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Empowered Consumers

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People play a critical role in achieving health for themselves, the people they care about, and the communities within which they live. Consumers of health services create and maintain healthy lifestyles, develop healthy communities, and, in collaboration with healthcare professionals, manage disease and its recovery. Similar to their professional counterparts, lay people engaged in health care also benefit from informatics solutions that permit them ready access and judicious application of health information, clinical recommendations, and interpersonal support. The purpose of this chapter is to characterize lay people as patients and consumers of health services, examine their recognized and implicit roles in health and health care, and explore how consumer health informatics (CHI) innovations support an empowered, engaged consumer.

An ideology of empowerment—granting of power to a dependent group or enhancing an individual's ability for self-determination—pervades contemporary American culture. CHI proceeds from this ideology and, in turn, facilitates its realization in health care. CHI innovations provide information about their health concerns, assist consumers in finding others who share their concerns, and afford them platforms to promulgate characterizations of health problems that are more person-centered rather than industry-centered. CHI innovations also help consumers navigate the complex healthcare system and access the professional recommendations and evidenced-based practice guidelines that aid in disease management. CHI innovations have the potential to support knowing participation in healthcare practices. In this chapter, we explore ideas central to collaboration in health care, examine the roles of lay persons, and evaluate the rich, ever growing set of informatics innovations for the extent to which they empower consumers to take charge of their health and actively participate in decisions about healthcare delivery.

Collaboration in Health Promotion and Disease Management

Accomplishing personal and population health objectives and the goals of healthcare delivery requires the active participation of many individuals, including clinicians, research scientists, healthcare administrators, policy makers, and financiers. Lay persons play a central role in the health and healthcare process, not only as the identified recipients of professional health services but also as initiators of positive personal health behaviors, who organize and manage home-based care for themselves and others, and as citizens engaged in the collaborative practices such as proper sanitation and clean air promotion that ensure the health of their communities. Philosophies of

partnership and consumerism aptly characterize the active, engaged roles assumed by lay people as they join with health professionals to set and accomplish healthcare goals.

Philosophies of partnership and consumerism reflect the ideological shift among health professionals and policy makers, and lay persons themselves, in the ways lay persons are perceived to participate in health and health care. Partnership expands the roles of patient from the once widely accepted connotation of dependence, passivity, and compliance to one of active engagement. Considering lay persons as *partners* with healthcare providers shifts the balance of power for decision making and choice from one clearly situated within the purview of skilled professionals with specialized knowledge to one arising from a clinical alliance characterized by shared expectations, mutual problem solving, and joint decision making. Experiences within the mental health sector demonstrated that active engagement of patients in planning and carrying out treatment resulted in outcomes far superior to those arising under more traditional, clinician-directed care [1] and led to a reconceptualization of patients from passive recipients into actively engaged clients. This change in perception spread throughout the entire healthcare sector, resulting in a shifting of the concept of patient from one who receives care to one who actively participates in care options.

Consumerism emerged in the 1960s as a social movement characterized by the right to act based on informed choice, active participation, and full engagement in critical processes. Rights may be granted by one group holding power in a situation or marketplace to another, or may be wrested from those holding power by those desiring participation. Both pathways are evident in the history of health care. Consumerism results in a redefinition of what constitutes participation and who has rights to information, as well as what information is considered central and relevant.

We restrict the term "patient" to the roles assumed by lay people engaged in a care partnership with a specific health professional. This relationship is characterized by mutual respect, commitment to shared goal setting and treatment planning, and an accountability of both parties for the treatment plan and its implementation. "Consumers of health care" are, broadly, all persons, sick or well, who seek information and take action in accord with personal preferences, life situations, and individual health goals, and may, but do not always, include a specific relationship with an identified healthcare provider.

The shift in naming lay persons from patients to consumers reflects not only a perceptual change but also the real changes in the distribution of work in health care that shifted from a professional model of service delivery to a collaborative model of care engagement. Care migrated from the hospital and clinic to the home and community, spurred on as much by financing incentives such as prospective payment as by the evidence that community-based care augmented and could even be superior to institution-based treatment. This changing of the care site vested more responsibility in lay people to take on some of the work once viewed as solely a professional pursuit, such as monitoring health status and delivering clinical therapeutics. Thus, achievement of health and accomplishment of healthcare goals rests not only on the ministrations of health professionals but essentially also on the active participation of patients and informal caregivers.

Expansion in the connotation of patients and recognition of their essential contribution to ensuring the accomplishment of healthcare goals occurred concurrently with rapid growth in society's and sciences' understandings of health, disease, and therapeutics. Recognition of the role played by heredity and a lifetime of health behaviors led to the realization that accomplishing health goals rested not only on the judgments

and actions that occurred during an encounter with a professional but was also found within the everyday choices and behaviors in the life of each individual. Therefore, information needed by consumers to create and maintain health, and recover from disease, needed to address not only those dimensions relevant in the health service encounter but also those practices and choices that, made in the course of everyday living, were most likely to lead to long-term well-being.

One more change in the healthcare milieu contributed to the expanded role of lay people, and consequently to expansion of their information needs. Despite growth in understanding of the biological basis of illnesses, personal preferences assumed increasing importance as guides for the selection of treatment choices. Increased sophistication in therapeutics now can present patients and clinicians with several equally appealing treatment approaches that differ in factors related more to individual preferences and values than to physiological considerations. For example, in selecting cancer treatment approaches, consideration of the patient's willingness to tolerate certain side effects may shift the intervention choice toward one approach over an equally effective but potentially more noxious alternative. Only through exploration of patients' values and preferences can these considerations be understood and meaningfully applied to the clinical decision. Thus, in addition to factual information about disease etiology and treatment options, people need strategies that help them reflect on the meaning of illness and the consequences of its management in their lives. CHI innovations provide great assistance in this arena. Careful understanding of the nature and context of consumers is essential in the design and deployment of CHI innovations.

Who Are the Consumers?

A perspective on health and health care that encompasses health-promoting lifestyles, healthy communities, active participation in health care, and clarification of personal values necessitates consideration that all persons, sick or well, hold vested interests in health, health care, and health information and therefore are constituents of CHI. Critical characteristics of these constituents, such as their ages, genders, ethnic and cultural identities, and socioeconomic situations, influence their health states, their access to health care, and the ways they are likely to use CHI innovations [2–4].

"Consumer" is not a uniform characteristic of all people; rather, consumers are distinguished by their very diversity. Clearly, some consumers act in self-interest, making choices and engaging in health-enhancing behaviors. Some constituent consumers, such as parents, informal caregivers, and friends, act as *agent*s for others, advocating for their needs, ministering personal care services, and seeking and interpreting information for them. Thus, the phrase "consumers" refers to a rich and diverse collection of individuals with a self-defined need for health information and role in ensuring the accomplishment of their own health goals or those of others.

For most people, health concerns and the need for health information occur at home, away from the resources and supports of healthcare institutions. Fear and questions may arise unpredictably at times when health professionals are unavailable. Concerns arise regarding managing illnesses and the accouterments of care in the context of family living environments. Home-dwelling consumers thus integrate their health practices and healthcare experiences subject to the influences of the structure of their environments, the social rules of living in their community, and diurnal variation of their lives [5]. CHI innovations are used in these contexts, capitalizing on and competing

with the resources and tenor of environments much different from the typical health-care situation.

Contemporary consumers are "wired" consumers. Approximately 125 million Americans have access to the Internet, and about 80% of these have sought health information at least once [6]. People of all ages, including children and elders, access health information on the Internet. Women are more likely than men to seek health information on the Internet, and the promise of privacy makes this medium particularly useful for those who prefer to explore health concerns in private. Although many consumers need information about specific medical conditions or health concerns, others look for information about health insurance, health promotion, and the quality assessment of their local hospitals and clinicians [7]. Thirty to forty percent of consumers have Internet access from their homes; the remainder use public computers connected to the Internet from schools, libraries, and workplaces. Unlike electronic mail or online telephone directories which are accessed almost daily, consumers look for health information on an as-needed basis.

Achieving personal and community health goals, and ensuring full value of modern therapeutics, relies on the active engagement of consumers. The Internet has promise to reach all citizens where they live and work, and, importantly, where they encounter health concerns and must cope with health problems. Yet, although the Internet and a host of contemporary technologies provide content, skills training, and linkages with others who share similar concerns, technologies in and of themselves are not empowering—empowerment emerges from the ways the technologies are used by the people they are designed for and the healthcare professionals who serve them.

Empowerment: Using Technology to Enhance Consumer Participation in Health and Health Care

Empowerment is a characteristic of groups and individuals that energizes them with the knowledge and confidence to act in their own behalf in a manner that best meets identified goals. Closely aligned conceptually with consumerism and assertiveness, empowerment is distinguished by its contextual nature—that is, empowerment emerges not in a vacuum, but as a realignment of a power structure in which power, once vested in one group or person, becomes claimed, and even shared, by others. Empowerment results in a redefinition of concerns, infusing once dominant paradigms of thought with the values and perspectives of new groups or individuals. Empowerment is visible through the actions and rhetoric of those involved. These actions and visibility occur on the level of both public health (the health of communities and groups) and personal health.

Public health empowerment can best be seen through the actions of self-help groups and collectives who claim the right to define health concerns in terms of those most affected by them (such as mentally ill persons or the elderly) rather than those who seek to care for them. Communities and collectives participate as equal partners with governments and the healthcare industry in setting health priorities and investing in community-level health enterprises. Melville [8], citing a political science view of empowerment, identifies five key dimensions of empowerment: information, access, choice, representation, and redress of grievances. Thus, *social groups* who are empowered have information about health concerns, access to and choice among resources, representation in decisions about the structure and deployment of those resources, and redress for their concerns regarding how resources are used. CHI innovations that

provide comprehensive information about health concerns, support access and choice, and strategies for engaging in the dialogs needed for representation in decision making and redress of concerns facilitate public health empowerment.

The ideology of empowerment of *individuals* also provides a useful starting point for examining how CHI enables consumers to actively manage their own health concerns and participate in their own health care. On an individual level, empowerment is "...a social process of *recognizing*, *promoting*, and *enhancing* peoples' abilities to meet their own needs, solve their own problems and mobilize the necessary resources in order to feel in control of their lives" [9]. In this sense, then, empowerment characterizes the manner in which patients and clinicians approach care, with mutual expectations, rights, and responsibilities. Empowerment represents a change in philosophy for both care providers and patients alike, requiring the former to abandon the authoritative control once held and the latter to assume a greater level of deliberate self-involvement in the care process.

Empowerment does work; there is good evidence that coaching patients using empowerment strategies leads to broadened, less pejorative definitions of illness as well as improved self-management by lay persons. However, without concomitant responses from care delivery systems, and clinical providers themselves, the benefits of empowerment are unlikely to emerge [10].

For consumers to be fair and equal participants in empowered partnerships with clinicians requires that they have adequate knowledge; set realistic goals; access systematic problem solving, coping, and stress management tools; obtain social support; and maintain self-motivation. In turn, clinicians and care delivery systems must bring to the situation a commitment to collaboration, content, and communication strategies; attention to the comprehensive needs of the individual; confidentiality; and continuity along the care concerns of the individual [10]. Although some dimensions of empowerment emerge only in the interpersonal context of care, information technology, specifically CHI innovations, can ensure the ubiquitous availability to society and lay persons of the tools and communication channels necessary to support empowerment.

CHI, the deliberate application of medical informatics technologies to serve the needs of lay persons, proceeded from many philosophical origins [11,12]; regardless of the implicit or explicit motivation of the initiators, CHI innovations have the capacity to support empowerment of lay persons in managing their own health concerns and acquiring the necessary healthcare resources to achieve health goals. The information technology requirements to support empowerment include four key functions: access to comprehensible, reliable, and relevant health information; communication with peers and professionals; access to personal care management tools including self-monitoring and decision support systems; and ubiquitous access to clinical records. The past 20 years has witnessed a plethora of experimental and prototype Internet-based resources that attempt to fulfill these requirements.

Consumer Health Informatics as a Means Toward Empowerment

Almost since the Internet began, lay people and their family caregivers have looked to exploit its capacities to achieve health and healthcare goals. The Electronic Grandparent project of the mid-1970s used simple terminal connections to link elders in a senior center and children in a daycare center, promoting intergenerational communication [13]. In 1982, the Cleveland Free-Net opened as an experimental use of early

electronic bulletin board technology designed for rapid consultation between family medicine trainees and their off-site faculty mentors. Unexpectedly, lay people learned that they, too, could post questions and have them answered by the family medicine experts. By 1985, in San Francisco, there were more than 25 public bulletin board services for people with AIDS, allowing those coping with this complex, emerging disease easy access to peers who could offer self-management advice and the few professionals who had some knowledge about how to treat an unusual health problem. The 1990s witnessed rapid growth in the deliberate use of Internet-based systems designed to promote self-management and educate consumers about health, wellness, healthcare options, and disease management strategies [14,15]. The widespread availability of the World Wide Web led to the creation of health-related Internet resources (health-related Web sites), ensuring direct access by consumers to professional and research biomedical literature and to commercial health information management providers, such as WebMD®. Recent developments in Web-enabled access to clinical records systems provided an opportunity for healthcare systems to provide patients with access to their clinical records, thus expanding the portfolio of CHI tools.

Key Types of Consumer Health Informatics Innovations

CHI encompasses a variety of applications of Internet-based computer technology employed to meet the information, self-care, and health service participation of patients, family members, and well persons. CHI tools are used to deliver advice and instruct professional support and include health-related Web sites and mobile/wireless computing tools. These also allow patients to record and sometimes analyze relevant clinical concerns. Some CHI applications assist patients in making complex decisions [16] while others provide coaching and advice on clinical management of patient problems [17,18].

Interactive health communication technologies (IHC) is the term employed by the Science Panel on Interactive Communications Technologies (SciPICT) to encompass the variety of Internet-based CHI innovations [19]. IHCs include health-related Internet resources, specialized Internet-accessible clinical care services, and Internet-supported communication and information management with care providers. The SciPICT called for rigorous evaluation of these innovations to determine their effects and likely benefits for consumers. Field evaluations by several groups demonstrated that IHCs are acceptable to many types of consumers and do have demonstrable benefits, including greater knowledge about their health concerns [20], improved decision making confidence [21], symptom relief [22], and changes in the way consumers access and use health services [2]. Here we summarize three types of IHCs and examine their contribution to empowering consumers and engaging them in healthcare practices: health-related Web sites, experimental Internet-based health services, and integrated clinical information systems access.

Health-Related Web Sites

The advent of the World Wide Web (WWW) created easy access to vast stores of health information. Health-related Web sites appeared almost immediately as the WWW emerged. Health-related Web sites characteristically include factual information about health concerns and how to manage them, advice from health professionals, and communication resources that permit conversations among persons sharing common con-

cerns. Health-related Web sites may be sponsored by professional societies, healthcare providers, and self-help groups. The content ranges from general-purpose health portals that encompass many health problems to highly focused attention to a single disease, syndrome, or concern.

The public health community—government agencies, public interest associations, and activists—employ the Web for a variety of uses. Web sites become gathering places for groups sharing like concerns, enabling unrestricted public dissemination of information and open public debate regarding concerns and community issues. Public Health authorities use the Web to alert citizens of public health concerns and public health warnings [23]. Robust tools such as hyperlinks and discussion groups allow rapid integration of diverse content and easy integration of diverse viewpoints.

Other health-related Web sites provide information related to an individual's experience of health and health care. Healthcare providers, clinicians, and even lay people themselves create Web sites that address the concerns related to specific diseases or conditions and make those sites available to the general public through the Internet. Individuals use network computers to access these health-related Web sites and locate the sites through many pathways—queries initiated from general search engines such as *google.com* or *yahoo.com*, direct referral to the Web site address from colleagues or recommendations of clinicians, or happenstance and browsing.

Consumers report an increased sense of confidence gleaned through obtaining health information from Web sites. Consumers consult health information on the Internet in preparation for visits to their clinicians and report discussing this information with their clinicians. Clinicians vary in their responses to consumer-directed consultation of Internet health sites, with some discussing and clarifying the consumers' information with them and others discouraging this type of exploration.

Some challenge the value of health information on the Internet, noting that consumers may find information that presents inconsistent or confusing results or that simply may be wrong [24]. Others argue that consumers may be only better informed but no more powerful in accessing health services or applying the information in their own care [25]. Some evidence suggests that consumers have difficulty selecting appropriate search terms to locate relevant health information, and coping with differences between "lay language" and professional terminology poses significant challenges for lay people [26]. However, consumers seem undaunted when faced with the multiple results of imprecise searches, demonstrating willingness to sort through a large number of results to find information of interest [27] and showing the ability to discriminate between credible and unworthy information.

Experimental Internet-based Health Services

Although health-related Web sites provided electronic gathering places for persons with like concerns to obtain information and peer support, their use remained limited to motivated individuals who had the technological resources and personal persistence to locate and to access them. Systematic demonstration that Internet-based health services could empower people to act effectively on their own behalf required careful field experimentation with targeted groups.

Experimental Internet-based health services provide a core set of services (e.g., condition- or disease-specific information, communication with peers and professionals, and self-management tools) to a specific sample representing a key population. Key distinctive factors of these initiatives lie in their use of controlled field experimental procedures to determine what effects can be directly attributed to the intervention.

Thus, these experimental innovations are similar in structure to health-related Web sites and can capitalize on their acceptability but, because of the sophisticated experimental design and observation strategies, offer a strong advantage to understanding how these systems are used and greater explanation of the benefits and consequences of the use of IHCs.

Brennan's ComputerLink projects (ca. 1988–1992) and HeartCare initiative (1995–2003), Gustafson's CHESS project (1992–present), and Safran's Baby CareLink stand as exemplars of experimentally tested Internet-based health services designed to complement or augment available healthcare resources. The results of these early experiments were largely positive, demonstrating that providing lay people with access to health-supportive computing resources in the home improved self-care, enhanced well-being, and reduced reliance on traditional health services.

The Projects

Home access to health-related resources predates the World Wide Web. In the late 1980s, Brennan's group designed and deployed ComputerLink, a specialized computer service designed to promote self-care and peer communication among home-bound persons and their family caregivers. Targeting two groups, persons living with AIDS and caregivers of persons with Alzheimer's disease, the two ComputerLinks were similar in design (information, communication, and personal management tools) and were deployed over a 6- to 12-month period with the identified groups [28]. ComputerLink had differential effects on consumers, with the greatest benefit accruing to female caregivers who did not live with the care recipient [29].

Capitalizing on improved technology, Brennan's group developed HeartCare [18], a specialized Web site that included tailored, sequenced information guiding patients through the first 6 months following surgery, private communication with other patients and with a clinical nurse specialist, and a public bulletin board. Patients recovering from coronary artery bypass graft surgery used WebTV® to access HeartCare. A tailoring program, launched when the patient accessed the site, created unique, personalized interfaces and directed the patient to information relevant to his or her point of recovery (Figs. 2.1 and 2.2).

Gustafson and colleagues developed the Computer Enhancement and Social Support (CHESS) system [4] to provide specific assistance to persons facing complex health crises. The system included searchable knowledge bases, text and video presentation of interviews with persons sharing the same condition, and tools for decision assistance and values clarification. Targeting persons with complex, life-threatening problems (persons living with AIDS, women diagnosed with breast cancer, families of children with asthma), the CHESS team deployed the computer tools for information access, social support, self-exploration and values clarification, and decision making assistance.

To support families of children born at a very low birth weight, Safran's team created Baby CareLink [30] (Fig. 2.3). Baby CareLink employed a hospital-based Web site and an interactive video connection between the neonatal intensive care unit and the family's home to provide up-to-date information about the baby and general advice about caring for a prematurely born child. Family members could use the video link from home to visualize the hospitalized child, observe care being provided, and interact with nurses and other care providers. On discharge of the baby, the video linkage allowed in-home conferencing and coaching, supporting the family through the transition from hospitalized care to home management. Major findings of the study included
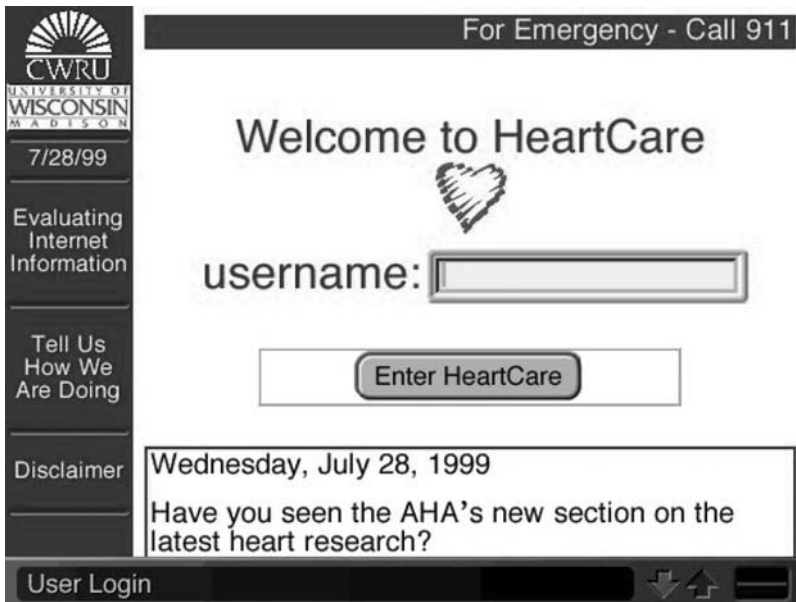
FIGURE 2.1. Web TV Device and Display.

FIGURE 2.2. HeartCare Opening Screen.

FIGURE 2.3. Baby CareLink opening screen.

improved parent satisfaction with care, greater communication and coordination between the family and the hospital care team, and slightly shortened length of stay for the baby. Today, Baby CareLink operates without the two-way video in 13 hospitals in 8 states [31].

Making self-care information available on the WWW has been shown to be useful to various patient populations in managing their own health concerns. Works of Brennan and colleagues, Gustafson and colleagues, and Safran and colleagues demonstrate that CHI applications are far more complex than simply posting health information on the Web. Brennan's work emphasized self-care and personal management of chronic or acute disease processes. Recently, Brennan's group demonstrated that clinical gains accompany the personal satisfaction and competence experienced by computer network users. Gustafson's CHESS projects provide patients facing health crises with clinical advice, peer experiences, and the opportunity to consult experts. Important successes include reduced negative mood, reduced time spent in health services, and a greater sense of control. Evidence exists that appropriate use of technology decreases health service utilization and promotes timely and appropriate healthcare visits. Problematically, most technology interventions occur independent of, in parallel with, but not integrated within, the clinician–patient relationship. Safran's work stands alone in its demonstration of the application of consumer electronics to extend hospital services directly into the home. Although clinical outcomes of the babies in the Baby CareLink conditions were equivalent to the outcomes of those receiving standard care,

families experienced greater satisfaction and confidence in their ability to perform necessary care activities.

The experimental Internet-based health services offer strong support for the concept of technology-empowered patients. These innovations reach underserved persons who have needs not typically addressed in contemporary health care. More importantly, they provide access in the home over long periods of time to the kinds of information, peer support, and skill-building tools that strengthen lay peoples' abilities to participate meaningfully in health care. The full value of these experiments will be available to consumers, the healthcare systems, and lay people when their functional components become linked with the clinical information systems used during formal care services.

Integrated Access to the Clinical Record

With the exception of Baby CareLink, most CHI interventions coexist with, but do not directly integrate with, the formal care delivery resources used by individuals. Healthcare systems and hospitals are now experimenting with providing patients access to their clinical records, to information resources specially screened by the facility, and to care management functions such as secure communication with clinicians or appointment scheduling [32]. An important benefit of these systems is direct access to clinical reports, such as laboratory tests and recent diagnostics.

Columbia Presbyterian Medical Center developed PatCIS, a patient-accessible view into the clinical record [33]. Accessible through standard Web browsers with appropriate encryption and security, PatCIS enables patients to view clinical tests and report self-monitoring information (Fig. 2.4). PatCIS also contains links to relevant health information resources that aid the patient in understanding and interpreting the clinical information. Specialized tools allow some patients, for example, those with diabetes, to chart daily food consumption, home glucose monitoring results, and exercise patterns and to view this information in a manner linked to their clinical records.

Direct access by lay persons to their clinical records aids empowerment in several ways. First, it facilitates balancing of power between patients and clinicians by ensuring that patients and clinicians have access to the same information. Second, it permits patients to review clinically relevant information privately in a circumstance likely to be more conducive to reflection and understanding. It permits disclosure and discussion of the basis for clinical intervention decisions. Finally, by its very existence, consumer-available views on the clinical record demonstrate the commitment by the care-providing facility and the clinician to include the patient as a full partner in clinical decision making (Fig. 2.4).

Discussion

The migration of health care from the clinic to the community, coupled with the rapid diffusion of commercial electronics, contributed to the development of the field now known variously as CHI, e-health, or patient-focused computing. Thus, carefully designed and properly deployed electronic innovations for lay people may enhance the engagement of health professionals and lay persons now well recognized as the optimum environment for health care. Experimental systems and practice innovations in CHI show that lay people can and will use computer tools for health purposes, that this use leads to good health outcomes, and that linking consumers, health information,

FIGURE 2.4. PatCIS Data Entry Example.

and healthcare providers via systematically deployed CHI innovations facilitates achievement of health and accomplishment of healthcare goals in a way not feasible by the singular efforts of consumers, clinicians, or computers.

It is timely to realign the application of computer tools to patient care in such a way as to ensure that the technologies be systematically applied in a manner most likely to produce desired health outcomes. Philosophies of care provide likely candidates for creating frameworks for the effective deployment of information technology in the service of patients attempting behavioral change or disease management.

The early experiences of lay persons' capturing of the Internet for health purposes persist today—the Internet serves as a vehicle for educating individuals about health problems, linking those coping with complex health problems to others in similar circumstances, facilitating consumer-directed access to up-to-date health knowledge bases and disease management routines, and connecting patients to their clinical records and care providers. What is changing are two things: the underlying technological capacities for ubiquitous access and complex searching and the capacity of clinicians to systematically exploit for clinical care purposes consumers' willingness to use the Internet for personal and public health management.

It is time to move the discussion beyond the feasibility of using emerging technologies to improve lay people's accesses to health information and health communication. Now the challenge to health professionals and medical informatics professionals alike is embedding these emerging technologies into a care system grounded in a philosophy of engagement [34]. Engagement ascribes to the patient–clinician alliance those characteristics that ensure a commitment to joint efforts toward the person's goals of health promotion or disease management.

The quality chasm and emerging healthcare personnel shortage need sophisticated information solutions to replace the naïve view that simply providing WWW-based health information would lead to improved disease management and adherence to healthy behaviors. Full engagement of informed, empowered consumers with the health professionals and healthcare delivery systems requires creating CHI innovations within new clinical care approaches, augmenting and complementing care delivery models with electronic innovations.

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