

A New Health System for the 21st Century

Fundamental changes are needed in the organization and delivery of health care in the United States. The experiences of patients, their families, and health care clinicians, as well as a large body of evidence on the quality of care, have convinced the Committee on the Quality of Health Care in America that the time for major change has come. This chapter sets forth the evidence; the reasons underlying the inability of the health care system to meet patient needs; and the committee's framework for a new health system, which serves to structure the remaining chapters of this report.

THE QUALITY GAP

The year 1998 was a watershed in the quest for improvement in the quality of health care (Kizer, 2000). In that year, three major reports detailing serious quality-of-care concerns were issued. The Institute of Medicine's (IOM) National Roundtable on Health Care Quality documents three types of quality problems—overuse, underuse, and misuse. The report describes the problem as follows:

The burden of harm conveyed by the collective impact of all of our health care quality problems is staggering. It requires the urgent attention of all the stakeholders: the health care professions, health care policymakers, consumer advocates and purchasers of care. The challenge is to bring the full potential benefit of effective health care to all Americans while avoiding unneeded and harmful interventions and eliminating preventable complications of care. Meeting this challenge demands a readiness to think in radically new ways about how to

deliver health care services and how to assess and improve their quality. Our present efforts resemble a team of engineers trying to break the sound barrier by tinkering with a Model T Ford. We need a new vehicle or perhaps, many new vehicles. The only unacceptable alternative is not to change. (Chassin et al., 1998)

The Advisory Commission on Consumer Protection and Quality also released a report on quality. That report calls for a national commitment to improve quality, concluding: "Exhaustive research documents the fact that today, in America, there is no guarantee that any individual will receive high-quality care for any particular health problem. The health care industry is plagued with overutilization of services, underutilization of services and errors in health care practice" (Advisory Commission on Consumer Protection and Quality in the Health Care Industry, 1998).

Finally, the reports of both of these national panels were supported by the results of an extensive literature review conducted by researchers at RAND Corporation and encompassing publications in leading peer-reviewed journals between 1993 and mid-1997 (Schuster et al., 1998). The report on those results substantiates the serious and pervasive nature of quality-of-care problems.

In the fall of 1998, the Committee on the Quality of Health Care in America established a Technical Advisory Panel on the State of Quality to review the most recent literature on quality. In collaboration with RAND, the earlier synthesis of the quality literature was updated to include work published between July 1997 and August 1998. The detailed results of this review, now covering 8 years and more than 70 publications, are included in Appendix A. The committee concurs with the findings of the panel that "... there is abundant evidence that serious and extensive quality problems exist throughout American medicine resulting in harm to many Americans."

The literature reviews conducted by RAND encompass studies categorized under the rubric of quality of care. Other reviews that probe more deeply in a specific clinical area (e.g., oncology) or focus on a particular type of quality problem (e.g., errors) provide further evidence of the systemic nature of quality-of-care problems.

One such study, an IOM report examining cancer care, reveals that quality problems occur across all types of cancer care and in all aspects of the process of care (Institute of Medicine, 1999). For example, problems with breast cancer care include underuse of mammography for early cancer detection, lack of adherence to standards for diagnosis (such as biopsies and pathology studies), inadequate patient counseling regarding treatment options, and underuse of radiation therapy and adjuvant chemotherapy following surgery.

In its first report, *To Err Is Human: Building a Safer Health System*, this committee reviewed the literature on a specific type of quality problem—medical errors. We found about 30 publications published during the last 10 to 12 years

substantiating serious and widespread errors in health care delivery that resulted in frequent avoidable injuries to patients (Institute of Medicine, 2000).

These quality problems occur typically not because of a failure of goodwill, knowledge, effort, or resources devoted to health care, but because of fundamental shortcomings in the ways care is organized. The nation's current health care system often lacks the environment, the processes, and the capabilities needed to ensure that services are safe, effective, patient-centered, timely, efficient, and equitable.

UNDERLYING REASONS FOR INADEQUATE QUALITY OF CARE

Four key aspects of the current context for health care delivery help explain the quality problems outlined above: the growing complexity of science and technology, the increase in chronic conditions, a poorly organized delivery system, and constraints on exploiting the revolution in information technology. Each of these factors plays a role, and each exacerbates the effects of the others.

Growing Complexity of Science and Technology

Health care today is characterized by more to know, more to manage, more to watch, more to do, and more people involved in doing it than at any time in the nation's history. Our current methods of organizing and delivering care are unable to meet the expectations of patients and their families because the science and technologies involved in health care—the knowledge, skills, care interventions, devices, and drugs—have advanced more rapidly than our ability to deliver them safely, effectively, and efficiently (The Robert Wood Johnson Foundation, 1996).

For more than five decades, investments in biomedical research have increased steadily, resulting in an extraordinary expansion of medical knowledge and technology (Blumenthal, 1994). Between 1994 and 1999, the budget of the National Institutes of Health increased from \$10.9 to \$15.6 billion (National Institutes of Health, 2000), while the investment of pharmaceutical firms in research and development increased from about \$13.5 to \$24 billion (Pharmaceutical Research and Manufacturers of America, 2000). Spending on research and development in the medical device industry, most of which comes from private sources, totaled \$8.9 billion in 1998 (The Lewin Group, 2000).

As suggested earlier, quality problems do not generally stem from a lack of knowledge, training, or effort by health professionals. Today, no one clinician can retain all the information necessary for sound, evidence-based practice. No unaided human being can read, recall, and act effectively on the volume of clinically relevant scientific literature. Since the results of the first randomized controlled trial were published more than 50 years ago (Cochrane, 1972; Daniels and Hill, 1952), health care practitioners have been increasingly inundated with

information about what does and does not work to produce good outcomes in health care. Over the last 30 years, the increase in such trials has been staggering—from just over 100 to nearly 10,000 annually. The first 5 years of this 30-year period accounts for only 1 percent of all the articles in the medical literature, while the last 5 years accounts for almost half (49 percent) (Chassin, 1998), and there is no indication that this rate is slowing. Studies on the effectiveness of medical practice have also become increasingly sophisticated, involving complex issues of patient selection and statistical procedures.

As the knowledge base has expanded, so too has the number of drugs, medical devices, and other technological supports. For example, the average number of new drugs approved per year has doubled since the early 1980s, from 19 to 38 (The Henry J. Kaiser Family Foundation, 2000). Between 1990 and 1999, 311 new drugs were approved by the U.S. Food and Drug Administration (U.S. Food and Drug Administration, 2000). The cost of pharmaceuticals is the most rapidly growing component of health care expenditures. As clinical science continues to advance, the challenge of managing the use of existing and new pharmaceuticals and health technologies will intensify.

Without substantial changes in the ways health care is delivered, the problems resulting from the growing complexity of health care science and technologies are unlikely to abate; in fact, they will increase. For example, work being done in genomics offers significant promise for disease diagnosis and, eventually, treatment. Engineering advances in miniaturization will place diagnostic, monitoring, and treatment tools directly into the hands of patients as science improves and costs are reduced. And the application of epidemiological knowledge to large populations and databases will enable us to understand more and more about the dynamics of wellness and disease.

Increase in Chronic Conditions

One of the consequences of advances in medical science and technology is that people are now living longer. Although health care is by no means the only factor that affects morbidity and mortality, innovations in medical science and technology have contributed greatly to increases in life expectancy. The average American born today can expect to live more than 76 years (National Center for Health Statistics, 2000). Roughly 1 additional year has been added to life expectancy every 5 years since 1965.

Because of changing mortality patterns, those age 65 and over constitute an increasingly large number and proportion of the U.S. population. Today, this age group accounts for approximately 1 in 8 persons, or 13 percent of the population (National Center for Health Statistics, 1999). In 2030, when the large baby boom cohort has entered old age, 1 in 5 persons (20 percent) is expected to be in this age group. These demographic changes have important implications for the organization of the health care delivery system, but we have yet to address them in any

serious way. One consequence of the aging of the population is an increase in the incidence and prevalence of chronic conditions.

Chronic conditions, defined as illnesses that last longer than 3 months and are not self-limiting, are now the leading cause of illness, disability, and death in this country, and affect almost half of the U.S. population (Hoffman et al., 1996). About 100 million Americans have one or more chronic conditions, and this number is estimated to grow to 134 million by 2020 (The Robert Wood Johnson Foundation, 1996). About 1 in 6 Americans is limited in daily activities in some way as a result of a chronic condition (The Robert Wood Johnson Foundation, 1996). Disabling chronic conditions affect all age groups; about two-thirds of those with such conditions are under age 65.

The majority of health care resources are now devoted to the treatment of chronic disease. In 1990, the direct medical costs for persons with chronic conditions was \$425 billion, nearly 70 percent of all personal health care expenditures (The Robert Wood Johnson Foundation, 1996). The indirect costs—lost productivity due to premature death or inability to work—added another \$234 billion to this figure.

Providing state-of-the-art health care to a population in which chronic conditions predominate is complicated by the fact that many of those afflicted have comorbid conditions. About 44 percent of those with a chronic illness have more than one such condition, and the likelihood of having two or more chronic conditions increases steadily with age. In 1987, annual medical costs per person were more than twice as high for those with one chronic condition (\$1,829) as compared with those with acute conditions only (\$817) (The Robert Wood Johnson Foundation, 1996). Annual medical costs per person increase much more for those with more than one chronic condition (\$4,672).

Unlike much acute episodic care, effective care of the chronically ill is a collaborative process, involving the definition of clinical problems in terms that both patients and providers understand; joint development of a care plan with goals, targets, and implementation strategies; provision of self-management training and support services; and active, sustained follow-up using visits, telephone calls, e-mail, and Web-based monitoring and decision support programs (Von Korff et al., 1997). Much of the care provided to the chronically ill is given by patients and their families. Activities performed range from the provision of basic support care to active monitoring and management (e.g., self blood glucose monitoring by diabetics, use of peak flow meters by asthmatics). Although some degree of collaborative management is essential to achieve desired outcomes for many chronic conditions, patients vary a great deal in the amount of information they want to receive on their condition and their desire to participate in treatment decisions (Strull et al., 1984). Nonetheless, the collaboration involved in much of the care provided to the chronically ill adds another layer of complexity to the delivery of health care to this growing segment of the population.

Poorly Organized Delivery System

The current health care delivery system is highly decentralized. In a survey of physicians practicing in community settings, nearly 40 percent were in one-physician practices, and more than four of five practiced in settings with fewer than ten physicians (American Medical Association, 1998). Hospital consolidation is occurring in many markets; of the more than 5,000 community hospitals, 3,556 belong to some form of network or system (American Hospital Association, 2000). The formation of physician organizations is occurring much more slowly, however (Kohn, 2000).

The prevailing model of health care delivery is complicated, comprising layers of processes and handoffs that patients and families find bewildering and clinicians view as wasteful. Patients in a 1996 Picker Survey reported that the health care system is a “nightmare to navigate”—that it feels less like a system than a confusing, expensive, unreliable, and often impersonal disarray (Picker Institute and American Hospital Association, 1996). Care delivery processes are often overly complex, requiring steps and handoffs that slow down the care process and decrease rather than improve safety. These processes waste resources; leave unaccountable gaps in coverage; result in the loss of information; and fail to build on the strengths of all health professionals involved to ensure that care is timely, safe, and appropriate.

In a population increasingly afflicted by chronic conditions, the health care delivery system is poorly organized to provide care to those with such conditions. In a review of the literature on chronic care, Wagner et al. (1996) identified five elements required to improve patient outcomes for the chronically ill:

- *Evidence-based, planned care.* The literature is replete with evidence of the failure to provide care consistent with well-established guidelines for common chronic conditions such as hypertension (Stockwell et al., 1994), asthma (Legorreta et al., 1998; Starfield et al., 1994), and diabetes (Kenny et al., 1993). Successful chronic care programs tend to be ones that incorporate guidelines and protocols explicitly into practice.

- *Reorganization of practices to meet the needs of patients who require more time, a broad array of resources, and closer follow-up.* Such reorganization generally involves the delivery of care through a multidisciplinary team, the careful allocation of tasks among the team members, and the ongoing management of patient contact (appointments, follow-up) (Wagner et al., 1996).

- *Systematic attention to patients' need for information and behavioral change.* A review of 400 articles, randomized trials, and observational studies of self-management support interventions (Center for Advancement of Health, 1996), revealed substantial evidence that programs providing counseling, education, information feedback, and other supports to patients with common chronic conditions are associated with improved outcomes (Brown, 1990; DeBusk et al., 1994; Mullen et al., 1987).

- *Ready access to necessary clinical expertise.* Specialized clinical knowledge and expertise are important to improved outcomes. Evidence suggests that there are numerous ways to enhance access to such knowledge and expertise, including education of patients and primary care providers (Inui et al., 1976; Sawicki et al., 1993; Soumerai and Avorn, 1990), referrals to specialists, various consultation processes (e.g., teleconferencing, hot line to specialists) (Vinicor et al., 1987), collaborative care models whereby primary care providers and specialists practice together (Katon et al., 1995; McCulloch et al., 1994), and computer decision support systems (Barton and Schoenbaum, 1990; Litzelman et al., 1993; McDonald et al., 1988).

- *Supportive information systems.* Patient registries have been used effectively in many settings to issue reminders for preventive care and necessary follow-up, and to provide feedback to the provider practice on patient compliance and service use (Glanz and Scholl, 1982; Johnston et al., 1994; Macharia et al., 1992; Mugford et al., 1991; Stason et al., 1994). Mechanisms for sharing clinical and other information among all members of the care team, ranging from patient-carried medical records (Dickey and Petitti, 1992; Turner et al., 1990) to automated patient records, can also improve care.

Thus the American health care system does not have well-organized programs to provide the full complement of services needed by people with such chronic conditions as heart disease, cancer, diabetes, and asthma. Nor do we have mechanisms to coordinate the full range of services needed by those with multiple serious illnesses. And our current health system has only a rudimentary ability to collect and share patient information.

A growing body of evidence for some procedures and conditions suggests that higher volume is associated with better outcomes (Hewitt, 2000). We know little about the underlying factors that produce this relationship (e.g., more effective care processes, better processes for incorporating knowledge into practice, provider skill, effective multidisciplinary team, access to specialized resources). But the results are consistent with the conclusion that the growing complexity of health care necessitates more sophisticated and carefully designed care processes.

The application of engineering concepts to the design of care processes is a critical first step in improving patient safety. Yet few health care organizations have applied the lessons learned by other high-risk industries that have led to very low rates of injury. These lessons include organized approaches to collecting data on errors and analyzing their causes, minimizing reliance on human memory, and standardizing routine aspects of care processes (Chassin, 1998; Institute of Medicine, 2000). Patient safety emerges from systems that are skillfully designed to prevent harm (Cook, 1998). Although many, often simple, steps could be taken now and without great cost, knowledge about such actions has neither been disseminated among health care institutions nor widely implemented, probably because there are often no real penalties for failing to do so and

no real rewards for effective improvements. Although Americans have come to expect high-technology care, they do not demand safety and reliability with the same insistence.

For the most part, health care organizations are only beginning to apply information technology to manage and improve patient care. A great deal of medical information is stored on paper. Communication among clinicians and with patients does not generally make use of the Internet or other contemporary information technology. Hospitals and physician groups operate independently of one another, often providing care without the benefit of complete information on the patient's condition or medical history, services provided in other settings, or medications prescribed by other providers.

Our attempts to deliver today's technologies with today's medical production capabilities are the medical equivalent of manufacturing microprocessors in a vacuum tube factory. The costs of waste, poor quality, and inefficiency are enormous. If the current delivery system is unable to utilize today's technologies effectively, it will be even less able to carry the weight of tomorrow's technologies and an aging population, raising the specter of even more variability in quality, more errors, less responsiveness, and greater costs associated with waste and poor quality.

The challenge before us is to move from today's highly decentralized, cottage industry to one that is capable of providing primary and preventive care, caring for the chronically ill, and coping with acute and catastrophic events. To meet this challenge, there must be a commitment to organizing services around common patient needs and applying information technology and engineering concepts to the design of care processes.

Constraints on Exploiting the Revolution in Information Technology

The advent of the Internet and the World Wide Web has placed us on the threshold of a change that is reshaping virtually all aspects of society, including health care delivery. The Internet supports a rising tide of consumerism, with greater demands for information and convenience in all areas of commerce. And Internet services are becoming cheaper and easier to access.

Four of ten U.S. households had Internet access as of August 2000 (U.S. Department of Commerce, 2000), and it is predicted that 90 percent will have access by 2010 or before (Rosenberg, 1999). Large increases in Internet access have occurred among most groups of Americans, regardless of income, education, race or ethnicity, location, age, or gender (U.S. Department of Commerce, 2000). Nonetheless, a "digital divide" remains, especially for the disabled and for African Americans and Hispanics.

Large numbers of patients are turning to the Internet for health care information and advice. An estimated 70 million Americans seek health information online (Cain et al., 2000). It is estimated that there are 10,000 or more health-

related Web sites (Benton Foundation, 1999), allowing consumers to search for information on specific diseases and treatments, evaluate health plans and clinicians, pose questions to care providers, manage chronic conditions, participate in discussion groups, assess existing health risks, and purchase health-related products (National Research Council, 2000). There is however, much variability in the accuracy and completeness of health information found on the Web (Biermann et al., 1999).

The effect of these trends on health care will be a fundamental transformation in the ways services are organized and delivered and clinicians and patients interact. Individuals are making many of their own decisions about diagnosis and treatment. Increasingly, they are also bringing information to their physicians to obtain help in interpreting or judging its value for themselves.

To better understand how information technology can contribute to improving quality, the Committee on the Quality of Health Care in America held a workshop in September 1999 at which participants identified five key areas in which information technology could contribute to an improved health care delivery system:

- *Access to the medical knowledge-base.* Through use of the Web, it should be possible to help both providers and consumers gain better access to clinical evidence.
- *Computer-aided decision support systems.* Embedding knowledge in tools and training clinicians to use those tools to augment their own skills and experience can facilitate the consistent application of the expanding science base to patient care.
- *Collection and sharing of clinical information.* The automation of patient-specific clinical information is essential for many types of computer-aided decision support systems. Automation of clinical data offers the potential to improve coordination of care across clinicians and settings, which is critical to the effective management of chronic conditions.
- *Reduction in errors.* Information technology can contribute to a reduction in errors by standardizing and automating certain decisions and by aiding in the identification of possible errors, such as potential adverse drug interactions, before they occur.
- *Enhanced patient and clinician communication.* Information technology can change the way individuals receive care and interact with their clinicians. Instead of a \$65 office visit and a half-day off work, a 2-minute e-mail communication could meet many patients' needs more responsively and at lower cost. Similarly, patients would be able to go online and obtain test results, inform their clinicians about how they are doing, send pictures and data, participate in interactive care management services, receive after-care instructions, and participate in support groups. Appropriately structured e-mail communication between patient

and provider could also permit continuous monitoring of clinical conditions, especially for patients with chronic conditions that require self-management.

A recent report by the National Research Council of The National Academies, *Networking Health*, also concludes that “the Internet has great potential to improve Americans’ health by enhancing communications and improving access to information for care providers, patients, health plan administrators, public health officials, biomedical researchers, and other health professionals” (National Research Council, 2000). In recent years, some applications have become commonplace, such as online searching for health information by patients and providers. Others, such as remote and virtual surgery and simulations of surgical procedures, are in early stages of development.

Although opportunities to improve access, quality, and service abound, the health care industry has been slow to invest in information technology. In 1996, the industry spent only \$543 per worker on information technology, compared, for example, with \$12,666 spent by securities brokers, and ranked 38th out of 53 industries surveyed (U.S. Department of Commerce, 1999). In a recent survey of 30 health plans, it was found that all had established Web sites to allow patients to obtain certain types of information and interact with the organization (e.g., online provider directory, search formulary, ability to query member services or file a complaint), and about one-half had the capability to conduct some types of transactions online (e.g., enrollment, referral processing, claims submission) (First Consulting Group, 2000). But none had automated entire service functions, such as online medical management, which would require significant changes in business strategy, involve many employees and/or partners, and entail sizable capital investments.

There are many technical, organizational, behavioral, and public policy challenges to greater use of information technology. Technical challenges include ensuring the security of personally identifiable information; making persistent, reliable broadband connectivity available to many locations, including rural clinics and patients’ homes; establishing processes for authentication of the source and recipient of information; and making tools available for locating information of interest and for determining the quality of retrieved information (National Research Council, 2000).

Over the long run, however, organizational challenges may play the greatest role in constraining the adoption of various types of Internet applications. The diverse and highly decentralized structure of the health care industry, as discussed above, makes the business models for new applications complex and difficult, resulting in slow adoption of even highly successful pioneering applications. Efforts to introduce new applications also encounter resistance from health care professionals for a variety of reasons, including uncertainties about how such applications will alter relationships among and between clinicians, patients, and health care organizations (National Research Council, 2000).

Numerous public policy, payment, and legal issues also must be resolved. Many applications in the public health arena (e.g., videoconferencing during emergency situations, collection of information from local and state public health departments, incident reporting and disease surveillance) are within technical reach at relatively low cost, but are not widely used because of a lack of targeted public-sector funding and organizational barriers (e.g., shortage of adequately trained personnel). Fee-for-service payment, the most common method of payment for physicians, does not compensate clinicians for time spent on e-mail communication. State-based professional licensing requirements and restrictions on practice have stymied widespread use of other applications, such as remote medical consultations. Online access to and transfer of clinical information has also been slow to evolve, in part because of concerns about privacy and confidentiality. Chapter 7 reviews in greater detail the use of information technology to improve the quality of health care and some of the barriers to its more widespread adoption.

AGENDA FOR THE FUTURE AND ROAD MAP FOR THE REPORT

Throughout the course of its work, the committee has been cognizant of the fact that the health care system has been in a rapid state of flux for more than 10 years and that this situation is likely to continue. Over the last decade, the primary impetus for change has been a desire to slow the rate of inflation of health care costs. During the coming decades, cost pressures will remain, but the health care system will also be shaped dramatically by broader forces transforming society in general, most notably the growth of the Internet and changing population needs for chronic care.

There is little doubt that the health care enterprise has been slow to change. Research documenting safety and quality concerns has been mounting for over a decade. Successful quality improvement initiatives are very slow to spread, and rarely adopted on a widespread basis. For these reasons, the committee believes that a more intense and far-reaching effort will be needed. Substantial improvement in quality over the coming decade can be achieved only by engaging the support of patients, clinicians, governing boards and managers of health care organizations, private and public purchasers, state and federal policy makers, regulators, researchers, and others. Change is needed at all levels, including the clinician and patient relationship; the structure, management, and operation of health care organizations; the purchasing and financing of health care; the regulatory and liability environment; and others.

This report offers general principles, not a detailed blueprint, for the building of a new system. In part, the committee cannot foresee all the new organizations, forces, technologies, needs, and relationships that will develop even in the early years of the 21st century. More than that, however, the committee has come to

believe that a framework for a new health system should be based on systems that can organize themselves to achieve a shared purpose by adhering to a few well-thought-out general rules, adapting to local circumstances, and then examining their own performance (see Chapter 3 and Appendix B). In reshaping health care, local adaptation, innovation, and initiative will be essential ingredients for success.

With these precepts in mind, the committee proposes the following agenda designed to bridge the quality gap:

- That all health care constituencies, including policymakers, purchasers, regulators, health professionals, health care trustees and management, and consumers, commit to a national statement of purpose for the health care system as a whole and to a shared agenda of six aims for improvement that can raise the quality of care to unprecedented levels.
- That clinicians and patients, and the health care organizations that support care delivery, adopt a new set of principles to guide the redesign of care processes.
- That the Department of Health and Human Services identify a set of priority conditions upon which to focus initial efforts, provide resources to stimulate innovation, and initiate the change process.
- That health care organizations design and implement more effective organization support processes to make change in the delivery of care possible.
- That purchasers, regulators, health professions, educational institutions, and the Department of Health and Human Services create an environment that fosters and rewards improvement by (1) creating an infrastructure to support evidence-based practice, (2) facilitating the use of information technology, (3) aligning payment incentives, and (4) preparing the workforce to better serve patients in a world of expanding knowledge and rapid change.

The succeeding chapters of this report detail in turn the elements of this agenda. Specifically, the report:

- Sets performance expectations or aims for improvement for the 21st-century health care system (Chapter 2).
- Explores the implications of these performance expectations for the interactions between patients and clinicians, and develops some simple rules to guide the actions of all stakeholders (Chapter 3).
- Encourages all stakeholders to focus immediate attention on the development of state-of-the-art care processes for common conditions, and calls for the establishment of a \$1 billion innovation fund that can be used to invest in enhancing organizational capacity, building an information infrastructure, and training multidisciplinary teams, among other things (Chapter 4).

- Addresses the importance of building more effective organizational structures to (1) redesign care processes; (2) use information technologies; (3) manage knowledge and skills; (4) coordinate care across patient conditions, services, and settings over time; (5) develop effective teams, and (6) implement performance and outcome measurement for improvement and accountability (Chapter 5).
- Identifies critical steps that must be taken to support evidence-based practice, including making evidence more useful and accessible to support the clinical decisions of clinicians and patients, and constructing quality measures for improvement and accountability (Chapter 6).
- Explains why a more sophisticated information infrastructure is necessary to improve quality, and calls for a renewed national initiative to build such an infrastructure (Chapter 7).
- Illustrates some of the ways current payment policies impede efforts to improve quality, and explains the importance of better aligning payment incentives to encourage innovations and reward enhancements in quality (Chapter 8).
- Addresses critical issues related to the culture, education, and training of a health professional workforce prepared to succeed in the 21st-century delivery system (Chapter 9).

The committee's recommendations in these areas are presented in the respective chapters, highlighted in bold print.

In sum, health care is plagued today by a serious quality gap. The current health care delivery system is not robust enough to apply medical knowledge and technology consistently in ways that are safe, effective, patient-centered, timely, efficient, and equitable. As we strive to close this gap, we must seek health care solutions that are patient-centered, that is, humane and respectful of the needs and preferences of individuals. And, most important, we must build a 21st century health care system that is more equitable and meets the needs of all Americans without regard to race, ethnicity, place of residence, or socioeconomic status, including the nearly 43 million people who currently lack health insurance (U.S. Census Bureau, 2000).

REFERENCES

- Advisory Commission on Consumer Protection and Quality in the Health Care Industry. 1998. "Quality First: Better Health Care for All Americans." Online. Available at <http://www.hcqualitycommission.gov/final/> [accessed Sept. 9, 2000].
- American Hospital Association. Resource Center Fact Sheet. Fast Facts on U.S. Hospitals. *Hospital Statistics, 2000*. Chicago, IL: Health Forum - An American Hospital Association Company, 2000.
- American Medical Association. *Socioeconomic Characteristics of Medical Practice: 1997/98*. Chicago, Illinois: American Medical Association, 1998. Page 21.

- Barton, Mary B. and Stephen C. Schoenbaum. Improving Influenza Vaccination Performance in an HMO Setting: The Use of Computer-Generated Reminders and Peer Comparison Feedback. *American Journal of Public Health* 80(5):534–6, 1990.
- Benton Foundation. 1999. "Networking for Better Care: Health Care in the Information Age." Online. Available at <http://www.benton.org/Library/health/> [accessed Sept. 18, 2000].
- Biermann, J. Sybil, Gregory J. Golladay, Mary Lou V. H. Greenfield, and Laurence H. Baker. Evaluation of Cancer Information on the Internet. *Cancer* 86(3):381–90, 1999.
- Blumenthal, David. Growing Pains for New Academic/Industry Relationships. *Health Affairs* 13(3): 176–93, 1994.
- Brown, Sharon A. Studies of Educational Interventions and outcomes in Diabetic Adults: A Meta-Analysis Revisited. *Patient Education and Counseling* 16:189–215, 1990.
- Cain, Mary M., Robert Mittman, Jane Sarasohn-Kahn, and Jennifer C. Wayne. *Health e-People: The Online Consumer Experience*. Oakland, CA: Institute for the Future, California Health Care Foundation, 2000.
- Center for Advancement of Health. Indexed Bibliography of Behavioral Interventions of Chronic Disease. Washington, D.C., 1996.
- Chassin, Mark R. Is Health Care Ready for Six Sigma Quality? *Milbank Quarterly* 76(4):575–91, 1998.
- Chassin, Mark R., Robert W. Galvin, and the National Roundtable on Health Care Quality. The Urgent Need to Improve Health Care Quality. *JAMA* 280(11):1000–5, 1998.
- Cochrane, A. L. Effectiveness and Efficiency, Random Reflections on Health Services. *The Nuffield Provincial Hospitals Trust*, 1972.
- Cook, Richard I. *Two Years Before the Mast: Learning How to Learn About Safety*. 1998. Invited presentation. Annenberg Conference, "Enhancing Patient Safety and Reducing Errors in Health Care," Rancho Mirage, CA November 8–10, 1998.
- Daniels, Marc and A. Bradford Hill. Chemotherapy of Pulmonary Tuberculosis in Young Adults. An Analysis of the Combined Results of Three Medical Research Council Trials. *BMJ* 31:1162–8, 1952.
- DeBusk, Robert F., Nancy Houston Miller, H. Robert Superko, et al. A Case-Management System for Coronary Risk Factor Modification after Acute Myocardial Infarction. *Ann Int Med* 120: 721–9, 1994.
- Dickey, Larry L. and Diana Petitti. A Patient-Held Minirecord to Promote Adult Preventive Care. *J Fam Pract* 34(4):457–63, 1992.
- First Consulting Group. *Health Systems on the E-Health Path: A Survey of Scottsdale Institute Members*. Long Beach, CA: FCG, 2000. eHealth@FCG.com.
- Glanz, Karen and Theresa O. Scholl. Intervention Strategies to Improve Adherence among Hypertensives: Review and Recommendations. *Patient Counselling and Health Education* 4(1):14–28, 1982.
- Hewitt, Maria for the Committee on the Quality of Health Care in America and the National Cancer Policy Board. *Interpreting the Volume-Outcome Relationship in the Context of Health Care Quality*. Washington, D.C.: Institute of Medicine, National Academy Press, 2000. Online. Available at <http://books.nap.edu/catalog/10005.html> [accessed Jan. 29, 2001].
- Hoffman, Catherine, Dorothy P. Rice, and Hai-Yen Sung. Persons With Chronic Conditions. Their Prevalence and Costs. *JAMA* 276(18): 1473–9, 1996.
- Institute of Medicine. *Ensuring Quality Cancer Care*. Maria Hewitt and Joseph V. Simone, eds. Washington, D.C.: National Academy Press, 1999.
- . *To Err Is Human: Building a Safer Health System*. Linda T. Kohn, Janet M. Corrigan, and Molla S. Donaldson, eds. Washington, D.C: National Academy Press, 2000.
- Inui, Thomas S., Edward L. Yourtee, and John W. Williamson. Improved Outcomes in Hypertension After Physician Tutorials: A Controlled Trial. *Ann Int Med* 84:646–51, 1976.

- Johnston, Mary E., Karl B. Langton, R. Brian Haynes, and Alix Mathieu. Effects of Computer-Based Clinical Decision Support Systems on Clinician Performance and Patient Outcome: A Critical Appraisal of Research. *Ann Int Med* 120:135–42, 1994.
- Katon, Wayne, Michael Von Korff, Edward Lin, et al. Collaborative Management to Achieve Treatment Guidelines: Impact on Depression in Primary Care. *JAMA* 273(13):1026–31, 1995.
- Kenny, Susan J., Philip J. Smith, Marilyn G. Goldschmid, et al. Survey of Physician Practice Behaviors Related to Diabetes Mellitus in the U.S.: Physician Adherence to Consensus Recommendations. *Diabetes Care* 16(11):1507–10, 1993.
- Kizer, Kenneth W. The National Quality Forum Enters the Game. *International Journal for Quality in Health Care* 12(2):85–7, 2000.
- Kohn, Linda T. Organizing and Managing Care in a Changing Health System. *Health Services Research* 35(Part 1):37–52, 2000.
- Legorreta, Antonio P., Jennifer Christian-Herman, Richard D. O'Connor, et al. Compliance With National Asthma Management Guidelines and Specialty Care: A Health Maintenance Organization Experience. *Arch Int Med* 158:457–64, 1998.
- Litzelman, Debra K., Robert S. Dittus, Michael E. Miller, and William M. Tierney. Requiring Physicians to Respond to Computerized Reminders Improves Their Compliance with Preventive Care Protocols. *J Gen Intern Med* 8:311–7, 1993.
- Macharia, William M., Gladys Leon, Brian H. Rowe, et al. An Overview of Interventions to Improve Compliance with Appointment Keeping for Medical Services. *JAMA* 267(13):1813–7, 1992.
- McCulloch, David K., Russell E. Glasgow, Sarah E. Hampson, and Ed Wagner. A Systematic Approach to Diabetes Management in the Post-DCCT Era. *Diabetes Care* 17(7):765–9, 1994.
- McDonald, Clement J., Lonnie Blevins, William M. Tierney, and Douglas K. Martin. The Regenstrief Medical Records. *MD Computing* 5(5):34–47, 1988.
- Mugford, Miranda, Philip Banfield, and Moira O'Hanlon. Effects of Feedback of Information on Clinical Practice: A Review. *BMJ* 303:398–402, 1991.
- Mullen, Patricia D., Elizabeth A. Laville, Andrea K. Biddle, and Kate Lorig. Efficacy of Psychoeducational Interventions on Pain, Depression, and Disability in People with Arthritis: A Meta-Analysis. *Journal of Rheumatology* 14(suppl 15):33–9, 1987.
- National Center for Health Statistics. *Health, United States, 1999. With Health and Aging Chartbook*. Hyattsville, MD: U.S. Government Printing Office, 1999.
- . *Health, United States, 2000. With Adolescent Health Chartbook*. Hyattsville, MD: U.S. Government Printing Office, 2000.
- National Institutes of Health. 2000. "An Overview." Online. Available at <http://www.nih.gov/about/NIHoverview.html> [accessed Aug. 11, 2000].
- National Research Council. *Networking Health: Prescriptions for the Internet*. Washington, DC: National Academy Press, 2000.
- Pharmaceutical Research and Manufacturers of America. 2000. "PhRMA Annual Report, 2000–2001." Online. Available at <http://www.phrma.org/publications/annual2000/> [accessed Nov. 11, 2000].
- Picker Institute and American Hospital Association. *Eye on Patients Report*. 1996.
- Rosenberg, Matt. Popularity of Internet Won't Peak for Years: Not until today's middle-schoolers reach adulthood will the technology really take off. *Puget Sound Business Journal*. May 24, 1999. Online. Available at <http://www.bizjournals.com/seattle/stories/1999/05/24/focus9.html> [accessed Jan. 22, 2001].
- Sawicki, Peter T., Ingrid Muhlhauser, Ulrike Didjurgeit, and Michael Berger. Improvement of Hypertension Care by a Structured Treatment and Teaching Programme. *Journal of Human Hypertension* 7:571–3, 1993.
- Schuster, Mark A., Elizabeth A. McGlynn, and Robert H Brook. How Good is the Quality of Health Care in the United States? *The Milbank Quarterly* 76(4):517–63, 1998.

- Soumerai, Stephen B. and Jerry Avorn. Principles of Educational Outreach ('Academic Detailing') to Improve Clinical Decision Making. *JAMA* 263(4):549–55, 1990.
- Starfield, Barbara, Neil R. Powe, Jonathan R. Weiner, et al. Costs vs. Quality in Different Types of Primary Care Settings. *JAMA* 272(24):1903–8, 1994.
- Stason, William B., Donald S. Shepard, H. Mitchell Perry, Jr., et al. Effectiveness and Costs of Veterans Affairs Hypertension Clinic. *Medical Care* 32(12):1197–215, 1994.
- Stockwell, David H., Shantha Madhavan, Hillel Cohen, Geoffrey Gibson, and Michael H. Alderman. The Determinants of Hypertension Awareness, Treatment, and Control in an Insured Population. *American Journal of Public Health* 84(11):1768–74, 1994.
- Strull, William M., Bernard Lo, and Gerald Charles. Do Patients Want to Participate in Medical Decision Making? *JAMA* 252(21):2990–4, 1984.
- The Henry J. Kaiser Family Foundation. *Prescription Drug Trends - A Chartbook*. Menlo Park, CA: The Henry J. Kaiser Family Foundation, 2000.
- The Lewin Group, Inc. *Outlook for Medical Technology Innovation: Will Patients Get the Care They Need. Report #1: The State of the Industry*. Washington, DC: Health Insurance Manufacturers Association, 2000.
- The Robert Wood Johnson Foundation. *Chronic Care in America: A 21st Century Challenge*. Princeton, NJ: The Robert Wood Johnson Foundation, 1996. Online. Available at <http://www.rwjf.org/library/chrcare/> [accessed Sept. 19, 2000].
- Turner, Robert C., Leo E. Waivers, and Kevin O'Brien. The Effect of Patient-Carried Reminder Cards on the Performance of Health Maintenance Measures. *Arch Int Med* 150:645–7, 1990.
- U.S. Census Bureau. Health Insurance Coverage: 1999. *Current Population Survey*. by Robert J. Mills. Washington, D.C.: U.S. Census Bureau. September, 2000. Online. Available at: <http://www.census.gov/hhes/www/hlthin99.html> [accessed Jan. 22, 2001].
- U.S. Department of Commerce. *The Emerging Digital Economy II*. Washington DC: Economic Statistics Administration, Office of Policy Development, 1999. Online. Available at: <http://www.ecommerce.gov/eds/report.html> [accessed Sept. 19, 2000].
- . *Falling Through the Net: Toward Digital Inclusion. A Report on American's Access to Technology Tools*. Washington DC: Economics and Statistics Administration; National Telecommunications and Information Administration, 2000. Online. Available at: <http://www.ntia.doc.gov/ntiahome/digitaldivide/> [accessed Sept. 19, 2000].
- U.S. Food and Drug Administration. Figure 3-2: Mean Approval Times for New Drugs, 1987–1999. *2000 Pharmaceutical Industry Profile*. Washington DC: Pharmaceutical Research and Manufacturing Association, 2000.
- Vinicor, Frank, Stuart J. Cohen, Steven A. Mazza, et al. DIABEDS: A randomized trial of the effects of physician and/or patient education on diabetes patient outcomes. *Journal of Chronic Diseases* 40:234–56, 1987.
- Von Korff, Michael, Jessie Gruman, Judith Schaefer, Susan J. Curry, and Edward H. Wagner. Collaborative Management of Chronic Illness. *Ann Int Med* 127(12):1097–102, 1997.
- Wagner, Edward H., Brian T. Austin, and Michael Von Korff. Organizing Care for Patients with Chronic Illness. *Milbank Quarterly* 74(4):511–42, 1996.