Health Care Technology Assessment: Implications for Modern Medical Practice.

Part II. Decision Making on Technology Adoption

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Abstract

Health care technology assessment, the multidisciplinary evaluation of clinical and economic aspects of technology, has come to have an increasingly important role in health policy and clinical decision-making.

In Part I—Understanding Technology Adoption and Analyses—this review addressed the difficult challenges posed by assessment and provided a guide to the methodologies used. Part II presents the factors that drive the technology choices made by patients, by individual physicians, by provider groups, and by hospital administrators.

Evaluation and adoption of health care technology (HT) impinge on care delivery in numerous ways. Although some choices are made at the national or regional policy levels, many decisions are made locally by patients, individual physicians, provider groups, and hospital administrators.

The Patient's Perspective

On the whole, patients in the United States have enthusiastically supported adoption of new medical technologies and have generously funded medical research because they are hopeful that innovations will improve care. The faith of the US public hinges on the perception that technologies adopted since the 1950s are noninvasive or less invasive than previous methods, are more effective, and can be performed on an outpatient basis, thereby decreasing the pecuniary and nonpecuniary costs of prolonged illness and hospitalization.[24]

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Am J Orthop. **2007;36(2):71-76.**

Part I appeared in *Am J Orthop.* 2007;36(1):11-14.

Sociopolitical Forces. Various sociopolitical forces have increased patients' appetite for HT over the past several decades. One factor is vastly increased media coverage of health topics, medications, and devices.[25] Health reports have become a staple of TV news broadcasts, and very frequently the content addresses emerging technologies that promise improved care. Television advertisements, periodicals, and the Internet provide ubiquitous pharmaceuticals publicity. Citizen-run campaigns to finance research increase awareness both of illnesses and of the very best technologies available to those afflicted.[25]

Consumerism. A second factor is the expansion of consumerism into health care. Many patients now arm themselves with information regarding their ailments and the available therapeutic options, in part because numerous sources of medical information and testimonials are publicly accessible. The quality of such data varies, and misinformation is common, leading to subsequent frustration on the part of patients and clinicians.[26] Nonetheless, patients increasingly seek providers who will explore treatments discovered by patients online rather than offer a nonnegotiable care plan.[25] Patients also have demanded that their alternatives be optimized: Diagnostic approaches must be more precise, provide greater information, and be less invasive, and interventions should be safer, more convenient, and faster.

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Third-Party Payment. The clamor for HT in the United States is supported in large part by third-party payer mechanisms. Research has demonstrated that patients seek physicians who signal excellence through use of expensive HT.[27] However, employer-sponsored and federal health insurance programs shelter individuals from the true costs related to adoption and use of such technology.[15] The result is "moral haz-

ard"—behavior based on lack of exposure to the full cost of decisions—which paradoxically tends to increase national expenditures on health care over time rather than promote efficiency and reduce costs, as in other industries.[15,28]

Recent advances in cardiac care offer an instructive example. In 2003, Cutler and Huckman[29] found that introduction and use of percutaneous transluminal coronary angioplasty (PTCA), a potential substitute technology for extremely costly coronary artery bypass graft (CABG) surgeries, actually increased total expenditures for heart care nationwide, despite costing less per procedure than CABG. By the end of the 1990s, 25% to 35% of PTCA procedures were substitutes for CABG procedures. However, a combination of generous insurance coverage for PTCA costs, advertisements by medical centers and device manufacturers, and enthusiasm among cardiologists encouraged many patients with noncritical heart disease to undergo angioplasty, when before they would have avoided costly and invasive coronary procedures altogether. For these patients, PTCA brought improved quality of life at relatively low personal cost, but the health care system paid more in aggregate.[29] This phenomenon has contributed to debates about whether and how patients might bear more of the real cost of health technologies in the future.[30] Health care technology assessment (HTA) should be a part of these discussions, as careful cost–benefit analysis could show that the PTCA experience was in fact a rational development rather than genuine overconsumption of resources.

The Provider's Perspective

A clinician's ability to alter diagnostic and treatment approaches as new technologies emerge depends on access to information about the clinical value and profitability of new tools and practices.[31] For physicians, this evaluation is usually straightforward: Have I found a good reason to change my practice? Which new tool should I obtain, what skills must I learn, or both? How much time and money must I invest? What will be my return (ie, how will I be reimbursed)?

Several well-studied factors influence physicians' technology adoption habits.

Provider Characteristics. Personal characteristics have an important role, with advanced professional training, increased specialization, and a scientific orientation positively correlating with earlier technology adoption.[32] Access to information is likewise important: Physicians with many journal subscriptions, close ties to medical organizations beyond their local region, and a high degree of social integration within the medical community are more likely to adopt compared with peers who have fewer subscriptions and looser ties with professional organizations.[31]

Medical Turf Wars. Competition between physicians for patients and related revenues—a kind of medical turf war—also drives adoption. Barros and colleagues[27] argued that providers invest in technology, often excessively, as a way to "signal" their intrinsic and unobservable quality to patients, who conjecture that providers displaying newer technologies and special certifications are more qualified than their peers. Providers who purchase impressive, state-of-the-art HT can advertise themselves as experts within their region or community, thereby increasing market share and their own prestige, but also increasing the pace of technology investment.[32]

Desire for professional advancement, including financial gain and enhanced reputation for providing high-quality care, is also influential. Clinics frequently adopt a new technology because it will permit them to improve patient care, recruit and retain high-quality staff, conduct research, or augment revenue through billing for the new service.[33]

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This last category, financial incentives, shows particularly strong correlation with adoption and use among providers in the present era of declining reimbursements for services.[33] Implementation of a prospective payment system for provider services, managed care environments, and the 1997 Balanced Budget Act, which effectively lowered Medicare reimbursement rates, have frequently discouraged physicians' HT adoption and utilization. By decreasing payments, payers can alter the profit expectations of health providers and reduce their cash reserves, thereby diminishing incentives for rapid adoption. Health plans can also strategically award contracts to lower-tech, lower-cost providers, thereby devaluing the reputation of clinicians and groups that use expensive technology and limiting patient access to such high-tech care.[34] On the contrary, when reimbursement rates are high, physicians move quickly to acquire and use technologies. The frequent use of endoscopy throughout the 1990s is a telling example: Data showed that endoscopy was overused, but these data did little to curb use of procedures at the time because reimbursements remained high.[35]

Decision-Making Heuristics. What is arguably the most important determinant of technology acquisition and use among physicians—efficacy—has little to do with economics, cost, or reimbursement but rather with patient care. The goal of medical care and research, at their core, is to improve treatment of disease. Caught between imperfect data and enormous consumer demand, physicians must choose among

technologies that may improve patient outcomes. In doing so, they rely on decision-making heuristics developed during training and practice to simplify information processing. These heuristics tend to underemphasize cost considerations.[27] From an HTA perspective, this underemphasis creates a gap between the provider's private valuation of technology and its true social value, thereby leading to escalating health care spending. The resultant inflation has led to efforts at cost containment in US medicine.

The Health Care Manager's Perspective

Like individual providers, managers of health care delivery systems also carefully examine how medical innovations will affect patient care. However, managers must also directly contend with considerations that clinicians often overlook—at times leading to disagreement over technology appraisal, adoption, and use.

Financing

One leading concern for managers is financing—specifically, whether a given technology will pay for the costs related to its setup and use. When performing HTA, managers therefore strongly emphasize the bottom line and tend to look beyond questions of clinical efficacy to concerns about purchasing negotiations, contracts, and payments. Sufficient payment for technology use is increasingly important in the current practice climate, as the majority of reimbursements for many health care groups comes from Medicare and Medicaid, or private third-party payers such as Blue Cross, which frequently determine their reimbursement schedules based on the federal payers.[36]

In an ideal world of perfect information, predictable policies, and accurate economic models, such financial planning would simply be a matter of diligently analyzing the present net value of an investment and negotiating fair terms on contracts to limit costs. However, determining whether an innovation will pay for itself is, in fact, exceedingly difficult. As Hillman and colleagues[32] noted, "there are idiosyncrasies of the health-care marketplace that make the relation between the time of purchase and the financial return an uncertainty." Uncertainty arises in part because of changing (often declining) reimbursement rates and hidden costs of adoption, but also because manufacturers and prospective purchasers frequently do not fully understand the eventual utility of an innovation: Will it quickly become obsolete, or will new uses appear?[32]

In the past, managers could ignore this dilemma, as HT risks and benefits were strictly separated. Before the passage of the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA), acute care hospitals, for example, were reimbursed for all direct costs arising from services to Medicare beneficiaries. Hospitals were also able to bill payers for costs associated with capital equipment, physical plant improvements, and indirect expenses associated with newly adopted medical innovations. In essence, the more an institution spent on technology adoption and use, the more reimbursement it received. Because the economic risks were low, managers could deliver the newest tools and techniques at physicians' request, thereby avoiding direct conflicts with providers and the public.[36] Meanwhile, federal administrators of Medicare were left to deal with the resulting budgetary implications.

Rising health costs undermined this inefficient system. Efforts to share risks arising from HT adoption have resulted in nationwide attempts to limit technology use by reducing physician and hospital reimbursements.[34] This has been accomplished through a prospective payment system, which fixes reimbursements for medical services through diagnosis-related group (DRG) categories and assigns emerging innovations to existing DRGs.[37] However, this approach often fails to cover the true costs associated with HT adoption.[38] The US Department of Health and Human Services[39] recently announced it was establishing a department-wide task force to explore more effective strategies for encouraging innovation and adoption of effective HT.

While many providers have been angrily opposing these changes, health care administrators have been facing the day-to-day challenges of maintaining the financial viability of their organizations. Not surprisingly, profits have moved to the fore in managerial HTA models.[40] Whereas managers formerly ranked enhancement and expansion of clinical programs as leading priorities, many in the 1980s and 1990s began looking for technology to improve efficiency and reimbursements. Often this has meant slowing the acquisition of new technology, retaining assets over longer periods, reducing debt loads used to acquire high-cost devices, and decreasing the scale of new capital projects.[36]

These trends are likely to continue, as the aging of the United States population and technological innovation drive health care costs. Many health care researchers have argued that, as revenues shrink, hospitals, clinics, and provider networks face a future in which they must find other funding for equipment acquisition. In addition, they must use existing equipment to increase profit and reduce costs, eliminate services and devices that produce a net financial loss, decrease technology

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acquisition budgets, and ensure that they wisely invest in "good tech rather than just high tech."[36]

Regulation

While the financing of health care technologies receives considerable attention, health care managers must address a variety of other factors when undertaking HTA. One factor is regulation, such as state laws requiring health care institutions to obtain certificates-of-need from appropriate agencies before making large capital investments,[15] or requirements that certain services or programs provided by academic centers devote resources to medical education and research.

Implementation

Another factor is implementation. If managers find that a given technology is financially and legally feasible, then they must oversee organizational changes that many providers take for granted. For some innovations, new supplies are needed, but changes in service delivery are not. Other technologies require substantial changes in staffing and care delivery processes, establishment of new criteria for clinical privileges, and management of new referrals.[31] Capital investment, in particular, frequently entails special considerations, such as construction and renovation of buildings and development of supporting infrastructure.[36] Because capital budgeting processes are often lengthy and complex, the need for specialized facilities and staff may indeed deter technology adoption, even if the innovation itself is affordable.[33]

Institutional Strategy

Amid these challenges, managers have the additional charge of pursuing institutional strategy. With each potential HT adoption, they must ask whether a new innovation fits with the organization's mission, long-term goals, and position in the regional health care environment.[36] Such strategic leadership is often difficult. In competitive markets, financial pressures can take precedence over disciplined pursuit of HT strategy.[41] In some cases, managers may cut programs or capital budgets to control costs, thereby creating the paradoxical effect of decreasing clinical programs in spite of the fact that health care organizations are in the business of meeting community health needs.[36] In other cases, executives may pursue the opposite strategy—increasing commitment to cutting-edge care in the hope of attracting top physicians, who bring with them patients and reimbursement dollars that can increase revenues and boost institutional prestige.[41] The choice to adopt or not adopt can be a double-edged sword: adopt and face short-term financial costs that may or may not be recouped through more referrals, or do not adopt and risk alienating both highly respected providers, who might refer their patients elsewhere, and savvy patients, who seek out the newest health care innovations. It may come as little surprise that, under pressure from many sides, managers frequently adopt new technologies whenever possible.[41]

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Such adoption may then feed back to redefine an organization's mission by escalating commitment to a certain model of care. For example, the emergence of technologies that allow advanced, complicated care for neonates has resulted in the development of neonatal intensive care units (NICUs).[34] A hospital that chooses to develop a NICU finds itself dedicated to a particular form of high-tech care that becomes a novel asset and liability, as new sets of patients and providers seek referrals, the institution is judged against a new set of peers, and the hospital must change its relationships with payers, physician groups, and local competitors.[32]

Society's Perspective

Outside the scope of the patient–doctor encounter and the health executive committee, adoption and use of medical technologies raises pressing questions on a societal level. Alongside discussions about clinical efficacy and cost-effectiveness, ethical, legal, and political considerations influence debates about diffusion and application of HT in the United States.[14] Of particular interest is resource utilization, along with its relationships to distributive justice, preventive medicine, evidence-based practices, and public expectations about what services health care providers, insurers, and public programs can and should offer.

Health Care Technology Assessment: The Ideal. HTA in the United States has become an integral part of these conversations. Ideally, HTA can point out problems needing technological solutions, examine the use or effectiveness of existing health devices and techniques, be involved in the evaluation of specific evidence-based practice guidelines, and make suggestions for policy changes at local, regional, and national levels. It can entail the assessment of specific technologies within the context of certain regulatory or reimbursement programs, and it can contribute to societal discussion about health care resources. Indeed, this is

precisely the role that national HTA agencies play in many other developed nations.[42]

Health Care Technology Assessment: The Reality. However, HTA often fails to fulfill its potential as a driving force behind rational health policy decision-making in the United States. One reason is that no single organization advises policymakers regarding HTA.[5,11] A second is that the United States does not have a single health care system but rather many subsystems, each influenced by unique financial, sociocultural, legal, and medical factors. Third, HTA in recent decades has failed to recognize the inherent irrationality in the US political process, which seldom sets policies based on scientific data or economic arguments (both central values of HTA).[42] Fourth, HTA analyses are often poorly publicized. Critical information about an innovation may be discussed in a purely scientific article, which influential policymakers never read, or the HTA process can produce useful information months after public political debate has ended and new legislation or guidelines have been adopted.[42]

Despite the shortcomings of HTA, society must continue to answer the question: What if we adopt X? For some innovations, adoption will lead to a new and improved standard of care, but this result will be the exception, not the rule. How the question is answered is important, for even if an innovation is not truly an improvement, removing it and its costs from practice is difficult once implementation is widespread.

Conclusions and Recommendations

The past few decades have seen enormous changes in the way US health care is delivered, evaluated, regulated, and financed. These trends are likely to continue as health technologies and patient demand continue to drive up expenditures. In the future, intelligent management of innovations and related services will require critical evaluation of efficacy, availability, and cost.[1,4-6,36]

One of 3 Options? Some HTA researchers have argued that all societies have 3 basic options for providing health care: high quality and easy access but high cost; high quality and low cost but restricted access; and low cost and easy access but low quality.[34] Although this view of health care resource utilization is simplistic, particularly in the complex US health care environment, it is also thought-provoking. Publications in many fields—medicine, law, management, ethics, public policy, and economics—regularly analyze questions about the US high-tech, high-cost health care system and whether it is both effective and sustainable.[5] Similar discourse occurs in academic, legislative, and public forums. Clearly, many US citizens are concerned that the promise of health improved by more sophisticated, so-called sustaining technologies is straining the public and private resources of even this wealthy nation.[43]

Will Physicians Retain a Central Role in Selecting New Technologies? Stakeholders in US health care will face these questions throughout the 21st century. Already, global budgeting efforts, regional health alliances, calls for universal coverage, and an increasing emphasis on managed care have reshaped thinking and decision making about HT, at times challenging or even marginalizing physicians' historically central role in selecting and using medical innovations.[16,41] The burden now rests on physicians to decide to what extent they will acquire the skills needed to participate more actively in HTA.

HTA is not a perfect solution to present constraints on technology development and resource allocation. Although many countries with national health care systems have embraced HTA in an effort to rationally control health care expenditures,[10] national differences in political culture make the search for a universal approach to HTA unrealistic.[3] In addition, governments around the world have found that expectations about adoption and use of technologies are changed only slowly and tediously.[3] In the United States, physicians will continue to practice in a milieu of defensive medicine, a value system that prizes human life, overconsumption fueled by the tax benefits of employer-based health insurance, and US citizens' demand for the very best care that is available.[34] These pressures will make change difficult. Additional obstacles abound at the political level, where numerous vested interests with competing agendas heavily influence policymaking.[13] Underlying all other factors is public faith in the promise of technological progress, expressed as high demand for medical innovation.[15]

The United States needs more rational approaches to health care resource allocation. The country continues to spend remarkable fractions of its gross domestic product (GDP) on health care.[44] There is also evidence of technology misuse, waste, inefficiency, and deterioration in quality of care for many patients.[45] In part, these problems are a consequence of deficiencies in systematic, careful examination of new technologies.

HTA is the best tool for approaching such challenges. Its application and effectiveness can be improved in several ways. First, funding to support HTA research can be increased with the objective of intensifying, expanding, and integrating current efforts. As health technologies are generally a public good but are often produced through private entrepreneurship, a combination of federally funded programs and incentives for private organizations is needed to encourage more collaboration and sharing of information. Second, the teaching of HTA methods in medical schools, nursing schools, and schools of public health can be supported. Third, HTA efforts can be carefully integrated with existing efforts to foster evidence-based practices and clinical guidelines.[13] Fourth, efforts can be made to develop formal policies requiring integration of HTA consideration into basic research, applied research, and clinical investigation and testing.[35] Fifth, more rigorously standardized principles and techniques can be developed for use in health care economics evaluations, much like the principles followed by the accounting industry and enforced by the Financial Accounting Standards Board in the United States.[22]

Most important, physicians can become involved at every level of formal HTA. Cost-containment measures are a reality of the modern practice environment. Further efforts to curtail HT-related expenditures without obtaining significant input from practicing physicians may result, as Tuman and Ivankovich[46] noted, "in a false economy that limits therapeutic and diagnostic choices for the sake of reducing initial expenditures but potentially sacrifices aspects of quality and outcome of health care."

Becoming involved in HTA is not difficult. Physicians already take economic approaches toward their practices when they budget their time or choose between tests of differing efficacy and cost. Many providers also serve as advisers to the government, as medical chiefs of staff, or as department heads—roles in which they seek to ensure that the resources available for health care yield the maximum benefit.[14] They need only broaden their thinking to consider questions about technology use and enthusiastically seek increasing involvement in HTA.

Authors' Disclosure Statement and Acknowledgments

The authors report no actual or potential conflicts of interest in relation to this article. No support was received from private foundations, corporations, or other institutions. They wish to thank Tom Lee for research assistance and Vanessa Pierce for figure preparation.

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