

2036 A health care odyssey

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Welcome to 2036, as seen through the eyes of Ernst & Whinney technical adviser Jeff Goldsmith. A lot has changed since the old days 50 years ago-especially in the health care field. There is still death, of course, but not from illness; that was taken care of long ago. Technology made surgery obsolete. And you may be surprised to learn that the government is picking up very little of the nation's health care tab these days.

As for hospitals, well.... What's a hospital?

Thinking creatively about what health care delivery will be like 50 years from now is difficult at a time when the next 6 to 18 months are fraught with so much uncertainty. It is, however, much safer than short-term prognostication, if only because the inevitable (and embarrassing) confrontation with the facts is postponed beyond immediate memory.

This much is certain: Many of the elements of a mid-21st century delivery system are in germinal stages today. The two most uncertain elements in predicting what the system of the future will be like are how far the current vectors for change will extend into the years ahead, and how they will interact in our complex society to reshape health care delivery.

The direction of change. The major vectors for change in U.S. health care delivery are:

- Scientific progress in biomedical research
- Technological innovations in diagnosis, treatment, and clinical information systems
- Changing clinical practice (as influenced by the two forces listed above)
- Institutional and managerial strategies that bring innovation to the patient

The most powerful long-term vector for change may be the maturation of scientific inquiry in cell biology and genetics; progress in these areas could generate the most far-reaching effects in reshaping the delivery system. But these also are the areas of greatest uncertainty-although perhaps there is more uncertainty about the timing of the payoffs of biomedical research investments than about the ultimate outcomes.

For example, scientific progress borne of research investments during the past 30 years gave rise to a burgeoning biotechnology industry. Although it likely will take several decades to mature, this industry may well produce not only screens for genetically determined or genetically influenced conditions - such as diabetes, cancer, and mental illness - but also methods of genetic therapy that will alter genetic structures to reduce or even eliminate vulnerability to these illnesses. Biotechnology also will bring new biological entities, bred in the laboratory, to fight illness-including conditions caused by viral agents that eluded past therapy.

A brave new world unfolds. Many of the technologies described 50 years ago by author Aldous Huxley in his classic *Brave New World*-technologies such as in vitro fertilization and genetic engineering-either are already here or within realization. Also within realization, however, are the moral and ethical dilemmas inherent in using these technologies to alter the human future. These dilemmas include, for example, the decision to abort a fetus because it shows a genetic

predisposition to a costly or a fatal illness, or the invasion of workers' privacy by insurers and employers anxious to limit their future health care liabilities.

Progress in arresting illness at its root cause would enable society to avoid further massive social investments in what scientist and author Lewis Thomas, M.D., calls "halfway technologies" - artificial hearts, organ transplants, and the like. If society realistically can expect to conquer genetically programmed diseases and viral illnesses by the middle of the next century, then the remaining causes of death may be either purely social in character (homicides, suicides, accidents, and self-abuse from unhealthy habits like cigarette smoking) or related to the inevitable wearing out of the body.

Liberation from "phantom killer" illness could profoundly alter social attitudes toward health care spending. It may become, for example, socially acceptable for patients to bear most of the costs of illnesses that they had major roles in causing.

Americans also may come to believe that social resources should not be lavished on medical problems that inevitably lead to degeneration or death. Society may decide not to finance the "bionic body," leaving access to artificial means of mobility or life extension to those few individuals with the resources to afford them. Reallocating social dollars from these classes of medical problems to unmet needs-such as alleviating the social causes of illness and providing better access to medical care for less fortunate Americans-may be an important dividend of shifting societal values.

Today's advances, tomorrow's world. Developments in medical technology will create a more immediate impact on the shape of the U.S. health care system. But the most profound long-term effects may not come from the highly visible, big-ticket technologies (such as artificial organs) that receive the most media attention. Instead, advances in anesthesia and in less-invasive surgical technologies (both of which will dramatically broaden the scope of ambulatory surgery), plus improved diagnostic imaging and enhanced clinical information systems, may collectively produce a more significant impact in reshaping the delivery system.

Thanks to improved anesthesia and to advances such as laser surgery, fiberoptics, and high-tech catheters, entire surgical disciplines will be transformed into specialized forms of "bioplumbing." For example, ophthalmology has virtually disappeared from the inpatient hospital setting, followed by urology, plastic surgery, and gynecology. Advances in catheter technology not only have enhanced the safety of critical care monitoring but also are transforming cardiology from a primarily diagnostic discipline to an invasive, curative discipline. By the early part of the next century, only the frailest or sickest patients will require inpatient hospitalization for surgery.

At the same time, technologies that took off during the 1970s-technologies such as continuous-action peritoneal dialysis and enteral and parenteral nutrition-will be joined by new generations of technologies, enabling more patients with serious illnesses to be sent home safely. Remarkable progress with implantable devices already has produced implantable insulin pumps and implantable defibrillators; combining miniaturization with advances in microprocessor technology will enable sophisticated chemotherapy to be administered safely at sites remote from the hospital.

Meanwhile, other advances will produce remote fetal monitoring systems that can transmit signals over the telephone or via telemetry to indicate threats to the fetus. Parallel advances in

monitoring technology will produce sophisticated multifunction monitoring systems, such as the ambulatory computer-a "super-Holter" monitor that can monitor, evaluate, store, and send signals that indicate patient distress or risk to remote locations.

These technologies will enable physicians to extend their therapeutic and protective powers beyond the walls of their offices and hospitals. Systems providing continuous medication and patient monitoring will reduce the need to hospitalize patients, perhaps dramatically. The patients of the 21st century will be connected to their physicians or hospitals by webs of telemetry similar to those used in cellular communications; perhaps these communication webs will be coordinated or monitored by computer systems that could trigger responses in advance of crises.

Thus, changing medical technology will make it possible for the home or the residential community to reemerge as the primary site of clinical care-just as it was at the beginning of the 20th century. As a result, medical care in 2036 may become less obtrusive and more woven into the fabric of everyday life.

Making the most of the man-made mind. At the same time, the maturation of artificial intelligence applications in medicine may enhance, perhaps dramatically, productivity of physicians and nurses, and it may improve patient safety as well. Although research into the medical applications of artificial intelligence (the use of large clinical data bases and interactive software for support of diagnostic decisions) has been under way for more than 20 years, 1984 marked the first time that a commercially available product incorporating artificial intelligence became available for hospital use.

In the years ahead, "intelligent" clinical information systems will become the hospital's operating core, interacting with physicians and nurses in diagnostic decision-making and patient management. These systems will monitor patient conditions on a real-time basis, tracking physiological signs and incorporating test results, comparing patient responses against profiles gleaned from vast clinical data bases, and assisting the patient care team in evaluating and planning care. The most rigorous application of computer-assisted care will be in the intensive care unit, where monitoring technologies are most sophisticated and where integration of patient information and decision-making is most critically needed.

Physicians will use artificial intelligence systems to complement and to extend their diagnostic capabilities. By the early 1990s, a patient's first encounter with a new physician or health plan may take the form of responding to a diagnostic inquiry program linked by telephone or home computer to the physician's office. This will frame the first face-to-face meeting between patient and physician with a detailed, structured clinical background.

Referrals of patients to specialists or admitting patients to hospitals will be accompanied by machine-to-machine transmittal of clinical information that's necessary for therapy. Clinical information systems will combine text and images in new storage and retrieval modes, such as the writable laser disc, that will replace paper medical records. Information transmittal will contain both high-resolution visual images of specimens or affected body parts as well as oral or written commentary from the consultant.

Welcome to the hospital of 2036. As treatment advances divert large numbers of patients from the inpatient hospital setting, and as life-support and maintenance technologies enable patients to carry on their lives away from hospitals and nursing homes, the hospitalized population

will shrink to perhaps half its current size by the early part of the next century, despite an aging population. The hospitalized population will be incredibly frail and costly to treat, exhibiting acuity levels comparable to or higher than patients in today's hospital intensive care units.

The physical hospital will be much smaller and infinitely more complex technically. A 400-bed facility will be considered large, and the young people of the future will marvel at the 1,000- to 1,500-bed facilities that began emptying out during the 1980s.

By 2036, today's hospital will be converted (by technology and by changing delivery patterns) into the high-tech, critical care hub of a dispersed network of smaller clinical facilities, physician offices, and remote care sites. These networks will be knit together by "intelligent" clinical information systems and by both air and ground critical care transportation systems. The economic boundaries of the system will be defined by the coverage of financing packages tied to the provision of care within the system. Each metropolitan area will boast multiple competing systems, whose networks may stretch out as far as 200 miles from the core facility.

The baby boomers: boom or bust? After a crisis of fiscal adjustment during the late 1980s, government spending for health services will grow at a less rapid rate than either personal or corporate health care spending. By the early 21st century, government financing may be a distant third as a source of U.S. health funds, behind (in order) individual patients and corporate employers.

Why? Because as concerns mounted in the late 1980s about the adequacy of the system for financing the nation's growing need for long-term and chronic care services, privately financed annuity mechanisms-supported by tax preferences similar to those for individual retirement accounts (IRAs)-were put in place to finance these services. Paired with IRA mechanisms for income support, the availability of health-related IRAs justified government retrenchment from supporting middle-class retirement and health services needs, thus permitting a reallocation of funding for those who lack either government or corporate insurance coverage.

However, both the provisions for advance funding of chronic care costs and the available financial support for acute care will prove grossly inadequate later on, despite unprecedented scientific and technological progress made during the previous 50 years. During the decade 2030 and beyond, the U.S. health care system will be locked in its most serious economic crisis in 100 years, as the 78 million postwar baby boomers begin to die.

Despite the reduced volume of inpatient services, the cost of caring for a growing number of hospitalized patients will progressively outstrip public and private resources, creating serious fiscal problems for patients and care providers alike. Having failed to replace themselves demographically, the baby-boom elderly will not be able, as did their elders, to use their political power to tax the young to subsidize their care.

Despite active life-styles and healthy diets, the baby-boom generation may experience a lengthy and unsatisfying twilight of enforced leisure, reduced mobility, and emotional involution. Ironically, the active life-styles pursued by baby boomers during mid-life may extend their lives, but at the price of worn-out musculoskeletal systems that only a few will have the financial resources to alleviate.

Ultimately, society will become rigidly age segregated, with the elderly living in retirement colonies outside the mainstream of their communities; many communities may have no young people at all. The biggest problems faced by American society will be restoring the vitality it experienced in the late 20th century and mobilizing its resources to plan for a brighter tomorrow.