HEALTH CARE

Health Care Industry Study

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ABSTRACT

Health care expenditures in the U.S. totaled $1.3 trillion in the year 2000, and spending could reach $2.8 trillion, or 17% of the nation's gross domestic product (GDP), by 2011, up from 13.2% of GDP in 2000.[1] In addition, the greatest stress will come as baby boomers increasingly join the ranks of the "elderly" after 2011. From a resource perspective, health care is one of the largest U.S. industries, employing approximately 14 million people. The U.S. health care industry promotes national security by enhancing the quality of human life through use of technology, improved nutrition, disease containment/reduction, education, and research and development. Also, in the aftermath of the 2001 terrorist strikes, there is increased focus on public health monitoring and consequence management across the health care spectrum.

Providing the right care, at the right time, in the right place, and in a cost efficient manner has an enormous impact on the state of the industry. The primary instruments of national power, information, diplomatic, military, and economic, frame the ability of the U.S. health care industry to remain viable and assure national security. In the information arena, ~$350 billion is spent on information technology (IT) to capture, store, process, and retrieve information relating to patient records, cost accounting, and insurance claims.[2] Moreover, IT has the potential to deliver improved medical care at lower cost, with fewer errors. IT can also serve as the mechanism for delivering health information to consumers on line, and relaying real-time clinical information to physicians and other health care practitioners. But, the widespread use of IT throughout the health care industry also entails significant social and security concerns. On the diplomatic and military fronts, real and perceived strength greatly determine the ability to project power and influence world events. As a tool of diplomacy, U.S. health care accrues political goodwill by exporting health services and humanitarian assistance. Militarily, the failure to mobilize and field a healthy workforce could negatively impact our ability to project force and form alliances, hence compromising national security. Furthermore, a strong military force requires a healthy population from which to draw potential recruits. Economically, building and maintaining a strong and vibrant economy requires good health. And the synergistic effects of globalization mean good health throughout the world is essential to the well being of all nations. Consequently, enhancing U.S. national security interests and ensuring our continued prosperity call for advancing health care at home and promoting a quality worldwide health standard.

Ultimately, although the U.S. health care system is arguably the world's best (for those who can pay), sound policies are necessary to ensure increased access and quality, while constraining costs. Unfortunately, the U.S. does not have an overarching health care national strategy. The overarching policies suggested herein seek to enable the nation to achieve the optimal balance among cost, quality, and access to assure the best health for our people and therefore ensure our national security.

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International

Punic Port and Carthage Museum, Tunis, Tunisia

Tunisian Ministry of Public Health, Tunis, Tunisia

Charles Nicole Public Hospital, Tunis, Tunisia

Polyclinic Berges du Lac, Tunis, Tunisia

Bardo Museum, Tunis, Tunisia

Saloul University Hospital, Saloul, Tunisia

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Tunisian Military Medical Department, Tunis, Tunisia

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Central Medical Laboratories, Tunis, Tunisia

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International Committee of the Red Cross, Geneva, Switzerland

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World Health Assembly Plenary Session, Geneva, Switzerland

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INTRODUCTION

National health is a critical component of national security. Health care expenditures in the U.S. totaled $1.3 trillion in the year 2000, accounting for over 13% of Gross Domestic Product (GDP), and costs could reach $2.8 trillion by 2011.[3] While the U.S. spends far more per capita on health care than any other nation, many developed countries out-perform the U.S. in terms of life expectancy, infant mortality, and other health indicators. Hence, obvious questions about return on investment ensue. Additionally, the phenomenon of globalization has resulted in the movement of millions of people across international borders and increased interdependence among nations. Thus, international health issues, diseases, and health risks also become our concerns.

The U.S. Health Care Industry comprises a broad range of disciplines. It includes hospitals, clinics, insurance providers, professionals such as physicians, nurses, pharmacists, dentists, psychiatrists, and numerous other technical staff who provide assistance and patient care for diverse health related issues. Health care is indeed a basic human need of every American, and the aforementioned are essential to ensuring safety and quality in our nation's health care facilities. The present assessment discusses health care using four distinct categories:

1. Major Issues Affecting the Health Care Industry
2. Challenges to Providing Quality Care
3. Trends and Forecasts
4. Policy Initiatives

The discussion below addresses the critical instruments of national power mentioned above, which ultimately support U.S. national interests, fostering a strong workforce, vibrant economy, and global influence to promote worldwide peace and prosperity. Moreover, the impact on delivery of quality care in an environment fraught with threats of chemical and biological terrorism receives special attention. The recommendations seek to exploit the promise of new and intellectually challenging work, a great potential for medical breakthroughs in technology, improved medical care, workforce viability and policy initiatives, to in turn promote innovation, enhanced quality and access, and long-term cost reductions. Overall, since the United States lacks a viable and comprehensive health care strategy, policy recommendations highlight the need for

focus in this area. Ultimately, industry, government, and academic leaders must continually discuss strategies that will lead to improved care for all and transform the nation's health care delivery system into a world-class model.

MAJOR ISSUES AFFECTING HEALTH CARE INDUSTRY

The health of a nation's population (workforce) directly impacts the health of its economy, and a nation's stability and security depends on a healthy economy. Beyond our borders, stopping the spread of disease, especially in the developing world, is critical to ensuring regional stability. The attacks of September 11 and the subsequent anthrax contaminated letters showed the critical role of the health care industry in countering any strike, especially an attack using weapons of mass destruction. But, critical issues drive our ability to develop and maintain the capability necessary to provide high quality health care both in normal circumstances and during times of crises. The discussion below explores implications of key issues of managing cost, quality, and access, information management, bioterrorism and preparedness to handle mass casualty, and workforce concerns. The subsequent section addresses challenges and opportunities associated with these issues.

Managing Cost, Quality, and Access Issues

The competition among cost, quality, and access fuels the major tension that exists in the U.S. health care industry. For health care professionals and consumers, maintaining affordable, accessible, and high quality health care available at the point of use is of paramount concern. A number of challenges come to play in efforts to provide quality health care without regard to socioeconomic boundaries.

Federal, state, and local governments and private health insurance companies paid 84% of health care 1999 expenditures, while consumers paid 16% of these costs as out-of-pocket expenses.[4] More than 41 million Americans reported problems getting medical care in 2001, and nearly two-thirds cited cost as the reason. Perhaps most troubling, the "access gap" is up almost 2% from the 1997 rate of 13.5 percent.[5] So, for many health care consumers, the ability to pay weighs heavily in their decision to seek timely and appropriate levels of care, and access to the providers and technology necessary to ensure good health.

A shift to outpatient care and rising health care costs have taken a toll on hospitals; the number of hospitals in the U.S. has dropped in the last 20 years. Private hospitals decreased from 4,052 to 3,759 between 1980 and 1999. Meanwhile, the number of public hospitals nationwide dropped 33% during the same period, from 1,778 to 1,197. For the last five years, the rate of hospital closure or conversion has remained relatively constant, at roughly 2-5%.[6] While the health care industry is projected to exceed 15 % of GDP by 2005, individual hospitals face tremendous challenges to balance staffing, equipment, re-capitalization, and other costs, even as they deal with inadequate payment rates for hospital care by many managed care organizations.[7] Ultimately, the

impact of these closures is reduced capacity and hence potentially impeded access in the event of a catastrophic national emergency.

Information Management Issues

Information technology offers tremendous opportunity as well as growing challenges for the health care industry. Great potential exists to apply information systems beyond administrative functions, with particular emphasis on clinical applications. And, due to the exponential growth and capabilities of information systems, health care leaders and practitioners must take a strategic and longitudinal view to invest, prepare for, and shape the future.[8]

Perhaps the greatest area of both promise and controversy for information technology rests in research, development, and application of biometric, genomic, and other emerging medical innovations driven by information technology. The issues surrounding these fields, however, are fraught with social and ethical concerns, moral dimensions, and uncertainty. But, ultimately, there is great potential to fundamentally contribute to prevention and disease management. Essays included at the end of this paper address these issues more fully.

Post 9/11 Bio-terrorism and Mass Casualties Concerns

In the wake of the terrorist strikes of 9/11 and the ensuing anthrax attacks on the east coast, the American public gained an appreciation for the potential risks and challenges posed by a bio-terrorist event. Related to this, hospitals and health care practitioners are taking steps to understand and increase preparedness to manage mass casualty event response. Some hospitals are developing robust contingency response plans that consider isolation, containment, and decontamination scenarios.

In the post 9/11 environment there are additional issues that bear discussion. For instance, in a bio-terror attack or infectious outbreak, how will health care professionals attend to their family and life responsibilities if they are unable to go home? And, what if one of their family members becomes ill? These issues are especially worrisome for single parents employed in the health care community. For hospital administrators, they also represent a new problem set to anticipate and manage.

Health care professionals and public health officials must balance preventive measures and consequence management in a risk management construct. Essay #1 below further explores these topics.

Workforce Concerns

At present, there are strong indicators the medical workforce will not be positioned to keep pace with growing health care demands caused by: 1) aging baby boomers, 2) recruitment and retention problems within key health care disciplines, and 3) projected retirements of health care professionals within the next decade.

To illustrate, a recent survey of American Hospital Association (AHA) members found that of 168,000 vacant hospital positions, 126,000, or 75% are for registered nurses (RNs). Overall enrollment in basic RN programs has declined by over 50,000, or 22%, since 1993.[9] Based on current trends, if nursing school enrollments do not increase in the short term, by 2020 the U.S. will experience a shortfall of more than one million nurses.

Workforce shortfalls also exist in pharmaceutical, radiological and technical support disciplines. Collectively, these shortages can equate to decreased access to care and limited surge capacity, as some hospitals have reduced the number of inpatient beds available.[10] Recruitment and retention dramatically affect the health care resource horizon. The first challenge is to increase respect and appreciation for a career in the health care industry.

HEALTH CARE CHALLENGES AND OPPORTUNITIES

The diplomatic, economic, military, and informational instruments of national power frame the challenges of, and opportunities for, providing quality health care. On diplomatic fronts, others' perceptions of our strength, endurance, values, and conformity to the fundamental principles of our republic limit our ability to exert influence. It is reasonable to assume that international observers carefully consider perceived or real inequities of quality and/or access of health care within the U.S. population. These perceptions may either improve or degrade our power to maintain the requisite moral high ground regarding human rights, and hence influence world behavior and foster responsible governance.

Uninsured

In 2000, the private work force employed 118.2 million workers, with 68 million jobs in small businesses.[11] Because of the high cost of employer sponsored health care plans, the latter group tends to have a greater incidence of inadequate or no health care insurance. Currently, about 16% of Americans (around 45 million people) are without health care coverage.[12] Our uninsured population is exceptionally high and draws much criticism among developed nations, the vast majority of whom have socialized health care programs providing some minimum level of care for all citizens. Also, the magnitude of our uninsured population arguably contributes to the United States' relatively low health statistics when compared to other developed nations.

World View

During a joint press conference with President Toledo of Peru on March 23, 2002, President Bush proclaimed, "education, jobs, and health care are the greatest remedies to poverty and hopelessness." It is clearly in our national interest to promote international prosperity, and improved health care is a linchpin in that endeavor.

America has made great strides over the past two decades in the development of efficient ambulatory care - clearly an excellent tool of diplomacy. Ambulatory care involves many services of growing need in developing countries: immunizations, HIV prevention programs, prenatal care, and basic pediatric care. Such "know how" is exportable via teaching teams, distance learning, and telemedicine. These ambulatory care methods are relatively low-cost with high-value, and yield very positive patient outcome measures. Perhaps more importantly, these actions are not politically polarizing and will not necessitate an extreme expenditure of political capital.

Information Management

Information technology has helped improve both the quality of, and access to, care since the early 1990s. The computer-based patient record is an e-tool that is a repository for all demographic and health care data on patients. These data allow health care providers to run more efficient practices and enable doctors to improve treatment regimens through a process called "evidence-based medicine."

Information technology is also improving patient access to care. Already systems exist that allow patients with chronic illnesses such as diabetes and high blood pressure to "visit" their doctors "on-line" while in the comfort and privacy of their own homes. Indeed, the home may become the dominant site for health care delivery during the first two decades of the 21st century. Intranet and extranet systems are also playing an ever-increasing role in reducing both the cost and inefficiency of administrative overhead in the health care industry. An estimated 20-25% of every dollar spent on health care in the U.S. today goes to paper-heavy administrative costs such as purchasing, patient billing, insurance verification, and medical record keeping. The same transactions performed electronically through business automation and e-commerce are estimated to cost only 5 cents of every dollar. Such a reduction in administrative overhead can save the nation more than $200 billion annually. To illustrate the magnitude of this potential savings, $200 billion would be enough to cover the cost of insuring ALL of the nation's ~50 million uninsured[13] individuals immediately.

Unfortunately, the industry has not fully implemented information technologies. High up front costs and the relatively long time it takes to realize true savings has led to very poor physician buy-in nationwide. In fact, only about 5% of doctors in private practice use web-based systems in their daily practice to help them manage their patients.

Moreover, consumers and patients also have issues with information technologies. Chief among these are concerns about personal privacy and medical confidentiality. Information security, integrity and assurance have become major unresolved political issues for the nation. One effort to standardize electronic patient information and provide for its security is the Congressional legislation of 1996 called the Health Insurance Portability and Accountability Act (HIPAA). The legislation mandates Administrative Simplification and Public Key Infrastructure to standardize and secure electronic information. One of the essays below further explores this important first step to insure the security and integrity of online information.

The Military Health Service System (MHSS) 2020 Project was an active attempt to define where we are and where we are going in the delivery of military health care. Its continuum starts at the training base, crosses individual peacetime care for service members and their families, and extends into operations other than war and care in war zones. The goal of the project was to envision tomorrow's needs in an effort to properly structure current resources. General Gordon Sullivan highlighted this process when he asked, "Who would have thought our deployments now lead with water purification, medical resources, and some military police?"[14] The realization that health care will be the tip of the spear in many operations necessitates a modification in our approach to resourcing and structuring military health care. Prevention, early detection of illness, genomic procedures, pharmaceuticals, and telemedicine will be prominent features of the Military Health System (MHS) of the future.

The requirement to serve geographically dispersed populations, including family members and retirees, has resulted in Department of Defense (DoD) health care budget hikes, growing at a rate that exceeded all other defense programs. The MHS turned to a health maintenance organization (HMO) model - TRICARE - to help contain costs. Full implementation of TRICARE occurred in 1999; the jury is still out on whether the TRICARE model will stem the growth rate of DoD health care costs.

Finally, health care cost escalation is a brake on our economic engine. Rising health care costs put American companies at a competitive disadvantage in global markets. Health care costs in Canada, Europe, and Japan are between 25-50% less than in America.[15] Hopes that managed care models would cap the rise of health care spending are evaporating as managed care premiums have begun to rise by 6-8% per year.[16]

TRENDS AND FORECASTS

Change in the health care industry does not occur in a vacuum. The forces that affect health care are also at work in the broader domains of economics, politics and society. And, ultimately, the forces of technology may prove to have the most significant impact. Changes in worldwide health trends and population demographics, the impact of global terrorism, health care cost, access, and quality trends, and the proliferation of new technologies will arguably transform health care over the next two decades. Proactively leveraging the benefits of positive trends (i.e., new technology, increased use of information systems), while mitigating adverse consequences, is critical to preserve national security.

Lifestyle trends of the last two decades in the U.S., as well as throughout much of the developed world, have driven health trends. Unhealthy dietary habits are linked to high blood pressure and cholesterol. They become even more dangerous when combined with tobacco use and excessive alcohol consumption. Overall, America is becoming overfed and under nourished. Less that 50% of the population obtains sufficient physical activity to maintain a healthy lifestyle. As a result, non-communicable disease such as

heart disease, stroke, diabetes, and cancer are prevalent throughout society. And, these trends are notably evident in our children and young adults. Moreover, as the world's underdeveloped nations progress toward "development," some of these issues are also affecting their populations.

The aging of the U.S. population is an urgent concern in our health care delivery system. As the baby-boomer generation (those born between 1946 and 1964) ages and the pool of retirees increases exponentially, a period of great change in elder care looms. The median age of the U.S. population has been steadily rising. In 1900, one American in 25 was 65 or over. By the year 2050, that figure will increase to one in five. The U.S. Census Bureau projects that the over-65 population will more than double between 2000 and 2050.[17] The proportion of "oldest-old" Americans, those 85 and over, will grow even more rapidly, quadrupling over the same period. By the year 2020, the ratio of over-65 individuals to the working age adult population will be about one to four. At current utilization rates, persons age 65 years and older (12% of the population) account for more than one third of the total U.S. health care expenditures. Also, this population represents 31% of all hospital discharges, 42% of hospital days, 20% of all physician contacts, and most nursing home beds.[18]

On a global scale the burden of communicable/infectious disease is the biggest killer of the young. Such disease accounts for more than 13 million deaths annually, and most deaths occur in the developing world. But, given globalization, infectious disease is not just a developing country problem. Unless checked, the crisis threatens industrialized countries as well. As important as communicable disease is to affecting global health, non-communicable disease conditions account for 59% of the world's deaths. And non-communicable disease is no longer the purview of industrialized nations; it is becoming more prevalent in the developing world.

Finally, trends in the iron triangle of cost, quality, and access show the U.S. health care industry is "sick." And the industry will get sicker without the right prescription for change. Without the correct medicine, or perhaps without major surgery over the next several years, we project costs will continue to spiral out of control. Unfortunately, an accompanying decrease in access and little improvement in the quality of care and the overall health of the nation will result. The lack of good health, whether from communicable or non-communicable diseases, is a key element that contributes to the vicious cycle of despair and poverty. If left unchecked, we predict poor global health will engender unrest, violence, and political instability.

The policy initiatives recommended below seek to reverse the negative trends discussed above and promote quality health care and overall improved health.

POLICY INITIATIVES

The U.S. does not presently have a carefully formulated and executable national health care strategy. In our opinion, ensuring national security requires devising and implementing such a strategy. Direction and motivation must come from the President. Since the federal government is the single largest payer in the industry, the Department of

Health & Human Services is the appropriate executive agent, but all key stakeholders in the industry, including consumers and providers must be involved in creating the strategy. And, to avoid the fate that befell the early 1990s Clinton Health Plan, Congress must engage with the strategy. Such engagement provides political top-cover, fosters debate, and ensures legislation and suitable appropriation of resources.

Our national health care strategy must reverse the negative trends in the health care "iron triangle," and attempt to increase access and quality of health care while keeping cost increases down through increased efficiency and a focus on wellness. Among the many issues that must be addressed in the strategy, the following should have priority:

- Universal Access to Medically Necessary Care (Improve Access)
- National Focus on Wellness & Prevention (Healthy Lifestyles)
- Preparing for an Aging Population
- Engagement in Global Health
- Preparedness for Mass Casualties & Disease Outbreaks

Universal Access to Medically Necessary Care

To serve the best interest of the nation and its long-term security, the time has come for the U.S. to provide access to, and coverage for, medically necessary services for all its people. Medically necessary services include preventive services such as childhood vaccinations; quality pre-natal heath care; breast, colon, and prostate cancer screening and treatment; and other like services. Similarly, access to high quality primary care services is a must. Although this will entail significant up-front costs, there will be ample return on our investment in the long term, as the nation builds a healthier population that is more productive and consumes fewer health care resources per capita. Federal programs like Medicare and Medicaid are not the optimal answer to affordable coverage; a competitive market is better equipped to handle the rising costs of health care. Today, the private market has several disincentives that limit consumer choice. By legislating careful market reforms and creating incentives such as tax credits and flexible medical savings accounts, we can place greater choice back into the hands of consumers.

Implementing market reforms will enhance consumer choice and hopefully shift the burden of health care costs from government programs to private insurance coverage. This would provide needed funds for other government spending priorities and also stimulate the private market economy.

National Focus on Wellness

Two primary areas should focus our country's ability to stabilize and reverse our poor health trends and start us on the path to recovery. First, we need an information campaign directed at assisting Americans, particularly children, to make healthy choices both in eating and regular physical activity.

A second initiative would be to educate our population in an effort to change the perception of obesity. The primary concern should be one of health and not appearance. Moreover, health care providers need training in methods to prevent and treat obesity and unhealthy body images across the lifespan of their patients. Once again, this initiative should target the early health habits of our children. And ultimately, our policies should offer incentives for healthy behaviors and consequences for proven unhealthy ones.

Preparing For An Aging Population

A recent survey by the American Health Care Association found that 68% of baby boomers are not financially prepared for long-term care should they need it later in life. To avert the looming long-term care crisis, the government and the industry should form a partnership to explore and market ways to provide affordable long-term care insurance. In addition, the health care industry should experiment with new paradigms that facilitate home care of the elderly.

Global Health Solutions

Today's global economy does not allow our nation to ignore the challenges that face the international community. The spread of infectious disease and the economic impact of poor health know no borders. In conjunction with the international community and the World Health Organization, U.S. policy should focus on decreasing the incidence of communicable and non-communicable diseases throughout the world.

One-third of the world's population lives in abject poverty. These people face the threats of communicable and non-communicable disease with little to no health care infrastructure support. Good health creates wealth for nations, by providing a viable workforce. Conversely, poverty and illness spawn hopelessness, promoting political instability and fertile ground for terrorist groups.

Preparedness for Mass Casualties

The U.S. must foster increased education and training to ensure all responders in a disaster have the necessary skills. Moreover, we need to develop cost effective solutions to rapidly increase manpower and bed space during a mass casualty. Maintaining a trained and certified pool of retired and semi-retired health care professionals such as nurses, doctors and emergency medical technicians could fill the temporary manpower gap during a crisis. With sound planning and minimal modification, existing buildings like gymnasia and auditoriums could provide treatment space for minimally sick or injured patients, freeing hospital bed space for more seriously ill victims. Finally, it is essential that all involved governmental agencies respond through an integrated system that also exploits the resources of the private sector.

ESSAYS

This section comprises two essays covering significant issues affecting the health care industry. A third essay addresses technology and the future of health care.

Essay 1: The Health Care Preparedness Challenge - Post 9/11

By Mrs. Jennifer Carmichael, Defense Intelligence Agency

"Mass casualty incidents, by definition, overwhelm the resources of individual hospitals. They may overwhelm the resources of a community's entire health care system…The minimum components of an effective (mass casualty incident) response will involve public health, hospitals, physicians, community emergency management officials and "traditional" first responder organizations – fire, police, and emergency medical services."

--Rosalyn Schulman, Senior Associate Director for Health Policy
American Hospital Association (AHA), 26 February 2002[19]

In light of the post 9/11 environment, there are several issues that could prove critical in an emergency response situation with large-scale casualties: Is the U.S.' public health and emergency response system positioned to effectively respond to crisis and contingency demands and mass casualty requirements? What are the perceived risks and threats? And, what steps should the US take to mitigate risk and prepare for contingencies?

The Framework for Response

Within the U.S., the Federal Emergency Management Agency (FEMA) is charged to provide leadership for general disaster contingency planning, working alongside 27 Federal departments and agencies, including the American Red Cross, to assist state and local government in coping with disasters. The Federal Response Plan (FRP) provides direction for disaster response and includes emergency support plans for mass care and health and medical services.[20] Essentially, the federal response system distinguishes between public health, first responders – police, fire, and emergency medical technicians, and health care and pharmaceutical professionals.

Threats and Risks

In light of the war on terrorism and ongoing U.S. military engagement, adversaries could target U.S. interests for retaliatory action, which would require a significant response by the health care and emergency response community. In testimony before the Senate Armed Services Committee, 19 March 2002, Mr. George Tenet, Director of Central Intelligence (DCI) discussed converging dangers to the U.S. in a post 9/11 world. Mr. Tenet reported that one of the intelligence community's highest concerns is Al Qa'ida's stated readiness to attempt unconventional attacks against the U.S. Mr. Tenet asserted that Bin Ladin was pursuing a sophisticated biological weapons research program.[21] The news media continues to report on emerging threats and

potential targets of opportunity. Overall, the U.S. faces increased risk of chemical and/or biological warfare both now and in the future. Given current conditions, the global environment and potential threats, the U.S. must responsibly prepare for consequence management for mass casualties and the associated large-scale medical service requirements that would result.

Since May 2000, two key exercises have simulated outbreaks and the resulting containment efforts. By the end of the third day of the TOP OFF exercise, 3,060 U.S. and international patients were infected with pneumonic plague after it was introduced in Colorado. In that time, the infection spread to London, England and Tokyo, Japan.[22] Similarly, in June 2001, DARK WINTER simulated a deliberate introduction of small pox in three U.S. states. The exercise occurred over a 13-day game period. By the end of the game, the disease had spread to 25 states and 15 other countries and had overwhelmed the U.S. emergency response system.[23]

The Health Care Preparedness Challenge

In the midst of the anthrax attacks experienced in the fall of 2001, the AHA estimated it could cost about $10 billion to prepare the nation's hospitals to respond to a bio-terrorism attack. (The AHA represents approximately 85% of the nation's hospitals.) Infection control measures, such as isolation and de-contamination, were among the most serious deficiencies. There are additional realities and constraints within the health care industry that could dramatically impact emergency response and surge capacity within the existing U.S. health care system. These include:

- Ability to respond to a bio-terrorism attack is essential, hence ensuring timely response, accurate diagnosis, quick containment, and mitigation. Notably, response to a natural emergency like the 1918 flu pandemic could also overwhelm the health care system.
- Reduced hospital bed and surge capacity in both private and public hospitals.
- Increased regulatory and national preparedness requirements on hospitals.
- Need to invest in physical plant improvements, even as fiscal solvency declines.
- Growing concerns about workforce shortages in nursing and other key disciplines.
- The need for improved real-time and secure links among public health, emergency medical response personnel, hospitals, and health care professionals. Building linkages and partnerships in advance of crisis and contingency response will increase likelihood of efficient and optimum outcomes. Information technology must be used to its best advantage.
- The need to effectively train and prepare health professionals to handle disaster response scenarios. We must equip health care practitioners for proper diagnosis and plan to remove and contain the sick and exposed populace, in the event of a mass casualty, infectious outbreak. The adage, "hope for the best, but plan for the worst" comes to mind.
- Having a policy and strategy for providing the general public accurate, timely and sufficient information to reduce fear and anxiety, and to contain and mitigate risk.

Summary

Terrorist incident response in the U.S. has not traditionally involved overwhelming casualties, so we must ensure our existing first response system, public health departments, and hospitals and medical professionals are equipped to effectively handle mass casualties. Further, as the health care industry grapples with these issues, it is imperative that the industry and key government policy and decision makers work collaboratively to bring issues to light and work toward resolution, and legislative intervention where necessary, balancing risk with the need to maintain and sustain an adequate level of preparedness.

Essay 2: Medical Record Privacy
By Mrs. Sherry Richardson, U.S. Coast Guard

Medical record privacy entails ensuring individual awareness on processes to collect, maintain, and disseminate personal data. While the Health Insurance Portability and Accountability Act (P.L. 104-191, HIPAA) was passed to provide continuous insurance for workers who change jobs, a major component focuses on Administrative Simplification (AS), which mandates privacy and security of medical records transmitted electronically. The AS elements of HIPAA were implemented to reduce the costs and administrative burdens of health care by making possible standardized, electronic transmission of many administrative and financial transactions carried out manually on paper.[24] The AS process directs standards for implementation of privacy, security, electronic signatures, unique identifiers, and electronic health care transactions. The Act provides for the creation of a national electronic transfer system for personal health care data.[25]

Prior to the 1990s, there was no compelling need for such a system. However, as the 21st century unfolds, technological developments increasingly facilitate global sharing of information. These developments are the harbinger of enormous change and significant transformation to come, enhancing the need for medical record privacy which is by far the most important issue confronting health care communication via the Internet. No aspect of society has benefited more from technology over the last decade than the health care industry where there have been extraordinary breakthroughs in computing, communication, surgery, drug therapies, diagnostics and medical instrumentation. Yet, ensuring the security and personal privacy of information processed over our networks still remain a major concern for 82% of our population.[26] Incidences of unsecured fax and e-mail transmissions containing individual's private and confidential health information flowing freely among doctors, patients, pharmacists, pharmaceutical companies, insurance companies, lawyers, employers, marketers, and commercial companies heightens this concern.[27] Clearly, there is nothing more intimate than a person's health, and with the rampant growth of electronic transmission of data, a patients' desire for confidentiality of their most personal information, their medical history, will continue. Individuals are protective about most aspects of their health from weight, to illnesses, to prescriptions, to payment practices. While manual records are sometimes lost, misplaced or even viewed by others, the use of the Internet and

implementation of e-health care practices (the use of multimedia Internet or Extranet based technology for improved patient care and health care operations across dimensions of content, connectivity, e-commerce and e-care)[28] has exponentially increased access to medical records. The Internet provides global access to anyone, anywhere in the world thus, compromising an individual's right to privacy when no information systems security controls are in place. The number of health care professionals and others too numerous to name with access to medical records is unwieldy and raises concern regarding potential misuse of information and adequacy of security.

The concerns above drive the need for AS, and Public Key Infrastructure (PKI), also mandated by HIPAA, to ensure security and privacy standards for an individual's medical record when electronically maintained or transmitted. PKI is a means of ensuring information infrastructures are secure, protecting data stored, transmitted, or processed on them. Moreover, it has tremendous potential for organizing, collecting, transmitting and retrieving information. It promotes confidentiality (privacy), integrity (protection from unauthorized modification), authentication (verification, much like a fingerprint), and non-repudiation (undeniable proof of participation in an e-transaction). This technology meets the guidelines of HIPAA and is the only mature technology available today to meet digital signature standards. Compliance with these standards is critical to medical record privacy, as it provides secure on-line transactions citizens so overwhelmingly demand. PKI also serves as the tool to protect proprietary, financial, legal, and myriad other data requiring security and privacy controls. Agencies such as DoD, Veteran's Administration, Social Security Administration and General Services Administration, among others, use PKI for transmission and sharing of sensitive information.

The increased globalization of our networks, and the transparent interconnectivity that PKI offers is an essential weapon in our critical infrastructure protection arsenal. Following 9/11, there was heightened awareness regarding the importance of information assurance. Assessing vulnerabilities and mitigating risks regarding security breaches is paramount, as we have seen how terrorists use the Internet to gather and share information. Consequently, our national security strategy must reflect a framework fostering security of every network. Vulnerability in one network can have a domino effect, negatively impacting the security of the U.S. HIPAA has taken the necessary measures to secure and protect a patients' privacy. The infrastructure mandated by HIPAA enhances security and privacy, without limiting the ability to communicate or under-pin future economic competitiveness and military power. In fact, PKI technology ensures cooperation and coordination in communications. It is the mechanism that is promoting transformation and customer-centric integrated infrastructures. E-health care and communications of the future are dependent on this technology for enhancement of information assurance and operational effectiveness. Such transactions will require security improvements that enhance end-to-end protection of data. The PKI of today will serve as the bridge that connects current technology with tomorrow's electronic innovations. Information technology has shifted the paradigm from trying to keep hackers out, to assisting legitimate users with their need for remote access; moving

information in and out of the network and over the web has become the new business model.

Summary

Thanks to the passage of such laws as HIPAA, which established standards for health care providers to implement PKI and securely store, transmit, and access medical records electronically, the future protections of such data is promising. Technology will serve as the focal point to future innovations as we transform health systems, but information will be the key to how we address prevention, identification and treatment. Technology is our future; how we manage information will determine our success both in the business and delivery of health care services.

Essay 3: Technology and the Future of Health Care
By Dr. Lourdes Maurice, Department of the Air Force

The time lag between science fiction's prophecy and the realities enabled by new health care technologies is arguably shrinking. Hence, policy makers must probe further into the future and examine the long-term potential economic, security, and ethical implications of new health care breakthroughs.

Health Care Research and Development

From an economic perspective, the North American Industry Classification System (NAICS) does not categorize Research and Development (R&D) as part of the Health Care and Social Assistance industrial sector.[29] Nevertheless, R&D is an intrinsic component of the healthcare industry and examining the impact of technology innovations on healthcare is important to the U.S. and its Department of Defense (DoD) at both the tactical and strategic levels. In a recent survey, the National Science Foundation (NSF) found the top 500 R&D-spending corporations in the U.S. invested a total of $111 billion in R&D. [30] The $20 billion expenditures by the medical substances and devices sector (18%) were only second to the information and electronics sector ($45.8 billion). The portion of information and electronics corporate R&D investment devoted to healthcare applications was not accounted separately, but is debatably substantial. Moreover, the medical substances and devices sector had the highest R&D intensity (R&D to sales) ratio at nearly 12%.

Federal R&D investment, supported in fiscal year 2002 at a record 104 billion,[31] is primarily responsible for funding fundamental scientific investigations that have long-term, high payoff potential in a number of fields. Such research often is the basis for breakthroughs in diagnosing, treating, and preventing disease. Federal research dollars also support training programs to develop future researchers. Other Federal fundamental research investments often catalyze breakthroughs in health care. Basic science has helped abate threats to public health, increase life expectancy, and improve quality of life.

What are the potential impacts of today's significant R&D investments on the future of health care? Predictably, the confluence of breakthroughs in biotechnology, information technology and computing, and nanotechnology has the potential to transform health care.

A Convergence of Technologies

Human genetic research has been underway for about 50 years.[32] In 1986, researchers undertook a massive multi billion-dollar effort to map all genes found in human deoxyribonucleic acid (DNA), the Human Genome Project.[33] Aided by increasingly enhanced computer performance, researchers from the International Human Genome Project reported on their analysis of a substantially complete human genome sequence and scientists from Celera Genomics published a similarly complete sequence. Understanding the human genome sequence is leading to a better understanding of disease at a molecular level. Ongoing research could lead to new treatments such as improved drugs and genetic therapies to counter bioterrorism and tackle complex diseases such as cancer and Alzheimer's disease.[34]

The proliferation of biological data necessitates technology to read, access, and store the data to make it useful. Numerous companies with bioinformatics expertise offer services resulting from the sequencing of the human genome and other scientific breakthroughs. Advances allow for powerful computational capabilities to occur within research laboratories, storage of complex human genetic information, and the manipulation of very large-scale information sets. And this merging of biotechnology and information technology promises to continue accelerating the rate of advances in genetics and other related fields.[35]

Releasing the computing power of individual molecules could have a tremendous impact on health care administrative technologies. Powerful new computers could make useful voice recognition, translation, and powerful databases available to health care practitioners.

Nanotechnology could allow building complex molecular machines and computer controlled molecular tools much smaller than a human cell.[36] Sensors smaller than a cell could diagnose disease at much earlier stages, reverse disease, repair or re-grow human tissues, and possibly enhance human performance.[37] Admittedly, experts believe that even if all diseases were conquered, human life span would remain fixed at 125 years.[38] However, combining "nano, bio, and info" to create a bionic human could conceivably break the life span barrier.[39] Eventually, technology might even enable scientists to create science fiction's silicon based life forms.

Perhaps the greatest health care revolution of the 21st century will arise because the junction of terrorist threats and societal expectations with technology breakthroughs will refocus health care on preventive measures.[40] Ultimately, mustering public support could focus health care R&D breakthroughs on meeting public health needs and lowering health care costs.[41]

Policy Implications of Health Care R&D Breakthroughs

A revolution in computer power brought about by molecular circuitry has the potential to significantly enhance healthcare through enhanced performance and efficacy. However, could more integrated and efficient computerized clinical data repositories and medical records make today's confidentiality and integrity concerns[42] seem trivial by comparison? Will computer advances coupled with artificial intelligence make future healthcare "providers" increasingly silicon based? How will medical professionals, already somewhat bypassed by access to information and treatments the Internet already affords patients, react? And the vulnerabilities posed by an increasingly computer dependent healthcare system are ultimately of most concern to national security.

Genomics could have tremendous implications for society. But, although the information has the potential to dramatically improve human health, it also raises a number of complex ethical, legal, and social issues. The NIH's National Human Genome Research Institute (NHGRI) devotes 5% of its budget to the Ethical, Legal and Social Implications (ELSI) Program.[43] ELSI offers a new approach to scientific research by identifying, analyzing, and addressing ethical, legal, and social implications of human genetics concurrently with the scientific research. In this way, identifying problems areas and devising solutions precedes integrating new scientific information into health care practices.

Advances in pharmaceuticals, nanotechnology, preventive measures, and bionics promise to help us live longer and healthier. But, for the most part, new technologies have helped fuel rising healthcare costs.[44] This is hardly a surprising finding, given that healthcare R&D focuses on enhanced performance versus overall effectiveness as measured by benefit divided by cost.[45,46] How can differences in access to technology be bridged, and the divide between "haves" and "have nots"[47] mitigated without derailing innovation?

Ultimately, what is the future of healthcare R&D? Rita Colwell points out that the mix of Federal research funding across the different fields of science and engineering should be a cause for concern for policymakers.[48] The mix has changed significantly since 1970 - primarily via gains in biomedical fields and declines in the physical sciences and engineering. Undoubtedly tremendous benefits result from R&D investment in life and biomedical sciences. But, biology and medicine are highly dependent on other fields of science. Clearly, addressing the relative balance of Federal R&D investment is critical to the future of health care.

R&D Policy Recommendations

Ultimately, technology breakthroughs have always generally bettered society. Our policies must seek to foster health care R&D. But, we should cautiously shape health care R&D policy to foster debate, mitigate accidents, prevent abuses, and ensure security. A national program shaped like ELSI to debate ethical, legal, and social

implications of new health care advances while they are in their developmental phase. Medical information privacy issues are also important. However, rather than curtailing use, we should leverage increasingly intelligent and powerful computer technology to protect information.

Dealing with rising healthcare costs spurred by technology does require directive policy. While conquering complex diseases and bioterrorist threats must remain a goal, we should direct Federal R&D dollars toward producing more cost effective treatments that can be extended to a larger percentage of our populace. And we should capitalize on the mobilization brought about by the anthrax scare to direct R&D toward the public health segment.

Lastly, we must rebalance Federal R&D investment. Ironically, by directing a lopsided percentage of Federal R&D dollars toward biology and medical research, we could derail future healthcare advances.

CONCLUDING REMARKS

Despite its problems, the U.S. health care system is among the world's best, at least for those people who have full access to high quality care. But, the shortcomings of the U.S. health system and the health care industry could threaten the very health and security of the nation. We must shift the balance among cost, quality, and access to focus on wellness, prevention, and quality care, with universal access to necessary care. Over the long term, this should yield significant returns on investment in the form of a healthier and more productive populace. And, since healthier people consume fewer health care resources, this will arguably slow the rapidly increasing cost of health care that we see today. Finally, coupling these domestic health care initiatives with an increase in U.S. engagement in fostering the health of the global community, we believe the resultant economic and political stability that will likely ensue will further support our interests world-wide and our security at home.

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