Technology and Quality: Considerations for Adoption and Diffusion

A Literature Review

Prepared for a conference on

Accelerating Quality Improvement in Health Care: Strategies to Speed the Diffusion of Evidence-Based Innovations

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Convened by
The National Institute for Health Care Management Foundation
National Committee for Quality Health Care
Dear Colleague,

It is our pleasure to provide you with this annotated literature review, supported by funding from the sponsors of this conference. The review is divided into eight categories:

- Quality, Technology and Public Policy
- Regulation and Approval
- Technology Assessment
- Coverage and Reimbursement
- Organizational Implementation – Drivers and Barriers to Adoption
- Physician Acceptance and Utilization
- Clinical Process
- Patient and Consumer Experience

A comprehensive search of the medical technology literature was conducted to identify current research in technology adoption and diffusion. Entries were drawn from peer-reviewed journals with a particular emphasis on publications issued within the last five years. Key search terms included relevant descriptions of medical technological development, adoption, drivers and barriers of technology diffusion and a list of key technologies including those found in “Physicians Views Of The Relative Importance Of Thirty Medical Innovations.” (Fuchs, 2001)

The Health Technology Center research staff collected citations and papers from electronic indices, abstract databases, and medical libraries. HealthTech Senior Advisors made final decisions on the inclusion of papers based on relevance to issues of technology adoption and diffusion and the quality impacts of new technologies. The task of winnowing this body to a manageable review was challenging due to the wealth of available research.

HealthTech has provided annotations for papers that represent key findings and examples in the diffusion of healthcare technologies and a variety of arguments and proposals for policies to govern and propel the diffusion of medical technology. A further bibliography without annotations has been included to provide additional sources for readings regarding technology adoption and diffusion.

We hope that you will find this publication useful. An updated version of this literature review will be available on the Health Technology Center website: http://www.healthtechcenter.org.

Health Technology Center
Quality, Technology and Public Policy

Is Technological Change in Medicine Worth It?

Cutler, DM; McClellan, M, Is technological change in medicine worth it?, Health Affairs (Project Hope), Volume 20, Issue 5, September - October 2001, Pages 11-29.

To assess the relative costs and benefits of technological change, the authors review the findings of studies of medical technologies used for the treatment of five medical conditions: heart attacks, low birth-weight infants, depression, and breast cancer. The studies evaluated costs and benefits at the disease level, not the level of medical spending as a whole. Medical technologies, either as “treatment substitutions” or “treatment expansions”, were considered valuable if the benefits of medical advances outweighed the costs. The authors conclude that technological change was beneficial for four of the five medical conditions; for breast cancer screening, the benefits were roughly equal to the costs. The authors go on to comment on the immediate policy relevance of these findings, suggesting that public policy should shift from its past focus on reducing waste by delaying or limiting the use of new technologies to a balanced policy supporting rapid technical innovation in order to stimulate continued improvements in the productivity of medical spending.

Improving Clinical Decisions and Outcomes with Information: A Review


A review of the literature on the contribution of medical informatics to clinical decisions, quality improvement and the use of practice guidelines finds that the value varies greatly with the type, quantity, and quality of information available. The author describes the paradigm shift in clinical decision-making from the physician as sole decision-maker to a multi-disciplinary team using clinical guidelines. While clinical guidelines lend themselves to the standard CQI processes employed by most hospitals and clinics, there are still multiple barriers to the implementation of electronic medical records in support of CQI, including the fact that most EMRs do not include the data necessary to navigate practice guidelines, and the paucity of formal studies of EMR use. For these reasons, the author concludes, few hospitals and clinicians have realized the promise of quality improvement through EMRs.

Improving the Use of Medical Technology

Willems, JS; Banta, HD, Improving the use of medical technology, Health Affairs (Project Hope), Volume 1, Issue 2, Spring 1982, Pages 86-102.

This article reviews different options for improving policies toward medical technology adoption and utilization. The author states the factors that affect the use of medical technology: 1) the desire of physicians to provide good care for their patients; 2) medical education encourages excessive faith in the efficacy of therapeutic technologies; 3) fear of malpractice; and 4) society prone to seek technological solutions to problems. The goal this article is to improve the use of different technologies by suggesting six possible strategies: 1) guiding biomedical research and technology development; 2) change medical education and therefore physician behavior; 3) developing better information on efficacy, safety, costs, and social effects; 4) strengthening regulatory programs; 5) financing the use of medical technologies; and 6) re-examining the organization of medical practice. Arguments are made in favor of implementing the said strategies, especially in regards to developing better information on efficacy, safety, costs and social effects of certain technologies.
The Evolution of Medical Technology: Lessons from the Burgess Shale


The author proposes that recently developed concepts in the study of evolution could serve as a framework for understanding the emergence of new medical technologies. Analyses of the organisms embedded within the Burgess Shale quarry are cited as an example of this approach to evolution. The Burgess Shale quarry reveals a period of great diversification as a precursor to the emergence of a new stage in evolution. An analogy is drawn to technological innovation, with the examples of equivalent periods of great diversity in early vehicle development and the development of total knee replacements during the 1970s. The author makes the point that in both evolution and diversity there is a period of burgeoning diversity marked by iterations of competing designs that offer little assistance in forecasting the eventual dominant species or design. In the U.S., the evolution of medical technologies is tempered by two systems that attenuate the clinical risks of diverse approaches associated with emerging technologies: regulatory agencies and the tort liability system. The author proposes a "new product category" under the current FDA regulatory system that would match potential patients with new technologies while informing patients about the probability of yet-unidentified risks connected with emerging technologies.

The Diffusion of Medical Technology: Free Enterprise and Regulatory Models in the USA


The author provides a comparison of the diffusion of medical technologies under regulatory and free enterprise models. In each case physician and medical administrator manipulation foster ethical dilemmas and legal challenges. The author provides a historical context for two imaging technologies: CT scanners and MRI devices outlining the influence of certificate of need (CON) requirements and the risks and challenges hospitals faced in meeting those requirements. The regulatory and financial barriers associated with CON engendered financial schemes and arrangements associated with unregulated outpatient imaging centers that clearly created conflicts of interests for physicians. The author identifies and discusses the ethical considerations involved. For both technological cases, facilities entered willingly into the necessary process to meet the regulations but engaged in a business model of free enterprise despite attempts at regulation.

Regulation, Coverage, and Reimbursement of Medical Technologies


This paper, published in 1990, provides a historical context for the regulation (approval) and coverage of medical devices. The author traces the original intentions of the early framework for medical device regulation and the major changes that have occurred in the regulating bodies. The authors characterize the conservative approach of regulatory bodies to coverage and reimbursement for medical technologies, and the significant negative implications of these policies for the diffusion of new technologies. The author acknowledges that to ensure the efficacy and quality of new technologies, these new technologies may be widely disseminated before their long-term safety and effectiveness have been fully established. The author argues that the processes that result in regulatory decisions are relatively more fair and balanced than those supporting coverage and reimbursement, and that the latter is increasingly a deterrent to the diffusion of new technologies.
Technology Assessment

Technology Assessment and the Sociopolitics of Health Technologies


In many countries, technology assessment is an important component of healthcare policy and medical practice. To date, however, technology assessments have not included reference to social, political, or ethical issues. The authors propose that technology assessments should include formal consideration of sociopolitical issues. As an example, the authors discuss review the history of cochlear implants in children, suggesting that the diffusion of this technology would differ if technology assessment included sociopolitical considerations. They define these issues as: 1) the actors or stakeholders that play key roles in technology development; 2) the allocation of resources among groups and individuals; 3) the source and nature of knowledge about technology; and 4) power and authority, and the impact of technology on the freedom of various actors. The authors contend in the cast of cochlear implants, most of the power and information was held by the manufacturers of cochlear implants, which cost between $25,000 and $40,000 per treated child, while health plan and governmental coverage and reimbursement was much less. The deaf community and the children themselves had little power or influence over the manufacturers or the parents of the eligible children. The authors propose that effective assessment of this technology would have incorporated the viewpoints of the deaf community, considered the resource constraints limiting diffusion, and acknowledged the power and drivers involved in technology development and approval.

Quality Assurance and Technology Assessment: Pieces of a Larger Puzzle


The author proposes a framework for improving the process of technology evaluation, suggesting that technology impact analysis should combine technology assessment, clinical epidemiology, evidenced based medicine and quality assurance. The author differentiates technology assessment, which analyzes technology under ideal circumstances in order to prioritize the use of resources, from quality assurance, which identifies problems in the broader application of technology and tests improvements in the use of technology. The history of the development of quality assurance and technology assessment is reviewed. The author further describes the limitations of clinical epidemiology and reliance upon clinical trials, and the lack of studies of the impact of technologies beyond clinical trial settings. Incorporation of quality assurance methods, the author suggests, would add further data on experiences with each technology for analysis. The author points out that recent advances in information technology, and especially the electronic medical record, have greatly expanded the feasibility of the proposed approach. Finally, the author proposes the incorporation of quality assurance methodologies in demonstrations and clinical trials prior to approval, to improve the information base for regulatory review and to assist in the diffusion of technologies that will improve quality.

Managing Medical Technology: Lessons for the United States from Quebec and France


The authors present a comparison of the use of medical technology and technology assessment in the United States, Quebec and France. The historical and environmental background of each system is thoughtfully considered with particular emphasis on expenditures, access, and regulatory mechanisms. The United States system is characterized as a fragmented and uncoordinated system while the Quebec technology assessment program is described as thorough and systematic. The regulatory mechanisms and policy goals of the French approach to healthcare technology are described. Policy recommendations for the regulation
and control of the diffusion of technology in the United States are presented, including methods to discourage inappropriate use, restrict self-referrals, control fraud, encourage institutional sharing of technology, improve anti-trust policies, establish non-payer price controls and public sector quality control, control diffusion through supply-side strategies or market price (demand), protect technology assessment from political interventions, and increase public education about health technology assessment.

**Women, Health, and Technology**


This paper, published in 1993, discusses a series of concerns about the adoption and diffusion of technology, focusing on the adequacy of technology assessments and drivers of technology diffusion that are not related to the potential for clinical improvement. Electronic fetal monitoring (EFM) is discussed as an example of a medical technology that was adopted with marginal clinical benefits. Citing technological drawbacks of EFM and inefficiencies in its use, the author suggests that its diffusion cannot be explained solely by the utility of the technology for the provider or patient. The author asserts that the diffusion of EFM is better explained by its potential future use in research and the development of secondary technologies, including genetic diagnosis and therapy and fetal surgery. IVF technology is cited as an additional example of diffusion explained by potential future applications in secondary technologies, in this case referring to genetic engineering. Other drivers in the diffusion of technologies discussed by the author include economic relationships between providers and developers, and economic development programs intended to foster growth and competitiveness.

**Coverage and Reimbursement**

**Evidence-Based Coverage Policy**


This paper reviews the important role health insurance coverage plays in the adoption of new medical technologies. The author analyzes the principles behind evidence-based coverage policy and how they are applied by two major programs: the Technology Evaluation Center of the Blue Cross Blue Shield Association and the Medicare Coverage Advisory Committee. The speed of adoption and the rise in the overall quality of care are listed as two key effects of evidence-based coverage policies. The author concludes with a discussion of the future of evidence-based coverage policy with rapidly changing technology. The author asserts that although evidence-based decision-making may evolve, the underlying principles, including the need for standards and adequacy of evidence, for coverage decision making will remain.

**Insurance Coverage for Experimental Technologies**

Steinberg, EP; Tunis S; Shapiro, D, Insurance Coverage for Experimental Technologies, Health Affairs, Winter 1995, Volume 14, Issue 4, pages 143-158

The authors discuss difficulties inherent in coverage decisions for emerging technologies, and review policy options to improve these decisions. Current coverage policies are outlined and the social objectives for policies and decisions about unproven medical devices and procedures are explored. The limited data available on the effects of individual technologies during late stages of research and development presents problems for traditional coverage approaches, and delays decisions to cover even potentially beneficial new technologies. The authors present the rationale for the coverage category “investigational and experimental,” a definition based on insufficient data on the net health impacts of a technology. The authors describe the considerations that support changes in coverage approaches, and discuss three policies that could improve coverage decisions in the future: establishing explicit criteria for selecting potentially valuable technologies for special attention in coverage decision-making, sponsoring large multi-center trials to evaluate “special-priority” technologies, and clarifying and improving coverage for clinical research.
The Review Process Used by US Health Care Plans to Evaluate New Medical Technology for Coverage


A cross-sectional national survey of 231 medical directors at private health plans examines the process and information used by health plans for medical coverage decisions of new medical technologies. Participants in the study were asked to respond to questions relating to final decision authority in technology coverage decisions, their perceptions on the quality of evidence used for technologies coverage decisions, and the perceived barriers for making optimal decisions. Although medical directors are almost always involved in the evaluation of new technologies, only 27% of the medical directors possessed final decision authority. Evidence from strong scientific research designs was most frequently cited as the basis for decisions, in contrast to legal or regulatory issues. Medical directors ranked information on new technology from journals, medical society statements or practice guidelines, and opinions of national experts as the optimal sources of information, although less optimal sources such as local experts were often used. For-profit plans were more likely to use national experts than non-profit plans. Randomized trials, meta-analyses, and reviews were considered the best evidence for making coverage decisions. The lack of timely evidence on effectiveness and cost-effectiveness were greater barriers to optimal decisions than legal or regulatory issues.

Technology Coverage Decisions by Health Care Plans and Considerations by Medical Directors

Steiner, CA; Powe, NR; Anderson, GF; Das, A, Technology coverage decisions by health care plans and considerations by medical directors, Medical Care, Volume 35, Issue 5, May 1997, Pages 472-489.

Utilizing the same survey data as their 1996 paper on the review process of US health plans, the authors expand their analysis to consider the variation in health plan coverage of separate technologies as well as the types of considerations used in making these coverage decisions. Medical directors were asked to indicate the current coverage of 15 different laser therapies and then to rank the top considerations for and against coverage. Their responses were then compared to the available clinical information regarding the technologies and health plan characteristics. Coverage for 13 of the 15 laser therapies varied from 20% to 90%. For-profit and indemnity plans covered two more of the different technologies than nonprofit plans and HMOs. The top considerations in favor of coverage were clinical evidence (medically reasonable, reasonable and necessary, increased efficacy, decreased complications), economic incentives (increased cost-effectiveness), and regulatory issues (FDA approval). Legal (denial of coverage may be legally challenged), competitive (what other carriers cover), and compassionate concerns were listed less frequently. The top considerations against coverage were clinical (increased complication rate, experimental nature, alternative technique available, decreased efficacy) and economic (decreased cost-effectiveness). Other considerations listed less frequently included administrative (benefits policy exclusion), economic (potential for increased cost or volume), legal (complications present a liability risk), clinical (difference between efficacy and effectiveness), and regulatory (FDA approval) factors.
Managed Care and Technology Adoption in Healthcare: Evidence from Magnetic Resonance Imaging


An empirical approach is used by referencing different data sources to study managed care and technology adoption in healthcare, namely an AHA survey on hospital adoption of MRIs from 1983 to 1993 and two "censuses" of MRI sites for 1993 through 1995. The article focuses on the effects of technological progress and the adoption of new technologies in light of an increasing managed care presence in this country. As it is widely believed that the majority of health care cost growth over the past 50 years is due to technological change, it is an important topic to research. Laurence C. Baker argues that the increasing presence of managed care has slowed the adoption of MRIs. His research finds that in high HMO market share areas there are consistently lower MRI adoption rates than in low market share areas. Findings also show that more specialized and larger hospitals are more likely to adopt MRI technology. With his focus on this diagnostic, high cost technology, the author argues that managed care may have a significant effect in the adoption of other technologies.

Managed Care, Medical Technology, and the Well-Being of Society


The author presents a review of the literature on the effects of managed care on technology adoption and the implications for patient care, outcomes, and health care costs. The relationship between managed care and technology adoption is detailed, suggesting that managed care has slowed the adoption and utilization of new health care technologies but has not produced negative clinical outcomes for patients. HMO penetration was strongly associated with the decreasing availability of NICUs, for example, and with a reduction in use of revascularization for patients with AMI, but in both cases there was no evidence to support a claim of increased mortality or worse clinical outcomes. There is some evidence that managed care may have reduced some spending on technology, although this finding remains controversial. Most studies of managed care and technology adoption focus on high-cost technologies and services that are likely to be targets of utilization management. The author raises several concerns about the future effects of managed care on technology adoption: 1) That managed care may reduce the adoption of the full set of technologies required to support appropriate care; 2) Managed care may slow the overall development of medical technology and exert upstream effects as market opportunities for new products are reduced; and 3) Managed care may exert financial pressures on medical centers that contribute significantly to new discoveries in medicine. The author concludes that continued attention to the balance between excessive spending concerns and the promise of new technologies is needed.

Medical Technology and Professional Dominance Theory

Greer, AL, Medical technology and professional dominance theory, Social Science & Medicine, Volume 18, Issue 10, 1984, Pages 809-817.

An analysis of 378 physician interviews at 25 US hospitals examines the relations between the physician preferences and the expansion of medical technology in hospitals. The authors identify the four categories of physicians: community generalists, community specialists, referral specialists, and hospital-based specialists. Each group of physicians exhibited different relationships to hospital technology and different degrees of access to resources and organizational influence. Physicians were differentiated by their medical authority, patient leverage, substantive interest and expertise, and organizational role. To construct a model for medical technology decision-making and professional dominance, the author presents three difference decision systems for different types of hospital technologies: medical-individualistic (decisions for individual technology use), fiscal-managerial (technologies which expand or upgrade the service offerings of an
institution), and strategic-institutional (altering the mission of the organization). The author reaches the conclusion that professional dominance plays a significant role only in the medical-individualistic system, and not in the other two systems, which encompass the more far-reaching and costlier technology decisions. The author’s analysis, (1984) offers a framework of decision-making, which would serve as a suitable starting point for examining current physician influence on technology adoption.

The Timing of Medical Technology Acquisition: Strategic Decision Making in Turbulent Environments


This study examines the relative roles of decision-maker influence and environmental factors on the timing of MRI acquisition in hospitals operating in different levels of environmental uncertainty. In 1999, using a questionnaire of hospital CEOs and key decision makers, the authors analyzed responses from 68 Southern California hospitals and 48 Oregon hospitals, reviewing the roles of competition, physician influence, and CEO influence on MRI adoption.

California hospitals adopted MRI technology two years earlier than Oregon, primarily due to a turbulent, highly competitive environment. In California the turbulent environment was more important than the influence of the CEO or the physicians. By contrast, in Oregon, a less competitive environment, the overall adoption of MRI technology was most influenced by the CEO, while the timing of adoption was more influenced by physicians. The author concludes that technology adoption is often a means of controlling turbulent environments, independent of the potential return on investment associated with that technology. The authors also describe the possibility that another way to cope with turbulent environments is to join integrated delivery systems or networks for the joint purchase of technology.

Unrestricted Entry and Nonprice Competition: The Case of Technological Adoption in Hospitals


In this paper, the authors present an analysis of technology adoption as a major contributor to the rising cost of hospital care. Rather than fostering reductions in costs through increased efficiencies, the adoption of new technologies frequently increases costs and decreases the quality of care. This is principally due to market failure that provides incentives for market entry (technology adoption) and creates excess capacity for the technology in a geographic region. The analysis reviews hospital entry into the CABG market in California from 1983 through 1990. The technology was quickly adopted, even by hospitals in close proximity to other competing facilities, and the number of CABG procedures performed by each facility therefore decreased over time. The authors suggest that policies regarding the unrestricted entry of hospitals into markets for new technologies should be reconsidered.

Ownership, Competition, and the Adoption of New Technologies and Cost-Saving Practices in a Fixed-Price Environment


The adoption of four dialysis technologies is examined to study the incentives for adoption of new technology in a fixed reimbursement model. Because dialysis centers receive fixed price reimbursement from Medicare, their decisions may vary from decisions in a fee-for-service model. The authors examine decisions to adopt new technologies that were expected to improve quality but would also increase costs, identifying the trade-
offs made to enable the dialysis centers to adopt the technologies despite the lack of additional reimbursement. Key off-sets to the costs of new technologies in fixed reimbursement settings combined cost cutting measures such as reuse of equipment, staffing changes and decreased patient amenities. Measures varied significantly by type of facility, non-profit versus for profit, with non-profit facilities primarily decreasing patient amenities, while for-profit facilities tended to apply technology-based solutions such as re-use of equipment. Overall adoption rates in these fixed reimbursement environments varied with type of facility (non-profits being more likely to adopt) and the extent of competition in the market (lack of competition was associated with a lower adoption rate).

Medical Advancements Determine Health-System Capacity Requirements


The editorial discusses the impact of technology on hospital capacity planning. The authors comment on the importance of basing capacity planning on sound forecasting using study examines the relative role of decision-maker influence and environmental factors on the timing of MRI acquisition in hospitals with different levels of environmental uncertainty. The authors maintain that hospitals acquire new technology as one way of controlling the turbulent environment (defined as highly competitive) and that acquisition timing is dependent on the environmental turbulence as well. Using a questionnaire of hospital CEOs and key decision makers, the authors reviewed responses from 68 Southern California hospitals and 48 Oregon hospitals in 1999. The authors reviewed key factors of competition, physician influence and CEO influence on the adoption of MRI in the hospital.

The authors determine from their survey that the California hospitals adopted the MRI technology two years earlier than Oregon, primarily due to the turbulent, highly competitive environment. In addition, the authors conclude that in California, the primary driver for the adoption of MRI technology was the turbulent environment, not the influence of either the CEO or the physicians. By contrast, in Oregon, a less competitive environment, the overall adoption of MRI was mostly influenced by the CEO, however early adoption was influenced more by the physician. The authors also discuss the ability of hospitals to overcome the turbulent environment by moving into an integrated delivery system or network to jointly purchase the technology. The authors site surveys from 1994 that maintain that 71% of hospitals were moving toward integrated delivery systems. The conclusion that hospitals will not continue to acquire technology at the same pace if they move into integrated systems may be a false assumption.

Hospital Adoption of Medical Technology: An Empirical Test of Alternative Models


Three organizational strategies are considered as explanations for the adoption by hospitals of new capital-intensive medical technologies, in a survey of 507 hospitals that examined MRI acquisition as the product of three possible motivations: profit maximization, technological preeminence, and clinical excellence. The survey assessed measures of expected cost, effectiveness, technological change, and organizational strategy. While all three motivations were influential, the value an organization placed on technological preeminence was most important in driving acquisition, and explained more of the variance than clinical excellence or profit maximization. The likelihood of the hospital’s adoption of the technology was strongly related to its strategic positioning as a technological leader.
Physician Acceptance and Utilization

Externalities in Hospitals and Physician Adoption of a New Surgical Technology: An Exploratory Analysis


This paper presents an analysis of the role that physicians who are ‘early adopters’ within health delivery systems play in the subsequent adoption of that technology by their colleagues. The adoption of laparoscopic cholecystectomy is studied, using a survey to identify the factors influencing surgeons to adopt the technology. Laparoscopic cholecystectomy diffused extraordinarily rapidly; 81% of the 1660 surgeons surveyed had adopted the technology within 18 months of its introduction. The primary drivers of adoption centered on economic and informational effects related to the role of the ‘early adopter’. The first surgeon to adopt the new technology becomes a key source of information (in Rogers’ terms, ‘observability’) and provides an opportunity for colleagues to observe the technology in practice. The first surgeon also causes the hospital to invest in new staffing, training, facility modifications and other changes that reduce the operating costs for colleagues who subsequently adopt that technology. Because the new technology is installed and available, moreover, colleagues can ‘try out’ the technology easily (in Rogers’ terms, ‘trialability’). The author also examined the key characteristics of ‘early adopter’ physicians. Most commonly, these surgeons were faculty members from a prestigious facility, group practice providers rather than solo, relatively young (average age of 35), and physicians that practice in a hospital where another physician has already adopted the technology.

Influence of Physician Specialty on Adoption and Relinquishment of Calcium Channel Blockers and Other Treatments for Myocardial Infarction

Majumdar, S R; Inui, TS; Gurwitz, JH; Gillman, MW; McLaughlin, TJ; Soumerai, SB, Influence of physician specialty on adoption and relinquishment of calcium channel blockers and other treatments for myocardial infarction, Journal of General Internal Medicine: Official Journal of the Society for Research and Education in Primary Care Internal Medicine, Volume 16, Issue 6, June 2001, Pages 351-359.

The author provides an analysis of the differences in generalist and specialist responses to the adoption and relinquishment of technology by examining physician utilization of calcium channel blocker (CCBs) following adverse reports. The differences in use of CCBs and other acute myocardial infarction (AMI) therapies were examined across three levels of specialist involvement: generalist attendings, collaborative care and specialist attendings. The adoption of effective therapies for the treatment of AMI varied according to level of specialist involvement. Compared with cardiologists, generalist physicians were less likely to adopt some effective AMI therapies, particularly those associated with risk. Generalists were as likely as cardiologists to relinquish CCBs after the adverse reports. The authors conclude that there is strong support that generalists are therapeutically more conservative than specialists but just as likely to relinquish therapies associated with possible harm.

Patterns of Preference for Information Sources in the Adoption of New Drugs by Specialists


The study investigates the pattern of adoption of new prescription drugs by 156 medical specialists after they have evaluated various drug information sources. Earlier studies involving general practitioners indicated that the source of first information for novel pharmaceuticals was often drug company based sources. Sources that were deemed most influential in the decision to prescribe the drug, however, included journal articles and colleagues.
Clinical Process

Cascade Effects of Medical Technology


A cascade effect in medical technology is a chain of events initiated by an unnecessary test, an unexpected result or patient or physician anxiety that results in ill-advised tests or treatments that may cause avoidable adverse effects and/or morbidity. This article explores common triggers, factors that facilitate, and consequences of the cascade effects of medical technology. The author diagrams the influential parties in the adoption of new medical technology and explores ways in which the key players can avoid pitfalls associated with the cascade effect. These include better education of physicians and patients, research on the natural history of mild diagnostic abnormalities, achieving optimal capacity in health care systems and awareness that more care is not necessarily better. The author compares U.S. patterns of technology use with that of Canada, in which a lower capacity for invasive cardiac interventions contributes to reduced utilization without apparent detriment to overall cardiac health. The author encourages further research on the impact of system capacity on the use of technology for both diagnostic tests and therapeutic interventions, and calls for a more effective way to identify problems at an earlier stage in technology dissemination.

The Effect of Technological Adoption on Organizational Performance: Organizational Size and Environmental Munificence as Moderators


This study reviews patterns of technology adoption and financial performance in relation to hospital size and environmental munificence (average household income in the community). The authors hypothesized that larger hospitals in more affluent communities would benefit the most financially from the adoption of new technology. The study examined Florida hospital data from 1990 forward, including hospital size (number of beds), level of adoption of technologies, and financial performance expressed as the return on assets (ROA) for each hospital. These factors were reviewed in the context of the environmental wealth of the hospital. The study found several surprising results from the data. As expected, the data presented a strong correlation between the size of the hospital and the adoption of the technology as well as a moderate correlation with munificence. However, the ROA for large hospitals declined with the level of adoption rather than improved. Conversely, small and medium size hospitals had an increase in ROA that was commensurate with the increased level of technology adoption. In addition, the authors report that even in wealthy environments, large hospitals were found to have lower ROAs when there was a high level of technology adoption. The data showed again that small and medium sized hospitals had a higher ROA with a high level of technology adoption in a wealthy environment. The authors conclude that the potential for ROA on technology adoption for large hospitals is not in keeping with common wisdom and should be a major factor in determining the adoption of new technologies.

Too Many Choices? Hospital and Community Staff Reflect on the Future of Prenatal Screening

Williams, C; Anderson, P; Farsides, B. Too many choices? Hospital and community staff reflect on the future of prenatal screening, Social Science & Medicine, Volume 55, Issue 5, September 2002, Pages 743-753.

The difficulties of providing informed choice for patients in genetic screening were examined in a survey of seventy hospital workers involved in prenatal testing at two hospitals in England. The hospital workers reported concerns that, as the technologies used and the number of tests increase in genetic screening, it will be increasingly difficult to adequately educate and counsel patients. At the same time they saw the expansion of screening as inevitable, and largely driven by public perceptions of the value of the technology
rather than clinical efficacy. The authors noted that clinicians believed that the technology was not properly explained to the women and that bias existed in how screening information was provided. They generalize the findings of this study to the diffusion of similar technologies, such as gene therapy, and propose that these technologies acquire a momentum of their own through market and societal forces. They propose that clinician assessments of the value of a technology should be considered in order to form more useful policies on the advancement of technologies.

Patient and Consumer Experience

What Diagnostic Devices Do: The Case of Blood Sugar Measurement


The author analyzes the use of diagnostic devices, specifically blood sugar measurement devices, and the resulting shift in patient perceptions towards medical technology and healthcare. The author identifies several ways in which blood sugar measurement devices are used, the simplest being the measurement of blood glucose levels. The evidence suggests that measurement numbers provide a shift in meaning for the patient by providing a definition of normality. Blood sugar measurement devices do not just allow for a more frequent registering of the facts but also alter the value of the facts. Blood sugar regulation is made tighter by self-measurement. The author also asserts that the devices help the patient to correct ‘false sensations’ and push people to become more aware of their own health states. Usage of devices were determined to shift people’s attention away from their physical sensations towards the numbers measured but it may also help them to increase their own physical awareness.

Toward Understanding Consumers’ Role in Medical Decisions for Emerging Treatments: Issues, Framework and Hypotheses


The author utilizes a consumer perspective to examine emerging medical technology. Discussion of market, medical, social and consumer issues help to create a framework for analysis of the patient’s role in medical decision making with regards to novel technologies. Medical treatment using growth hormone therapy (GH) provides a contextual setting for discussion. The author outlines the various drivers associated with GH utilization and provides two models of treatment option decision-making—a contemporary model and an emerging shared decision-making model. The conceptual model is marked by a limited role of the consumer in the decision-making process as well as a lack of easily accessible consumer preferences without physician effort. The role of the consumer/patient is passive during these crisis-induced decisions. The shared decision model is marked by high motivation on the part of the patient to express motivation and also by the timing of the decision, which is based on consumer need and desire. In the shared model the consumer is viewed as an active participant in the decision making process.
Additional Readings

Quality, Technology and Public Policy

U.S. Health Care in Conflict—Part I. The Challenges of Balancing Cost, Quality and Access

Technology and Health Reform: A Legislative Perspective

Mixed Signals: Public Policy and the Future of Health Care R&D

Diffusion of Innovation in Healthcare
Diffusion of innovation in healthcare, Institute for the Future, May 2002

Technology Development

The Impact of Managed Care on Clinical Research: A Preliminary Investigation

Innovation under Federal Health Care Reform

In the Pipeline: A Wave of Valuable Medical Technology
Schwartz WB. In the pipeline: a wave of valuable medical technology. Health Affairs, Summer 1994, Volume 13, Issue 3, Pages 70-79

Technology Assessment

Historical Controversy in Health Technology Assessment: The Case of Electronic Fetal Monitoring
**Health Technology Assessment in the United States. Past, Present, and Future**


**The New Technology Assessment**


**Can Technology Assessment Control Health Spending?**


**Closer Inspection: The Recent Evolution of Technology Assessment**


**Health Technology Assessment and Policy Decisions on Hyperbaric Oxygen Treatment**


**The Ethics of Assessing Health Technologies**

Van der Wilt, G J; Reuzel, R; Banta, H D, The ethics of assessing health technologies, Theoretical Medicine and Bioethics, Volume 21, Issue 1, January 2000, Pages 103-115.

**Regulatory and Approval**

**The FDA and Regulatory Issues in Graft Development**

Abel, D; Shulman, M, The FDA and regulatory issues in graft development, Seminars in Vascular Surgery, Volume 12, Issue 1, March 1999, Pages 74-82.

**Endovascular Abdominal Aortic Aneurysm (AAA) Repair Since the FDA Approval. Are We Going Too Far?**

Adelman, M A; Rockman, C B; Lamparello, P J; Jacobowitz, G R; Tuerff, S; Gagne, P J; Nalbandian, M; Weisswasser, J; Landis, R; Rosen et al., Endovascular abdominal aortic aneurysm (AAA) repair since the FDA approval. Are we going too far?, The Journal of Cardiovascular Surgery, Volume 43, Issue 3, June 2002, Pages 359-367.

**Modernizing the FDA: An Incremental Revolution**

Merrill, R A, Modernizing the FDA: an incremental revolution, Health Affairs (Project Hope), Volume 18, Issue 2, March - April 1999, Pages 96-111.
How Should FDA Regulate Prescription Drug Promotion on the Internet?

FDA Sets Safety Framework for Cell and Tissue Therapies: Rules Would Cover Attempted Human Cloning

The FDA: Is It Protecting the Public with One Hand Tied Behind Its Back?

Coverage and Reimbursement

Using Pharmacoeconomic Analysis to Make Drug Insurance Coverage Decisions

Medicare Coverage for Oncology Services

Imaging: The Next Generation

The Blind Hog and the Acorn: Medicare Coverage for Investigational Devices

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