the Harvard Business School, the Wharton School of Finance, Johns Hopkins, Washington University, and the University of California at Berkeley. Dr. Goldsmith has served as national advisor for health care for Ernst & Young LLP, was director of Planning and Government Affairs at the University of Chicago Medical Center, and special assistant to the dean of the Pritzker School of Medicine. Dr. Goldsmith has written for the *Harvard Business Review* and has been a source for articles on medical technology and health services for *The Wall Street Journal*, *The New York Times*, *Business Week*, *Time* and other publications. He is a member of the editorial board of *Health Affairs*. He earned his doctorate in Sociology from the University of Chicago in 1973.

Michael M.E. Johns, M.D.

*Executive Vice President for Health Affairs
Emory University*

Director

*The Robert W. Woodruff Health Sciences
Center*

*Chairman of the Board and Chief Executive
Officer*

Emory Health Care

Dr. Johns heads Emory's academic and

clinical institutions and programs in the health sciences and is a professor in the Department of Surgery. A former dean of the Johns Hopkins School of Medicine, he was professor and chair of the Department of Otolaryngology-Head and Neck Surgery at Johns Hopkins. Before that he was assistant chief of the Otolaryngology Service at Walter Reed Army Medical Center. Dr. Johns is a member of the Institute of Medicine, and the Executive Council of the Association of American Medical Colleges and a fellow of the American Association for the Advancement of Science. He serves on the Governing Boards of the National Research Council and the Clinical Center of the National Institutes of Health, and on the advisory committee of the director of the Centers for Disease Control and Prevention. He is the president of the American Board of Otolaryngology, editor of the *Archives of Otolaryngology-Head and Neck Surgery*, and a member of the Board of Trustees of Genuine Parts Company. Dr. Johns received his Bachelor's degree and continued with graduate studies in biology at Wayne State University. He earned his M.D. at the University of Michigan School of Medicine.

Peter O. Kohler, M.D.

President

Oregon Health Sciences University

Dr. Kohler is president of Oregon Health Sciences University. After holding positions at the National Institutes of Health (NIH), he became professor of medicine and chief of the Endocrinology Division at Baylor College of Medicine. Later, he served as chairman of the Department of Medicine at the University of Arkansas

and then as dean of the Medical School at the University of Texas Health Science Center in San Antonio. Dr. Kohler has served on several boards. He has been chairman of the NIH Endocrinology Study Section and chairman of the Board of Scientific Counselors for the National Institute of Child Health and Human Development. Currently, he is chairman of the Institute of Medicine Task Force on Quality in Long-term Care and past-chair of the Board of Directors of the Association of Academic Health Centers. Dr. Kohler received his B.A. from the University of Virginia and earned his M.D. at Duke Medical School.

Edward D. Miller, Jr., M.D.
*Dean and Chief Executive Officer
Johns Hopkins Medicine*

Dr. Miller is chief executive officer of Johns Hopkins Medicine. His former posts include chairman of the Department of Anesthesiology and Critical Care Medicine; Interim dean of the School of Medicine; professor of anesthesiology and surgery and medical director of the Surgical Intensive Care Unit at the University of Virginia; E.M. Papper Professor at Columbia University; and chairman of the Department of Anesthesiology in the College of Physicians and Surgeons. Dr. Miller has authored and co-authored more than 150 scientific abstracts and book chapters. He received his A.B. from Ohio Wesleyan University and his M.D. from the University of Rochester School of Medicine and Dentistry.

Jeffrey Otten, M.A., M.B.A.
*President
Brigham and Women's Hospital*

Mr. Otten is president of Brigham and Women's Hospital where he previously served as executive vice president and chief operating officer. Before joining Brigham and Women's, Mr. Otten was chief operating officer for the Hospital of the University of Pennsylvania in Philadelphia and associate director and chief financial officer at UCLA Medical Center in Los Angeles. He has also served in senior management positions at Los Angeles County – USC Medical Center and Harbor – UCLA Medical Center. In addition, he has been a consultant in health care strategy and financial management. He has held teaching positions at California State University Los Angeles, UCLA, Wharton, and the Harvard School of Public Health. Mr. Otten is the immediate past chairman of the Massachusetts Hospital Association (MHA). He is director of corporate development of the Massachusetts Heart Association, chair-elect of the Board of Trustees of the Greater Boston Food Bank, a member of the Boston 2000 Consortium, and vice chair and executive committee member of University Healthsystems Consortium. Mr. Otten also serves on the Board of the Council of Teaching Hospitals at the Association of American Medical Colleges. He received a Master of Arts degree in 1975 and a Master of Business Administration degree in 1983 from the University of California at Los Angeles.

Mark L. Penkhus, M.H.A., M.B.A.

*Chief Executive Officer and
Executive Director
Vanderbilt University Hospital*

Mr. Penkhus is chief executive officer and executive director of Vanderbilt University Hospital. Prior to joining Vanderbilt, Mr. Penkhus was a partner and business unit leader for Healthcare Consulting (Mid-Atlantic area) in Washington D.C. for Ernst and Young LLP, and served as a national leader for academic health centers. During his career, he has worked with a variety of organizations as an innovator, and change agent with a special emphasis on strategic, operational, and financial performance improvement. Mr. Penkhus received a B.S. degree from Iowa State University, a master's degree in Hospital and Health Care Administration from the University of Iowa, and an M.B.A. from Rensselaer Polytechnic Institute in New York. He is also a graduate of the Advanced Management Program, Wharton School of Business, at the University of Pennsylvania. He is a fellow of the American College of Healthcare Executives (ACHE), a fellow in Project HOPE, Washington D.C., and a member of the Johns Hopkins University School of Hygiene and Public Health, Department of Health Policy and Management. Mr. Penkhus serves on several non-profit and for-profit boards in Tennessee and nationally.

Paul L. Ruffin, M.B.A.

*Vice President
Health/Managed Care Consulting Practice
Cap Gemini Ernst & Young U.S., LLC*

Mr. Ruffin leads the health/managed care consulting practice for Cap Gemini Ernst & Young U.S., LLC (CGE&Y) and is responsible for all business development and service delivery to CGE&Y's provider, managed care, and health/technology clients. He has over twenty years of health care consulting experience with a focus on developing and implementing strategies to transform health organizations including major providers and academic medical centers. He previously served as director for business transformation services for the health consulting practice where he had national responsibilities for operations improvement, merger integration, turnaround, medical management, physician practice management, supply chain, clinical improvement, and benefits realization services. Mr. Ruffin is a CPA, and holds a M.B.A. from Bowling Green State University and a B.A. in Accounting from Walsh College. He is a member of AICPA, Ohio Society of CPAs, Hospital Information Management Systems Society, and Healthcare Financial Management Association.

George F. Sheldon, M.D.

*Chairman and Professor
Department of Surgery
University of North Carolina at Chapel Hill*

Dr. Sheldon's background in graduate medical education spans four institutions: Kansas University, Mayo Clinic, University of California at San Francisco, and Harvard University. He is currently chairman and professor, Department of Surgery at the University of North Carolina at Chapel Hill and was formerly professor of surgery in the Department of Surgery at the University of California, San Francisco. He has held several national appointments, including: president of the American Surgical Association and chairman of both the American Board of Surgery and Council on Graduate Medical Education. He is currently chair of the Association of American Medical Colleges. He was past president of the American College of Surgeons, and past chair of the Council of Academic Societies of the Association of American Medical Colleges. He has published 195 articles and book chapters and co-authored eight books.

Katherine W. Vestal, Ph.D.

*Vice President
Health Consulting Practice
Cap Gemini Ernst & Young U.S., LLC*

Dr. Vestal leads the academic health center sector for Cap Gemini Ernst & Young's (CGE&Y) health consulting practice where she focuses on large-scale organizational change for a wide range of health care delivery organizations. Prior to joining CGE&Y, Dr. Vestal held several executive positions in academic health centers and taught at the graduate level at the University of Texas. Her background includes over 25 years of operations management and consulting in the areas of business transformation, post merger integration, and clinical management. She speaks nationally on issues of organizational improvement and is a Malcolm Baldrige National Quality Award Examiner. Dr. Vestal received a B.S.N. from Texas Christian University, an M.S. from Texas Women's University, and a Ph.D. from Texas A & M University. She is a Fellow of the Johnson and Johnson Wharton School of Finance, American College of Healthcare Executives, and the American Academy of Nursing.

About the Invited Participants

Jordan J. Cohen, M.D.

*President and Chief Executive Officer
Association of American Medical Colleges*

Dr. Cohen's career in academic medicine spans almost 40 years. Most recently, he served as dean of the medical school and professor of medicine at the State University of New York at Stony Brook, and president of the medical staff at University Hospital. Prior to serving as dean at SUNY-Stony Brook, Dr. Cohen served as professor and associate chairman of Medicine at the University of Chicago-Pritzker School of Medicine, and physician-in-chief and chairman of the Department of Medicine at the Michael Reese Hospital and Medical Center. He has held medical faculty positions at Harvard, Brown, and Tufts universities. Dr. Cohen is also a former president of the medical staff at the New England Medical Center Hospital in Boston. He has held a wide variety of leadership positions in almost all aspects of academic medicine, including chair of the American Board of Internal Medicine and the Accreditation Council for Graduate Medical Education, as well as president of the Association of Program Directors of Internal Medicine. A member of the American College of Physicians since 1978, he has served as vice chair of its Board of Regents and Chair of its Education Policy Committee; he was awarded a mastership from the college in 1993. Concurrent with his leadership of the AAMC, Dr. Cohen also serves on the Board of Directors of the Foundation for Biomedical Research and Research!America, and is a Trustee of the Educational Commission for Foreign Medical Graduates. He is a member of the

Special Medical Advisory Group of the Department of Veterans Affairs. In 1994, Dr. Cohen was named a member of the National Academy of Sciences Institute of Medicine. He is a graduate of Yale University and Harvard Medical School and completed his postgraduate training in internal medicine in Harvard service at the Boston City Hospital. He completed a fellowship in nephrology at the Tufts-New England Medical Center. He is the author of more than 100 publications and is editor of Kidney International's *Nephrology Forum*.

Dennis Gillings, Ph.D.

*Chairman and Chief Executive Officer
Quintiles Transnational Corporation*

Dr. Gillings began providing statistical consulting and data management services to pharmaceutical clients in 1974 during his tenure as professor of biostatistics at the University of North Carolina in Chapel Hill. Quintiles grew from his consulting activities and was incorporated in 1982. Today, Quintiles has 19,000 employees in 38 countries around the world. It is the global market leader in helping pharmaceutical, biotechnology and medical device companies develop, market and sell their products. Dr. Gillings devotes much of his time to strategic planning for continued international expansion of Quintiles. In addition, he oversees day-to-day operations of the company. Dr. Gillings has consulted for the pharmaceutical and biotechnology industries and has worked with a number of agencies, including the National Cancer Institute, the National Institute for Dental Research, and the Institute of Medicine. He has published widely in

scientific and medical journals. Dr. Gillings' research interests include statistical methods in the analysis of clinical trials and mathematical models to improve the delivery of health services in fields such as cancer, perinatal care, cardiovascular disease and rheumatology. Dr. Gillings serves on several boards and councils, including the University of North Carolina School of Public Health Dean's Advisory Council; the Graduate Education Advancement Board of the Graduate School of the University of North Carolina at Chapel Hill; North Carolina Institute of Medicine; ICAgen, Inc., Triangle Pharmaceuticals, Inc., and Healtheon/WebMD. Dr. Gillings received a diploma in Mathematical Statistics from Cambridge University in 1967 and a Ph.D. in Mathematics from the University of Exeter, England, in 1972. He served for more than 15 years as professor at the University of North Carolina at Chapel Hill.

John P. Glaser, Ph.D.

*Vice President and Chief Information Officer
Partners HealthCare System, Inc.*

Dr. Glaser is vice president and chief information officer, Partners Healthcare System, Inc. Previously, he was vice president, Information Systems at Brigham and Women's Hospital. Prior to Brigham and Women's Hospital, Dr. Glaser managed the Healthcare Information Systems consulting practice at Arthur D. Little. Dr. Glaser was the founding chairman of the College of Healthcare Information Management Executives (CHIME) and is past president of the Healthcare Information and Management Systems Society (HIMSS). He was the founding co-chair of the Affiliated Health Information Networks of New England, is a member

of the advisory board of Counterpart Capital, and a fellow of HIMSS and CHIME and a member of the American College of Medical Informatics. Dr. Glaser has been awarded the John Gall award for health care CIO of the year. Partners Healthcare has received several industry awards for its effective and innovative use of information technology. Dr. Glaser has been a member of National Academy of Sciences studies on the role of the Internet in health care and health care confidentiality and security. He is on the editorial boards of *CIO Magazine*, *Healthcare Informatics* and *Topics in Health Information Management*. He has published over fifty articles and a book on the strategic application of information technology in health care. He holds a Ph.D. in Healthcare Information Systems from the University of Minnesota.

Andrew Vaz

Vice President

*National Health e-Commerce Practice
Cap Gemini Ernst & Young U.S., LLC*

Mr. Vaz is vice president managing the National Health eCommerce practice for Cap Gemini Ernst & Young U.S., LLC. He leads the development of the firm's methodology and intellectual capital in the areas of e-Commerce and business strategy for both the provider and payor sectors. Mr. Vaz also holds responsibility for the firm's health care "dot com" practice and health new ventures initiatives. Prior to his current role, he was the managing partner of Ernst & Young's Northeast U.S. health practice and the national director of the Canadian health care practice. Mr. Vaz's consulting career has spanned strategy and business planning, business transformation and the

management of change. His client base has included academic medical centers, large integrated delivery systems, managed care companies and most recently, “dot coms” in the health care space. He has successfully led the development of e-Commerce strategies for world class health organizations, enterprise wide business transformation and re-engineering of academic medical centers in Canada and the U.S., facilitated numerous mergers and joint ventures, and developed leading edge strategies for organizations in the provider, payor and life sciences sectors.



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