

Technological Change and Health Care Delivery

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Abstract

This thesis explores the combined impact of professional identity and technological change on the delivery of health care. Technological change has often been blamed for the rapid rise in costs in the medical system. Efforts underway to increase competition within the health care marketplace are expected to slow this increase by reducing demand and encouraging firms to focus on cost-effective technologies. These changes are likely to produce a one time decrease in costs as inefficiencies are removed, but are unlikely to affect the long term growth in costs due to the expansion of capabilities and markets produced by technological change.

The changes towards a more market driven system however threaten to undermine the professionalism of physicians, limiting their autonomy. The proposed use of technology assessment and quality control schemes to improve outcome measures are difficult to implement due to the high degree of uncertainty in the costs and the scope of the markets for products still under development. The validity of outcomes research will only be acknowledged if a consensus develops among physicians who actually deliver care. In the absence of such a consensus such information will be widely disregarded.

Technology and professionalism intersect at a number of locations. Technical knowledge validates the competence of the physician, but rapid changes in technology and uncertainties undermine this competence at the same time. The dynamic between technological change, market encroachment and professionalism will continue to drive the health care system for the near future.

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Contents

- 1 Introduction 7**

- 2 Recent History of Health Care Reform 11**
 - 2.1 The Need for Reform 11
 - 2.2 Consumer cost consciousness—The RAND Health Insurance Experiment 14
 - 2.3 The Jackson Hole Plan 16
 - 2.4 The Clinton Blueprint 18
 - 2.5 The Failure of the Clinton Plan 20
 - 2.6 Problems of Managed Competition 22

- 3 Magnetic Resonance Imaging 24**
 - 3.1 The MRI Technique 25
 - 3.2 Equipment and Costs 27
 - 3.3 The imaging center 28
 - 3.4 Observations 31
 - 3.5 Comparative techniques in Angiography 32

- 4 The Medical Profession 37**
 - 4.1 Professionalism and Authority 38
 - 4.2 Professional Behavior 39
 - 4.2.1 The Role of Ideas and Beliefs 39
 - 4.3 Professionalism and the Market 41
 - 4.4 The Erosion of Professionalism 42

5 Technological Change 44
5.1 Technology and Organizations 44
5.2 Traditional views of technological Change 46
5.3 Technological Innovation in Medicine 47
5.4 Technology Evaluation 50

6 Policy Implications 52
6.1 Recent Developments in Health Care 52
6.2 Policy Implications 55

Chapter 1

Introduction

This study was undertaken in the Summer of 1993 during the height of the health care policy debate, just before the Clinton administration unveiled its Health Care Security Act. During the debate technology-intensive medicine was variously described as the hallmark of top-quality American medical care, as well as the prime culprit in the escalation of costs and the destruction in the traditional doctor-patient relationship.

Advances in diagnostic and therapeutic medical technologies have made remarkable strides in the latter half of this century. Clinical medicine has come to rely heavily on a multitude of drugs and devices, from biochemical analyzers to endoscopes, genetic markers and CT scanners. A 1980 conference entitled “The Technological Imperative in Medicine” concluded in its report that

“What has become abundantly clear is that the term “imperative” is all too appropriate. What began as simple tools and purely effective extensions of the physician’s personal approach have, especially in the last 80–100 years become *intrinsic, self-propagating, requisite and almost autonomous elements* of today’s biomedicine [1].” [emphasis added]

The idea of a “technological imperative” was echoed more recently by Victor Fuchs who suggested that it drives up costs through its influence on medical choices [2].

The frontiers of clinical medicine are virtually endless, being a product both of a rich and constantly growing set of scientific and technical opportunities and of

numerous unsolved or partially solved clinical problems. There is strong evidence that drastic technological changes are likely to take place over the next five to ten years in such fields as drug design, genetics and imaging techniques. Will these technological advances be a powerful force that drives cost upward, or will these advances slow down or stop the escalation of costs? Fundamental, rapid advances in molecular and cell biology could lead to the prompt discovery of curative therapies for some patients with major illnesses such as cancer and coronary artery disease. As a result the cost spiral may be sharply attenuated during the next 5 to 10 years. A more likely scenario is a further escalation in costs. For example, further advances in surgery that reduce risk and pain will open the door to many more surgical procedures. Unit costs will drop, but any savings will almost certainly be overwhelmed by volume increases [3]. If medical costs keep rising, there is the potential for conflict between the nation's commitment to health care cost containment and the commitment to innovation in medicine [4].

Medical innovation involves many institutions whose very *raison d'être* is innovation. These include federal agencies that support biomedical research, academic medical centers whose identity is defined by research leadership, private foundations, and firms in the pharmaceutical, biotechnology, medical device and instrumentation industries. The entire supply side is therefore supported by a network of public policies that embody the nation's commitment to innovation in medicine. As Rettig argues, any observer of the NIH over the years must conclude that the American public has immense hope in the promise of medical research and will continue to do so.

Consumer demand for increased research and delivery of medical technology is often channeled through political channels. Public advocacy of AIDS research and breast cancer research has changed the rules for safety and efficacy of drugs required before the drug enters the marketplace, the nature of clinical trials and reimbursement schemes for experimental drugs. In the political economy of health, demand for medical technology is expressed along the entire innovation continuum—from research funding and priorities, through clinical trial organization, through FDA review and

approval of new medications, to the modification of existing third-party insurance packages to pay for the benefits of new technology.

The purpose of this study was to examine how technologically-intensive medicine was used on an everyday basis in a major research hospital. High-tech medicine promises a lot and has the potential to deliver a lot, but its practical utilization depends on the knowledge and expectations of the physician delivering care, and the patient who is receiving it. An introduction to a 1987 survey of doctor-patient relationships observed that:

“Physicians often grant technology that central position because they define medicine more by the science it uses than by its actual task of care. When professional ideology defines medicine as scientific, professionals may assert that medicine *is* science, forgetting that science provides only a *method* for the study of illness. Or they may mistake medicine’s technologies of diagnosis and treatment for science, forgetting they are only the products of scientific knowledge and that they are often applied irrationally in practice [5].”

The introduction of modern technology in most fields leads to a rapid decrease in cost along with steadily improving performance. What is special about health care technologies that distorts this basic tenet of modern capitalism? The answer appears to lie in the structure of the reimbursement system, the medical drug and device industries, and the interaction between physicians and these new technologies. Rapidly changing technologies also lead to an increasing degree of sub-specialization in the medical professions. In addition to contributing to the bureaucratic complexity, this subdivision restructures the locus of scientific expertise as well. This restructuring impacts the structure of the institutions and their organizational hierarchy, while also shaping of the professional identity of these specialists in relation to the practice of medicine as a whole.

The technology studied was Magnetic Resonance Imaging (MRI), a diagnostic technique situated within Radiology departments. The technique has become fairly

widespread since its initial development in the early 1970s. The observations in this thesis were recorded during a one month clinical internship at an outpatient MRI center of a major urban teaching and research hospital, hereafter referred to as the imaging center. As a number of students pass through the clinic at various stages of their medical training, their presence is not out of the ordinary and hence the presence of an external observer should not bias the behavior of the professionals in this study. Since the imaging center is located within a major research hospital, the case mix observed is not typical of a commercial imaging center. The behavioral aspects of the interaction between technology and health care were observed at all times during the internship. In order to make a specific comparison between competing technologies vascular radiology was chosen as a test case. A comparison was made between non-invasive MR imaging of vessels and conventional angiographic techniques using a catheter, radio-opaque dye and fluoroscopy.

The next chapter discusses the need for health care reform and outlines the form of the Jackson Hole Group plan and the rise and demise of the Clinton Health Security Act. Chapter 3 describes the observations made about the use of Magnetic Resonance Imaging as a diagnostic modality and raises some important questions about physician behavior and the nature of technological change. Chapter 4 examines the nature of professional behavior while Chapter 5 discusses technological change in medicine. Finally chapter 6 concludes with an overview of the current status of health care delivery, and summarizes some of the limitations to reform policies in health care.

Chapter 2

Recent History of Health Care Reform

2.1 The Need for Reform

In an introduction to The President's Health Security Plan, Erik Eckholm of The New York Times identified two related causes for the crisis in health care [6]:

1. the growing number of Americans who lack health insurance; and
2. the spiral in health spending that threatened to bankrupt the government and cripple American industry.

A 1992 report by the Congressional Budget Office projected that health care expenditures would grow from 12% of GDP in 1990 to 18% of GDP by the year 2000 unless current trends were altered. This compared to expenditures of 7% of GDP in 1970 and 9% in 1980. While structural adjustments in the economy are a normal part of growth and development the report cited two causes of concern, consumers' apparent disregard for cost, and their lack of information about medicine which led them to trust health care decisions to professionals.

In examining the impacts on economic performance, the report concluded that the costs of health care are borne by employees in the form of lower real wages

or less generous nonmedical benefits, rather than any decrease in profits or lower competitiveness. The growth of health care costs was also identified as increasing the pressure on government budgets, with Medicare and Medicaid the fastest growing sections of the budget, rising from about 1% of GDP in 1970 to 3.0% in 1991, and expected to rise to 6.1% by the year 2002. The federal deficit after declining in the first half of the 1990s is likely to swell to more than \$500 billion as a result of increased spending for Medicare and Medicaid. They estimated that if federal spending could be held to its 1991 share of GDP, output would be about 2.2 percent higher than the CBO baseline by the year 2002 [7].

The rapid increase in health care costs, at a rate much higher than inflation, results in rising medical insurance premiums, increased costs to business and the de-insuring of a significant fraction of the American population. The increase in costs has been attributed to five major causes.

- The aging of the American population
- Overconsumption of medical services due to moral hazard
- The direct and indirect costs of malpractice litigation
- The increase in administrative costs due to bureaucratic complexity
- The use of new expensive medical technologies

The increase in life expectancy has resulted in a steady increase in the average age of the population. As the population ages, the incidence of health care problems appears to have increased as well. As a result an insurance system designed to spread risk across a population is supporting a higher proportion of higher risk patients, increasing the costs to the system. This is more likely to be a problem in the early part of the next century as the baby boomer generation enters old age.

Moral hazard is the tendency of insurance protection to alter an individual's motive to prevent loss, affecting expenses for both the insurer and the insured. Both doctors and patients have the ability, and the incentive, to alter their behavior and

affect the risk estimates of the insurers. Comprehensive third party insurance that does not involve cost-sharing, encourages individuals to utilize health care services without regard to costs, leading to overconsumption of these services and rising prices.

The effects of malpractice litigation are manifold. On one level it has resulted in all physicians having to take out expensive malpractice insurance which itself increases the cost to the system. A 1992 article in *The Economist* noted that malpractice insurance across Europe costs less than 10% of the \$16,000 annual average in the United States [8]. In addition, in order to protect themselves against the risk of malpractice, doctors are supposed to practice a very conservative form of care or *defensive medicine*. The incidence of medical malpractice may also have qualitatively altered the balance between the subjective clinical decision making of the doctor and the objective results of diagnostic tests. The mushrooming of diagnostic medical technologies has had a synergy with this shift in balance resulting in a tremendous increase in the use of diagnostic tests to rule out even very remote possibilities.

The increasing specialization of medicine has contributed to making the modern hospital a model of Weberian bureaucratic rationalization. The formation of physicians group practices and other provider groups, combined with multiple reimbursement schemes including a variety of HMOs and traditional fee-for-service insurance has led to an increase in paperwork and administrative complexity. Driven by technological change, the increasing degree of specialization in the medical profession leads to further subdivisions in hospital departments. Utilization management procedures put in place by insurance companies, and designed to contain costs also contribute to increasing administrative costs, which account for about 20% of all health care costs.

The CBO report considered factors such as the aging of the population, the practice of defensive medicine and the spread of acquired immune deficiency syndrome (AIDS) as relatively unimportant for the increase in costs. The report identified the major factor driving increases in health costs as advances in medical technology, exacerbated by the problem of moral hazard.

Joseph Newhouse, the principal investigator for the RAND Health Insurance Experiment (HIE), noted that cost sharing is unlikely to affect the rate of cost increases

in the health care system, except as a temporary adjustment. Newhouse attempted to quantify the possible causes of spending growth: an aging population, health insurance, physician-induced demand, defensive medicine, administrative costs, and the costs of caring for the terminally ill in the last year of life. He argued that the residual—“the march of science and the increased capabilities of medicine”—accounts for much of the increase in health care expenditures. In support of this view it has been observed that HMO costs are rising in parallel to fee-for-service costs, though from a lower base, and that expenditures in other western countries were increasing at a similar rate, though again from different bases [9].

2.2 Consumer cost consciousness—The RAND Health Insurance Experiment

The RAND Health Insurance Experiment (HIE) was a large-scale randomized controlled trial of alternative forms of health care financing that ran for 3 or 5 years between November 1974 and January 1982 in six sites around the country. It enrolled more than 7,700 persons in one of several experimental health insurance plans that differed either in the amount of cost-sharing borne by the families or in the organization through which they received their care.

In a variety of plans, the study observed that cost sharing and capitated resulted in a significant decrease in costs. The more families had to pay out of pocket, the fewer medical services they used. All types of services including physician visits, hospital admissions, prescriptions, dental visits, and mental health service use, fell with cost sharing [10]. Cost sharing reduced costs primarily by reducing use, in essence deterring people from seeking care at all. The reductions observed were the highest in the lowest income categories and affected children the most. A troubling finding was that the deterrent effect was pervasive, affecting all types of care-seeking. Consumers did not make selective decisions about which problems they should seek care for. While this reduction had negligible effects on general measures of health for

both adults and children in most cases, adverse disease specific effects were found for high blood pressure in poor adults and anemia in low-income children. The report acknowledged that

“This favorable outcome of cost-sharing comes at the price, however, of reductions in appropriate care; that is, it appears to invoke a considerable risk of foreclosing medical diagnosis and treatment for conditions in which such intervention can be expected to be effective and to benefit the patient [11].”

While consumers need independent information about quality so that they can shop for the lowest price for a given level of quality, the decisions that people reach on the basis of quantitative information about risks can vary dramatically depending on how the decision is framed. Therefore it is important not just to provide consumers with information, but also with a framework for evaluating it. This filtration of information is inherently affected by beliefs and can therefore become politically contentious.

Another RAND study noted that price information may not have the same effect on shopping for hospital services as it does for other products . As it is “no simple matter to assess the technical quality of medical services,” some consumers use price as an indicator of quality [12]. While price information did influence health plan choice, having made a choice consumers tended to stick with it as long as they were not dissatisfied. They did not seek additional information at subsequent enrollment sessions.

The HIE observed a major need for providing greater access to information related to the measurement of patient outcomes, improving the nature and dissemination of information to patients, improving quality of care assessment and assurance techniques. For example it would be necessary to improve patients’ abilities to distinguish those circumstances in which seeking medical care is indicated from those when it is less appropriate as many people may simply lack sufficient information to help them distinguish when care seeking is likely to be beneficial. Additional information is also

needed for providers about the sensitivity and specificity of common tests in different clinical circumstances if they are to be more selective in recommending procedures.

2.3 The Jackson Hole Plan

In 1977 economist Alain Enthoven offered the Carter administration a proposal for a “Consumer Choice Health Plan,” based on regulated private sector competition[13]. Though the plan was rejected, an emphasis on managed competition arose during the mid-1980s in response to rising health care costs and a political climate favourable to pro-market reforms. A group of health professionals, government officials, business leaders, academics, and other experts began meeting regularly in the home of Paul Ellwood in Teton Village, Wyoming. The group incorporated in July 1992 as the Jackson Hole Group, under the leadership of Enthoven, and has been very active in advocating market-based reforms in both public and professional forums. In an editorial in the Journal of the American Medical Association, Enthoven used the bogeyman of a single-payer health care system to gather physician support for the Group’s plans.

“Physicians and the other groups have a choice. They can cooperate in an effort to change the rules to make the market work in the consumers’ interest. Or they can abdicate and turn the whole problem of health care financing and delivery over to the government, which would impose spending limits and fee schedules. The latter would be bad news for most American physicians [14].”

The Group’s initiatives, which have been summarized in a couple of publications [15, 16], are outlined below.

Integrated Financing and Delivery

Arguing that traditional fee-for-service plans, solo medical practice and third party payment schemes are inefficient, the plan recommended the creation of integrated

financing and delivery systems. These include HMOs and new partnerships between physicians, hospitals and insurers—with per capita prepayment and public accountability for cost and quality.

Managed Competition

The group argued that the health care economy is dominated by cost-unconscious demand. Employers have not made their employees fully cost-conscious in their choice of health plan as they usually pay the full price of a fee-for-service plan. This subsidizes less efficient plans and denies the most efficient plans the opportunity to market their cost-effectiveness. The plan suggested that employers must offer employees choices of health plans, and limit their contributions so that they do not exceed the cost of the lowest-priced plan of acceptable quality. Employees desiring more expensive plans should be made to pay the difference out of their own pockets.

Reform in Small-Group Insurance

Roughly, about half the American work force is employed in small businesses comprising groups of 100 or less. These groups are too small for the spreading of risk, economies of scale in administration, or for the acquisition of adequate information and expertise to purchase effectively in a complex market. Administrative expenses are estimated to account for 5.5% of incurred expenses for groups of 10,000 or more while rising to about 30% for groups of 10 to 19 employees. Small groups should therefore be aggregated into larger purchasing units covering hundreds of thousands of lives each. These Health Insurance Purchasing Cooperatives, set up by the states, could then contract with several HMOs and other qualified health plans to offer enrollees increased price competition.

Regulatory framework

Markets do not work well without information on prices and the quality of goods and services. The plan proposed the formation of a national health board to “decide on the basis of science and values and not politics, which technological procedures

should be included in covered budgets [17].” [emphasis added] This board would set uniform standards for reporting health outcomes and publish data for consumers on risk-adjusted outcomes to enable them to make informed choices.

Universal Health Insurance

Part-time employees, the self-employed, the unemployed, early retirees and others not covered by either employer schemes or government programs would have coverage purchased by public sponsors through the Health Insurance Purchasing Cooperatives. The revenues for these purchases would be derived from a variety of taxes such as a payroll tax on all non-covered employment and an adjusted income tax for those not covered who escape the payroll tax.

2.4 The Clinton Blueprint

After the 1992 Presidential election, the task of revamping the health care system was spearheaded by the First Lady, Hillary Rodham Clinton and industrialist Ira Magaziner. The resulting plan, the American Health Security Act, guaranteed comprehensive health coverage for all Americans regardless of health or employment status, while employing a variety of schemes to limit costs. The Clinton blueprint proposed a major restructuring of medical care that would both promote market competition and establish vast new powers of government regulation.

Purchasing cooperatives

Drawing on the ideas of managed competition, the Act allowed most people to obtain their health insurance through a new system of regional purchasing cooperatives or health alliances run by the states. The states would set standards, under federal guidelines, for local health plans and make a range of plans available to consumers, all offering the same basic package of benefits. Large corporations could join the alliances or establish their own array of plans, but would have to offer the same benefits package under the same basic rules.

Cost-sharing

The proposal envisioned three basic kinds of plans: “low cost-sharing” plans, primarily HMOs in which patients pay a low flat rate of \$10 per office visit to an affiliated primary physician who also acts as a gatekeeper, limiting patient access to specialists; “high cost-sharing” plans with a high deductible of \$400 and 20% cost sharing above this deductible, in which patients have complete freedom in their choice of doctors; and “combination plans” in which patients pay little to use affiliated doctors and more to use others.

Competition among the different HMOs and other providers to contract with the purchasing cooperative was expected to decrease costs as these organizations improve their efficiency in order to compete more effectively. In the event that this increased competition did not bring costs down, the plan also proposed that the federal government impose caps on the growth in health premiums as a backstop.

Universal coverage

Under the proposal everyone would be required to carry health insurance and to contribute to its cost, with subsidies to help low-income individuals and small employers. All employers would be required to contribute 80 percent of the cost of premiums for workers and their families, who made up the remaining 20%. Individuals and most companies would sign up with the purchasing cooperatives, or health alliances, which would present their members with a choice of plans.

National Health Board

The plan also proposed the creation of a powerful new National Health Board to oversee national spending trends and set national standards and guidelines for practitioners. The Board would also define the minimum benefits package and the federal guidelines for the state-organized purchasing cooperatives. An important aspect of the plan was the development of ways to measure the quality of care offered by the health plans, in order to provide sufficient information to consumers to make effi-

cient resource allocation decisions. The increased availability of information should enhance the efficiency of operation of the market, with the government (or the taxpayer) bearing the transaction costs involved with gathering this information.

2.5 The Failure of the Clinton Plan

Explanations of the failure of the Clinton health plan range from the ability of special interest groups such as the AMA and insurers associations to block passage of the bills in Congress, to blaming the Clinton administration for its inability to articulate its vision to a confused, often frightened public.

In response to the unveiling of the Clinton plan, the American Medical Association (AMA) expressed “*serious reservations*” with the Clinton administration proposal because “it would limit choices by patients and physicians, undermine the quality of medical services, and lead to federal control of medical education and the physician workforce.” The letter from the AMA leadership warned its members that “Government and corporate intrusion into the relationship between the physician and patient could transform doctors from advocates for their patients to simple dispensers of services [18].”

The AMAs concerns related to the establishment of state-established fee schedules limiting charges in fee-for-service plans, which was seen as the imposition of price controls for physicians services. They also criticized the pressure on physicians to join capitated managed care networks and the increased monitoring of their work by non-medical personnel as threats to their authority and autonomy. They observed that the establishment of the National Health Board would result in a shift in quality management and control from private sector, professionally established entities to this Board.

Daniel Yankelovich believes that the problem is more deeply rooted in a disconnect between the American public and its leaders [19]. He argued that although elites have no problem conversing with one another, they carry out a “bizarre dialogue of the deaf” with the people. The plan was fashioned by experts and elites with no discussion

with the public. As it was attacked by special interests and sold by political leaders, there was no way for average Americans to understand what it meant for them. Americans blame hospitals, lawyers, physicians and drug companies for the rising costs of health care. Public confidence in medicine as a profession has been eroding for decades. In the 1960s the level of confidence in the medical profession was 73%, almost twice that of all other institutions (40%). In 1993 Americans' confidence in all institutions had dropped to about 23%, but medicine's fall to 22% was far steeper. Given this perception, it is no surprise that most Americans resisted making sacrifices to correct a problem they think the doctors and lawyers have caused.

Theda Skocpol argues that the secrecy surrounding the deliberation of the task force did not help to lay a basis of public understanding for the emerging Clinton reform plan [20]. The President and his allies had to hold the public's interest and support as the details of their approach were spelled out, not because the President's bill had to be enacted unchanged, but simply to ensure that the parties involved would remain willing to bargain. She lays the blame for the failure to communicate on the the weakness of the institutional "means of political communication" open to a U.S. president in the 1990s, especially if they are Democrats. The Democratic party no longer has a national, rooted infrastructure of loyal, local organizations and allied groups through which concerted grass-roots political campaigns can be run. The conservatives do in the form of grass-roots Christian fundamentalist groups and Rush Limbaugh-style talk radio. Thus Democrats tended to rely on pollsters, media consultants and television to get their message out. However, as these groups think in terms of appealing labels instead of explanatory discussions, the public was never educated about the issues involved.

The media in turn tend to focus not on the substance and adequacy of proposals, but on the "horse races" among conflicting politicians and interest groups. In a poll taken in February 1994 only one in four Americans claimed to know what a "health alliance" was. Americans' fears about a government takeover or bungling in the health care system left them open to alternative descriptions purveyed by the plan's fiercest opponents. A study by the Center for Public Integrity showed that health care reform

would become “the most heavily lobbied legislative initiative in recent U.S. history.” During 1993 and 1994 hundreds of special interests cumulatively spent in excess of \$100 million to influence the outcome of this public policy issue.

2.6 Problems of Managed Competition

Managed competition relies on the decrease in demand due to techniques such as utilization management and gatekeeping to guide technological innovation towards cost-effective measures, but does not explicitly modify the incentive structures for the development of technology. The impact of technological change will be investigated in more detail in Chapter 5.

Critics of managed competition question whether methods exist for adequately comparing medical performance. The absence of appropriate quality measures will therefore result in cost becoming a primary determinant in the selection of plans. It has also been observed that some fee-for-service plans have responded to HMO market penetration through nonprice rather than price strategies, competing for consumer loyalty based on real or perceived differences in quality while raising costs. Thus information asymmetries in the market continue to pose a problem to its efficient functioning.

In a 1994 article in the *American Journal of Public Health*, Howard Waitzkin attacked the idea of managed competition, arguing that it manifests a distrust of professionals [21]. He claimed that managed competition stresses the wisdom of managers based outside the medical profession, and moves the locus of decision making from the medical guild to a cadre of managers who administer the organizational sponsors or group plans. Managed competition will thus expand the decision-making powers of insurance companies while reducing consumers’ freedom to choose practitioners, and micromanaging clinical decisions, leading to increased dissatisfaction among both physicians and patients.

David Blumenthal in turn argues that health care reform cannot succeed—politically or substantively—unless it preserves and bolsters the professionalism of physicians

and other health care providers [22]. The main reason is that no amount of external quality monitoring or regulatory intervention will fully correct the asymmetries in information that exist between health care providers and their patients. Secondly, he argues that with the possible exception of a small intellectual elite, consumers and voters understand, expect, and even value this asymmetry as a means of reducing complexity in their lives, and want to believe that the health care providers they rely on will use their superior knowledge to promote the best interests of their patients. Echoing the views of Kenneth Arrow, he believes that professionalism is an antidote to the inevitability of market failure in medicine, an antidote that the public desires.

In order to preserve professionalism, federal and state authorities should therefore be careful to avoid the reality or appearance of removing the power of the professional and attempt to limit professional autonomy. Efforts to micromanage physician behavior can be particularly dangerous where guidelines are concerned, as in most important clinical situations “the knowledge base is insufficient to dictate proper treatment, and, in any case, local conditions vary so much that national guidelines must be tailored to patients’ wishes and institutions’ capabilities [22].”

Chapter 3

Magnetic Resonance Imaging

Nobel laureate Steven Weinberg wrote that “To a physicist, the 20th century begins in 1895, with Wilhelm Roentgen’s unexpected discovery of X-rays.” Roentgen also demonstrated that these x-rays had the ability to reveal internal structures in the body, particularly bony structures, without breaching the integrity of the skin. The use of x-rays to look at skeletal structures spread rapidly, both as a novelty at fairgrounds, as well as within the clinic giving rise to the medical specialty called radiology.

The field eventually grew to include a number of methodologies. The principal purpose of all these methods being to visualize internal structures in the body. Each radiological modality is characterized by the type of physical phenomenon used as a probe. Thus x-rays, ultrasound, nuclear medicine and MRI all use different probes, obtain slightly different types of information about the body, and play different functional roles, making them imperfect substitutes for one another.

The x-ray image which has been the mainstay of the radiology department for almost a hundred years has the disadvantage of yielding information in only two dimensions, without any information about depth. Structures are seen superimposed on one another, often obscuring clinically important information. In the early 1970s Hounsfield in England and McCormack in South Africa independently developed the technique of computed tomography. Computerized tomography enabled the acquisition and display of cross sectional images of the body, which could be stacked

to generate full three-dimensional images. While their work was directly related to x-ray computed tomography, the technique was easily generalizable to nuclear medicine yielding two additional methods—single photon emission computed tomography (SPECT) and positron emission tomography (PET). The CT scan revolution was only a few years old when its thunder was stolen by a new three dimensional modality, Magnetic Resonance Imaging or MRI.

The MRI technique is based on the phenomenon of nuclear magnetic resonance, simultaneously discovered by Felix Bloch of Stanford University and Henry Purcell of Harvard University in 1946 [23, 24]. While the technique rapidly became an important analytical tool in chemistry and physics research, it was not involved in clinical diagnosis till Raymond Damadian demonstrated in 1971 that the NMR properties (specifically the relaxation times T_1 and T_2) of tumor tissue were different from those of healthy tissues [25]. While he proposed and built the first full body MR scanners to obtain diagnostic information, the demonstration of magnetic-field-gradient-based spatial localization by Paul Lauterbur in 1973 launched the beginning of the imaging technique [26].

3.1 The MRI Technique

When placed in an external magnetic field, nuclei with an odd number of nucleons possess a net magnetic moment. A macroscopic sample containing these nuclei acts like a collection of tiny magnets. These magnets attempt to align themselves with the external field and, as a consequence of the conservation of angular momentum, precess around the external magnetic field in a manner similar to that of a spinning top in the earth's magnetic field. The frequency of precession, known as the Larmor frequency, is proportional to the magnitude of the the external magnetic field, with the proportionality constant being a property of the particular nucleus.

When a time-dependent magnetic field oscillating at the Larmor or resonance frequency is applied to the system of spins, the spins are excited from thermal equilibrium and it is possible to observe their response. When the spins are initially excited

they precess coherently and give rise to an observable radiofrequency (RF) signal. Hydrogen, which is abundantly present in all tissue, is the most NMR-sensitive nucleus and is an obvious choice for *in vivo* imaging. In a uniform external field, all the hydrogen nuclei in the body will precess at approximately the same frequency. The spatial encoding of the signal is achieved by superimposing a magnetic field gradient, whose magnitude varies linearly with position, over the external field. Due to the direct proportionality between the magnitude of the magnetic field and the Larmor frequency, these frequencies are now also spatially dependent, and it is possible to analyze the signal using Fourier Transform methods and to reconstruct the image.

The NMR signal decays exponentially as the coherence of the spins is destroyed. The time constant of the decay, called the spin-spin relaxation time (T_2) is a property of the system being studied. The strength of the signal is directly proportional to the density of the nuclear spins in the sample, another property of the system. The time constant characterizing the relaxation of the spins back to thermal equilibrium after an excitation, the spin-lattice relaxation time (T_1), is a third property of the system. The NMR signal measured is influenced by all three properties. By changing the sequence of the RF excitation pulses it is possible to obtain images that are preferentially weighted in favour of a particular property or a particular combination of them. In addition to the density of spins and the relaxation times, other properties such as diffusion, strain and flow can also be encoded into the NMR signal. It is also possible to inject an intravenous contrast agent into the body. These agents usually contain a paramagnetic species bound to a macromolecule that has relevant biochemical properties, which affects the relaxation properties of the tissue near the agent. Thus a variety of information can be obtained from an MRI scan resulting in its complexity and versatility.

There is thus an important distinction between MR images and either CT or traditional x-ray images. The x-ray image essentially provides anatomical information and is photographic in nature. The NMR image is not photographic, since depending on the specific combination of properties the excitation sequence interrogates in the subject, it produces a two or three dimensional mapping of these properties of the

tissue. Thus the physician has to have some idea of the specific pathology afflicting the patient in order to design an appropriate MR imaging protocol.

3.2 Equipment and Costs

An MR imaging system requires a strong, uniform magnetic field that is not susceptible to drifts. In general these conditions are only met by superconducting magnets. These magnets require liquid helium and liquid nitrogen as the primary and secondary coolants to cool the magnet. These requirements result in high purchase and maintenance costs for the MR system. In addition it is necessary to provide an RF shield around the room to prevent external interference with the detected NMR signal. This involves real-estate costs in terms of the amount of hospital space used. As hospital departments are required to maintain a consistent level of revenue per unit area of space, this increases the cost of the scanning as well. In addition to the room containing the magnet, there is a small area containing the operators' console that looks onto the magnet, and usually a second room containing a separate console for the radiologist to view completed scans.

MR systems cost upwards of \$3.0 million to purchase (without automatic upgrades) and about \$300,000 to \$500,000 to maintain, including service contracts as it is imperative to minimize any time the system is inoperable. Most conventional MR images take about half an hour to 45 minutes to acquire, resulting in most imaging centers using 45 minute time slots to schedule appointments.

At the time of the study the cost of a 45 minute slot was \$1100 if no contrast agent was injected, with an additional charge of \$400 for the use of the agent. The cost of a 40 unit bottle of contrast agent was \$100 which was used for 2-4 studies. Injection also requires additional physician monitoring during the scan. The pricing in the department was done on a cost plus basis to generate the required revenues.

It is important to point out that the cost of diagnosis is bundled into the cost of a scan. This introduces an element of product differentiation into the market. While most hospitals use similar technologies, the market was able to tolerate variations in

the cost of a scan from \$800 to \$1100. The lowest prices were found in commercial imaging centers while the highest were in large university research hospitals. The perception of greater competence as well as the bundling of services with other resources at the hospital allows the hospital to charge higher fees for services.

3.3 The imaging center

Radiologists usually complete either one or two years of a fellowship in a specialized area after they complete four years of training in residency, making the training period one of the longest in the medical profession. It is usually only on completion of the fellowship that the radiologist will become either a staff radiologist at a hospital or join in an independent group practice. The studies at the imaging center were divided into two categories; neurological cases dealing with the central nervous system—the brain and spinal cord, and body cases dealing with the rest of the body. The fellowship training was similarly divided, with the corresponding fellows called the neuro fellows and the MR fellows. The observations recorded in this study were made while accompanying an MR fellow. As the technologists at the center do not change while the radiologists did, the structuring observed was similar to that observed by Barley in Suburbans' radiology department on the introduction of the CT scanner [27]. The relative inexperience of the radiologist versus that of the technologists, especially in the early stages, led to greater discretion and decision-making on the part of the technologists.

The imaging center was open from 7am in the morning to 11pm at night Monday through Saturday, and 7am to 6pm on Sunday, with the MR fellow expected to be present from 8am to 5pm during the week. The various duties of the MR fellow could be divided into the following actions:

1. Setting up protocols;
2. Supervising scanning procedures;
3. Reading scans;

4. Consultation with staff radiologists: and
5. Generating reports.

Setting up protocols

Protocols were usually set up in the evenings. The fellow would examine the next days' schedule and check the requisitions received for each patient coming through. These requisitions were supposed to provide a brief medical history of the patient and the reason for the study being requested. In the case of patients within the hospital system the fellow was able to call up the medical database and examine what other tests had been performed and the results of these tests. On the basis of the requisitions the fellow determined which of a number of specific imaging protocols should be used to test for the particular condition suspected. These protocols were then given to the technologists who actually scanned the patient.

Supervising the scanning procedures

In most cases, the fellow did little to supervise the scanning procedure. The patients were usually checked in by the staff at the front desk who handed them over to the radiographers or technologists. The technologist would explain the procedure to them, and prepare them for the study, which usually involved removing all credit cards and metal objects from their possession. The technologists then positioned the patient and started scanning according to the protocol given to them by the fellow. At the end of the scan the data would be stored and the patient taken out of the magnet.

The fellow did have to supervise some patients during the scan, especially if an intravenous contrast agent was administered. These cases were usually scheduled during the day when the fellow was present. In addition, the technologists would call the fellow in for a consultation during the scan if they observed any anomalous finding. In some cases the protocols were changed during a scan due to such observations. If for some reason a case requiring the supervision of the radiologist was scheduled for

the late evening or night, the fellow would either stay behind or arrange with a neuro fellow, to supervise the case. As most neurological cases required supervision, there was always a neuro fellow in attendance.

Reading scans

The daily schedule of the fellow usually started with an examination of the cases that had been scanned the previous evening. The fellow would sit down at the observation console and look through the images obtained. After adjusting the thresholding and windowing to optimize the contrast in the image, selected images would be printed out onto regular X-ray film. These films would then be examined in a traditional light box. A preliminary diagnosis was made and relevant observations were noted down. During the day the cases were read as each patient was scanned.

Consultation with a staff radiologist

At some point during the day when there were relatively few cases to be read the fellow would take the films, and go meet the staff radiologists at the various radiological specialty departments such as vascular radiology, cardiac radiology, orthopedics, gastro-intestinal (GI) and gastro-urinary (GU) radiology. The films were read by the staff radiologist who either confirmed the preliminary diagnosis or made an alternate finding. These sessions were considered a critical part of the training of the fellow as she discussed each case with a staff radiologist. These trips to the various departments usually last two to three hours a day.

Report generation

After consulting with the staff radiologist, the fellow would dictate the report into the hospital recording system. These reports would then be written up by medical transcriptionists. At the end of the day the fellow would examine the transcripts of the reports that had been dictated and orally signs off on them. Only after both the fellow and the staff radiologist have signed off on a report would it be transmitted to the referring clinician.

The cases at the imaging center followed a weekly pattern. Mondays were devoted to neuroanatomical cases, Tuesdays and Wednesday mornings to gastrointestinal and gastrourinary cases. Wednesday afternoons and Thursdays to vascular cases. The orthopedic cases were scattered throughout the week.

3.4 Observations

The MR technique can give a specific answer to a specific query, as the observed image is highly dependent on the imaging parameters used during the scanning process. An MR scan of an organ can thus give a negative result when using one protocol and a positive result in a second protocol. It is therefore important to have sufficient knowledge *a priori* to decide on the protocol to be used.

About 20% to 30% of the cases scheduled at the imaging center arrived with incomplete information in the requisitions about the details of the condition suspected. This generally represented a lack of understanding on the part of the referring clinician about the functionality of the MR scanning procedure. In some cases the fellow was able to contact the referring clinician to get the necessary information in time. In other cases she was able to interview the patient briefly before the scan to make her own judgments, while a “most-likely” protocol was adopted in the rest. Even in those cases when it was felt that MR was not the appropriate test, these tests were rarely canceled as the slots had been reserved for that study. The head of the department of one specialty (GI/GU) had decided that too many “fishing expeditions” were being requested and assumed a gatekeeping function, mandating that all future studies had to be personally approved by him before they could be performed. Fishing expeditions are tests prescribed in the general hope of finding out what problems might be afflicting a patient and producing their symptoms, prior to narrowing the list of possibilities down.

The number of irregular requisitions tended to undermine the fellows’ trust in point-of-contact physicians. Information asymmetries that have always characterized the doctor-patient relationship are now threatening the relationships between doctors

themselves as their bases of commonality shrinks with increasing subspecialization. Their group loyalties have also tended to narrow down to their specialty, to radiology in this case.

A second effect observed was the tendency to question the requisitions received from physicians outside the hospital system more critically than from those inside the system. Studies performed outside were often repeated as a form of “quality control” in the belief that they may not been performed competently, while previous in-house studies were rarely questioned. It is arguable that this in-house re-testing is driven by purely commercial motives. However, the mere questioning of the previous study undermines the cohesiveness of the profession, whether it is a product of scientific uncertainty or the encroachment of market relations.

Specialization and the growth of corporate affiliations are thus seen to point to a further fracturing of relations of trust within the medical system. As physicians come to distrust the opinions and diagnoses of each other, their professional authority is eroded as will be discussed in the next chapter.

A third effect observed was that in a few protocols, usually conducted under the supervision of a staff radiologist, procedures that had not yet been approved for payment by insurance firms were conducted, while the insurance company was billed for another test which had already been approved. The radiologist obtained no financial gain from the misbilling, but believed he was acting in the best interests of the patient, recommending the most appropriate test. Insurance fraud was perpetrated in the name of optimal treatment and ethical professional behavior.

3.5 Comparative techniques in Angiography

Angiography involves the visualization of the blood vessels in the body. It encompasses all vessels except those of the heart, which fall within the purview of cardiology. Angiography studies usually test for either a stenosis or an occlusion in a blood vessel. A stenosis is a condition where the inner lumen of the vessel has narrowed, obstructing the flow of blood through it. An occlusion refers to the condition where the inner

lumen has been completely blocked off, stopping all flow. A stenosis may not be life threatening as small flows may be able to provide the downstream tissues with sufficient nutrition. In these cases problems are only observed during stress or exercise when tissue demand rises above normal. With an occlusion, the downstream tissue starts to die unless other vessels are able to compensate by increasing their flows.

Interventional angiography is the technique that is currently used to view blood vessels. It involves the insertion of a catheter into a blood vessel, usually into either the neck or the thigh, from where it is then maneuvered into the vessel of interest. The patient is continuously exposed to x-rays and small amounts of radio-opaque iodine are injected into the catheter to enable the radiologist to locate the catheter within the patient and guide it to the location of interest. Once the catheter has been placed correctly, a large bolus of dye is injected and a series of x-ray photographs (usually digital) taken at short intervals. The different parts of the vessel darken as the blood containing the dye passes through them. The absence of dye, or a change in the thickness of the stream of the dye indicates some type of blockage.

In the interventional angiography study the patient is admitted in the morning and undergoes a few tests before being brought into the operating room. In the past these patients had been admitted the night before for observation before the procedure, but the insurance companies had deemed these stays unnecessary. Although not operations, these procedures are fairly invasive and lie on the boundary between non-invasive and operative procedures. An anesthetic is administered and the procedure started. All procedures are performed in the morning, and range in length from 2 hours for a straightforward case to 4 hours in more complicated cases. The patient usually stays in the hospital till late in the evening that day and is discharged if there are no complications. The cost of the procedure is \$2200. However, several physicians did not agree with the insurance company's decision, and felt that their patients should be observed for six to twelve hours before the procedure. They asked their patients to report to the emergency room the night before the procedure so that they could be admitted to the hospital. Thus the procedure had additional hidden costs associated with patient admission through the emergency room, and the

hospital stay. This was another instance of insurance fraud committed in the name of professional responsibility with no apparent gain to the physician.

The patient receives a relatively high radiation dose as the radiologist guides the catheter through the body and during the acquisition of the images. The estimated radiation dose is between 70rad and 100rad. As x-rays have a quality factor of one, the dose equivalent, which represents the harmful effects of the radiation, is 70 to 100rem. The NRC recommended limit for whole body radiation dose for the public is 5rem per year. While a single radiation dose of this magnitude is not likely to be harmful, repeated studies could place a significant radiation burden on the patient. There is also a radiation burden on the radiologist performing these procedures. While everyone is required to wear a lead apron and a radiation monitoring badge, few people use the badges and hence little is known about their radiation exposure.

In order to access one of the larger vessels it is necessary to make a deep injection. There is a danger of hitting a nerve or another blood vessel, which could cause hemorrhage, permanent pain or even paralysis if a nerve is struck. In addition there is a danger that the catheter could scrape plaque off the walls of the vessel which could travel to the brain and cause a stroke. The radio-opaque dye injected into the blood can also cause kidney damage, making interventional vascular radiology a relatively high-risk procedure.

MR angiography (MRA) has started to challenge conventional angiography since the early 1990s. MRA encodes the motion of the blood in the vessels to obtain an image of flow within the vessel while suppressing the surrounding tissue. The MR protocol is usually designed to make the technique sensitive to flow in one direction as vessels are linear. However if the vessel bends and travels perpendicular to the encoding direction, no flow will be observed even though it may be present. It is possible to encode the flow in three dimensions though this increases the length of the scan greatly. As it is MRA usually takes up two time slots and requires the use of a contrast agent to be injected intravenously. The entire procedure can be done on an outpatient basis and takes about one and a half hours while costing \$2600. The only invasive aspect of the procedure is the injection, and there is no radiation dose

to the patient.

While the resolution of the interventional images is currently better than the MR images, the MR images are inherently three dimensional and have the potential to improve resolution still further. In 1993, at the time the comparison was made, MRA tended to overestimate the effects of blockage, often indicating no flow in cases when small flows were still present. A diagnosis based on MRA will thus indicate the need for intervention and treatment before a regular angiography will. In terms of cost, the minor differences appears to indicate that cost differences should not be a barrier to widespread use of MRA.

There are however two distinct qualifications that come into play. The first is the effect of the patient variability, especially in psychological makeup. There are a number of patients who get very claustrophobic in an MR magnet and will refuse to remain in it for the duration of the scan. This problem might be overcome by open magnet systems that are currently in development, though they pose additional technical challenges of their own. These same patients were then scheduled for interventional angiograms later in the week and have no problems lying on a table for three hours with five or six people arrayed around them. In other cases patients who had nearly died during an interventional angiogram had no problem lying in the magnet for two hours during an MRA.

Though interventional angiography has a higher degree of risk it is still considered a relatively standard procedure by patients and insurers alike. The information asymmetry is great and poses problems for both the patient and the radiologist. The radiologists are required to get "informed consent" from the patient before they can start the procedure. This implies explaining the procedure and the possible complications. The doctors face the dilemma of telling patients only the likely risks and not accounting for the one in a million case or being as detailed as possible and scaring them away from a procedure that might offer them help. The timing of the explanation can also play an important role. Informing a patient about the risks in the waiting room 5 minutes before they are about to undergo a procedure when they are psychologically stressed is more likely to deter them than if the risks are explained in

the physicians office a few days before the procedure. This brings up the problem of how information should be presented to patients. The framework within which the risks are presented will have a decisive impact on their decision making.

The second qualification is that MRA is a purely diagnostic technique, while interventional angiography can be therapeutic. Once the catheter is inside the patient and a problem found, it is possible to introduce a balloon into the catheter and perform an angioplasty, or to introduce drugs such as urokinase that dissolve clots as soon as a problem is discovered. In this case the choice between the two methodologies would depend on the relative frequency of false positive diagnoses on the part of the referring clinicians. Once again the knowledge and information base of the referring physician can become an important determinant. The problem of information asymmetries between different specialists and between specialists and general practitioners will exacerbate the problem.

A comparison between the two techniques could be performed with a cost-effectiveness approach, as outlined in chapter 5.

Chapter 4

The Medical Profession

The importance of professional organizations in modern society was first illustrated by Durkheim in “The Division of Labour in Society.” He regarded the unique functional specialization of modern society as creating greater interdependence between groups, thus engendering an organic solidarity that promoted social cohesiveness.

Sociologists have come to describe a profession as an occupation that regulates itself through systematic, required training and collegial discipline; that has a base in technical, specialized knowledge; and that has a service rather than profit orientation that is enshrined in its code of ethics. In an article aimed at reaffirming medical professionalism, P. Preston Reynolds defines it as a set of values, attitudes, and behaviors that results in serving the interests of patients and society before one’s own [28]. The socialization of new members into the medical profession and the transmission of rules of professional conduct are conducted primarily during medical school and residency.

While professionalism has also been described as a form of occupational control restricting entry, it is also however, a kind of solidarity, a source of meaning in work, and a system of regulating belief in modern societies.

4.1 Professionalism and Authority

Paul Starr, in his Pulitzer Prize winning study, argues that the rise of the medical profession depended on the growth of its authority [29]. In the classic definition of Max Weber *Herrschaft* or authority is the probability that people will obey a command recognized as legitimate according to the prevailing rules in their society. However our everyday notions of authority extend beyond the simple giving of commands. Authority also includes judgments about the nature of the world by groups, individuals or institutions that are considered competent in making them. In an increasingly complex world, such judgments become even more specialized as different professional communities become sovereign over different aspects of reality. Authority then also refers to judgments of meaning and value, as well as definitions of reality. Thus, professionals not only advise actions, but also come to evaluate the nature of reality and experience, including the “needs” of those who consult them. As Starr remarks, “Like the sovereign in Hobbes’ *Leviathan*, their authority extends to the meaning of things,” which Starr defines as their cultural authority.

In modern medicine, physicians serve as the intermediaries between science and private experience. Their cultural authority manifests itself as the authority to interpret signs and symptoms, to diagnose health or illness, to name diseases, and to offer prognoses—the foundations of any course of action the physician may subsequently recommend.

Starr asserts that the authority of professionals incorporates two sources of effective control: legitimacy and dependence. The chief basis of dependence on professionals is their superior competence. The reliance on professional judgment engenders a nonrational basis of power—psychological dependency. The authority of doctors and other professionals also has a distinctive basis of legitimacy. They claim authority, not as individuals, but as members of a community that has objectively validated their competence. The professional offers judgments and advice not for private motives or personal gain, but as a representative of a community of shared standards. The basis of those standards in the modern professions is presumed to be rational enquiry

and empirical evidence which results in a body of consensually validated knowledge and competence. Professional authority also presumes an orientation to specific, substantive values—in the case of medicine, the value of health. The attributes of a profession are thus collegial, cognitive and moral.

The therapeutic definition of the profession's role also encourages its acceptance, as its power is avowedly enlisted solely in the interests of health. On this basis physicians exercise power over patients, their fellow workers in health care, and even the public at large in matters within, and sometimes outside, their jurisdiction. The professions' authority spills over its clinical boundaries into areas of moral and political action for which medical judgment is only partially relevant.

4.2 Professional Behavior

This section attempts to understand why physicians commit insurance fraud in the interests of their patients, in the absence of any apparent gain. It focuses on the role professional identity plays in determining the actions of members of the profession. The logic of these actions is interpreted with respect to the stated or implied goals of the individuals themselves. While these actions may perpetuate the power of the profession, the maintenance of authority and power relations is seldom the motive force for the actions of professionals. As the source of their power is based on their competence and the moral purpose of their behavior, it can be difficult to distinguish those actions based on morals and beliefs from those based on a calculation of power relations. Professional actions would tend to fall into the category of *Wertrational* action or rational action in relation to a value in Weber's typology. The importance of these values and beliefs is often underestimated, as interests and goals can often only be defined with respect to an overall system of belief.

4.2.1 The Role of Ideas and Beliefs

Ideas and beliefs underlies the legitimacy of the actions of societal actors, by providing a normative vision of "right" and "wrong." Individuals and groups in society only

pursue their interests to the extent deemed societally-acceptable. This restraint is normally not even conscious, as Charles Lindbloom points out. “Early, persuasive, unconscious conditioning—we shall see evidence of it in a later chapter on social class—to believe in the fundamental politico-economic institutions of one’s society is ubiquitous in every society [30].” Individuals and groups who believe themselves to be making free, independent decisions have already had the limits of their actions defined for them. An example that is often cited is the power and persistence of certain ideas within the British party system which were responsible for the acceptance of Keynesian economics by both parties, thus limiting the options facing the British electorate [31]. A similar argument can be made about health care reform within the American system and the continued appeal made by all political parties to the uniqueness of the American system that precludes a debate on the benefits of a single-payer systems.

Ideologies constrain the choice set of all societal actors, even if this constraint is invisible. An attempt to pursue goals outside of those that have been sanctioned by the dominant ideology will be considered illegitimate. The issue of legitimacy extends to the actions of both the state and business. State actions that are considered illegitimate will be met with widespread non-compliance in the absence of coercive-enforcement. In describing the spurt in the creation of new institutions with the onset of social regulation in the 70s, James Q. Wilson emphasised the importance of the legitimacy of state actions arguing that

“Perceptions of the fairness and unfairness of a policy profoundly affect the extent to which it is regarded as legitimate and thus the difficulty (or cost) of finding persuasive justifications for that policy [32].”

Thus gatekeeping functions and utilization management mandates are unlikely to work unless the physician providers acknowledge the legitimacy of the HMO, insurance company or government organization that issues the mandate.

The issue of legitimacy tends to become blurred when an ideology is under attack from an alternative ideology. The legitimacy of the older ideology may be continually

undermined at the expense of the newer ideology. It is at these “critical conjectures” that a society debates the question of the legitimacy of different actions.

4.3 Professionalism and the Market

Starr maintains that the contradiction between professionalism and the rule of the market is long-standing and unavoidable [29]. Medicine and other professions have historically distinguished themselves from business and trade by claiming to be above the market and pure commercialism. In justifying the public’s trust, professionals have set higher standards of conduct for themselves rather than the minimum rules governing the market place. The ideal of the profession calls for the sovereignty of its members’ independent, authoritative judgment. No such dependency relations exist in the market. Actions in the market are motivated by what Weber calls *Zweckrational* action, or action in relation to a goal.

Kenneth Arrow has suggested that professionalism grew in response to the distinctive structural characteristics of medical care, in particular as an adaptation to uncertainty in the incidence of disease and in the efficacy of treatment. These uncertainties result in a departure from the model of a competitive market. The response is ethical restrictions on physicians’ behavior, such as a bar on advertising and overt price competition, and the expectation that advice given by a doctor will be divorced from self-interest.

The conversion of health care into a commodity has been one of the underlying movements in the transformation of medicine. This commodification simultaneously leads to both an increased specialization of labour and greater distance between the sick and the caregiver. In the physicians view the competitive market has represented a threat not only to their incomes but also to their status and autonomy because it blurred the lines between commerce and professionalism, and threatened to turn them into mere employees. The AMA response to the President’s plan is a manifestation of this attitude. The history of the health care system in the twentieth century has been strongly influenced by this antagonism.

The struggle in recent decades has involved the profession trying to defend its prerogatives against the drive to rationalize the organization of medical care. The threats are of two kinds—competition and control. Prepaid health plans and HMOs represent a form of bureaucratic control in medical care. Insurance companies under pressure to control costs search for methods to regulate medical decisions. Hospitals and other organizations are merging into larger and more powerful corporate systems, while the regulatory power of the state and federal governments is always present in the background.

4.4 The Erosion of Professionalism

The development of science helped establish the cultural authority of medicine by restoring a sense of its legitimate complexity. Science gives rise to complexity and specialization, which then removes knowledge from the reach of the common man. As the medical market grew, so did the opportunity and the incentive to specialize. Specialization gives producers partial relief from competition and enables them to take advantage of whatever comparative advantage they may enjoy.

While scientific knowledge provided a basis for authority in the competence of the physician, scientific and technological changes continually undermine that authority as new findings and technologies either discredit or surpass previous knowledge. Giddens has called this reevaluation of experience on the basis of newly discovered information the “reflexivity of modernity.” Even the most competent authorities can only be trusted “until further notice [33].” Thus an absolute faith in the competence of a physician will always be tempered by uncertainty about the scientific basis of that competence. In addition, technological specialization limits the shared experiences of physicians, subdividing them into smaller groups with their own particular expertise. Thus the consensus of scientifically validated knowledge is threatened, and professionalism is diminished.

The erosion of professionalism has been brought about by specialization in medicine and the encroachment of market relations into health care. Specialization also has

fostered self-interest, and at times, intense competition among physicians for patients, institutional resources, and control over diagnostic and therapeutic technology. Feelings of collegiality and commonality have been replaced by closer affiliations to, and identification with, the goals and values of a specialty division, a research team, or a clinical practice group. This was in evidence in the study in the imaging center. Reynolds argues that the deprofessionalization of medicine is best understood when considering the difference between a calling and a career. When one enters a profession as a calling, one assumes a definite function in a community and operates within the civic and civil rules of the community. When a profession becomes a career, the orientation is to impersonal standards of excellence. Patient referrals to academic medical centers for sophisticated diagnostic technology and medical therapeutics put distance between the physician and a local patient population. Thus, divorced from a local community, medicine gradually lost its professional “calling” and became more and more a “career [28].”

Chapter 5

Technological Change

Technological innovation necessitates the creation of new organizational structures to deal with its own increasing complexity. Indeed, technological innovations that arise within the framework of existing organizational structures usually contain the seeds of change for those very structures. Organizational structures that were born during earlier periods retain their characteristics unless a specific “structural adjustment” takes place within the industry. The rapid proliferation of technology in the last twenty years is being accompanied by significant reorganization in the health care system. What is the relationship between these two phenomena? Is health care financing the only connection?

5.1 Technology and Organizations

Two important studies have attempted to work out this relation between technology and organizational forms. In one study, Herbert Kitschelt adopts a sectoral approach to the study of organizational structure [34]. He uses Perrow’s two dimensional typology to characterize the different technological systems; the first dimension being the degree of coupling in the system, dependent on asset specificity; and the second dimension the degree of complexity in the system, dependent on the level of uncertainty. Each of the four characteristic systems within this typology gives rise to a unique organizational structure. Kitschelt identifies five different forms in the

historical evolution of technological systems. which he classifies using this typology. His analysis indicates that in each case the creation of new organizational structures coincided with changes in technological systems.

In explaining the evolution of the hospital system, Charles Perrow argued that the domination of the trustees in the early life of the hospitals was rooted in the need for capital investments and community acceptance. Doctors assumed control because of the increasing complexity and importance of their skills in the management of the hospital. Finally, there is now a trend towards administrative dominance because of the complexity of internal organization in hospitals and their relations with outside agencies.

In the second study, William Lazonick identifies the importance of organizational structure in the three industrial revolutions; the role of enterprise management in the British Industrial Revolution; the use of managerial capitalism to create a Second Industrial Revolution in the United States; and the use of collective capitalism by Japan to succeed in a microelectronics-based Third Industrial Revolution [35]. He explains the success of each country in these revolutions as due to the presence of specific organizational structures in business. He relates the evolution of the organizational forms of capitalism to increasing technological complexity, and the need to improve coordination in the face of uncertainty. Uncertainty is the constant companion of innovation in medical technology, pervading the scientific, technological, clinical, and economics aspects of new technology. The drive towards integrated management and delivery systems could also be viewed as a response to the management of increased uncertainty. The role of uncertainty in medical innovation is described in a later section.

If the creation of new organizational structures follows major technological change, it is necessary to look at the dynamics of this technological change to explain the changes in organizational forms.

5.2 Traditional views of technological Change

The product cycle provides a good starting point for a discussion of the dynamics of technological change. The four stages of the product cycle are: (1) the innovation of a new product and the initial boom during production for the domestic market; (2) saturation of the domestic market which leads to declining profits, and a shift to exports which can sometimes produce a second boom; (3) the shift of manufacturing overseas via a process of foreign direct investment as the export boom fades; and (4) the import of the product from an overseas manufacturing site into the domestic market and the decline of domestic manufacturing [36]. There is some debate as to whether modern, technologically sophisticated sectors actually go through a business cycle. The pace of technological change in some sectors has increased to a point where obsolescence occurs before the cycle can even enter the second phase described here.

Schumpeter, in his analysis of business cycles, points out that it is during the stage of declining profits, a business crisis, either during the saturation of domestic markets or due to competition from cheap imports, that firms can respond in two ways [37]. The typical response is one that he calls the adaptive response. In response to a saturating domestic market, the adaptive response is to search for alternative markets for the same product, leading to the second phase of the product cycle. This is the case of MRA described in chapter 3. MRI technologies did not envision an extension to angiography when first developed. However as the tumor detecting capabilities of MRI matured, other applications of the technique were explored. In response to competition from cheap imports, the adaptive response of firms will be a demand for protection against these foreign imports. The alternative to the adaptive response is the creative response, in which the firm branches out into new products and technologies. Schumpeter believed that firms can only make adaptive responses to crisis. "The new processes do not and generally cannot, evolve out of the old firm, but place themselves side by side with them and attack them [38]." New technologies usually require new organizational forms, thus old firms will be unable to compete unless they are willing to radically restructure their organizations to be compatible

with the new technology. In recent times legions of Management Consultants have arisen to help firms carry out such restructuring. The “gales of creative destruction,” the depressions in the business cycle, play the important role of weeding out inefficient producers and consolidating the success of newer products and processes. The national character of health care delivery systems, particularly the close associations between providers and industry that is described later, does not allow for the last two stages of the product cycle to come into play. This may be one of the reasons why medical technology markets are fragmented and tend to coexist with each other rather than replacing older technologies with newer ones.

The incentive to the entrepreneur to innovate is the monopoly rents that accrue while other firms attempt to catch up with the new process. This “first-mover advantage” is becoming especially important in high-technology industrial sectors. Far less is understood about the processes of innovation and the multiple forces that encourage or impede technological development.

5.3 Technological Innovation in Medicine

The conventional view of innovation in medicine regards it as a linear process, from ideas to laboratory to animal models to select population studies and finally the bedside. However, as Gelijns and Rosenberg point out, this conceptualization only captures a part of reality, particularly with regard to medical devices [39].

A high percentage of medical devices have emerged through technological transfer from other areas. For example the use of lasers, ultrasound, magnetic resonance and the computer were all developed outside the medicine and subsequently modified to suit the needs of the medical sector, often in the second stages of the product cycle in the initial market. Another problem with the linear model is that there is no neat distinction between research and development (R&D) on one hand and adoption on the other. It is a serious misperception to think that all important uncertainties have been ironed out by the time a new technology has finally been introduced into clinical practice. Much uncertainty can only be resolved after extensive use in prac-

tice,. Adoption constitutes only the beginning of an often prolonged process in which important redesigning takes place, exploiting the feedback of new information generated by users. There will always be incremental improvements after initial adoption of a technology. The two most prominent characteristics of medical innovation are therefore:

1. New technologies retain a high degree of uncertainty long after their initial adoption; and
2. A close interaction between developers often in industrial laboratories, and users is crucial to the development of new technology.

The innovation process has several feedback mechanisms. Following the development and introduction of first generation technologies, the selection criteria and experience of these various actors may generate important new information regarding the “improvements” that need to be embodied in second-and third-generation technologies. These feedback mechanisms have usually operated to improve the safety and efficacy of treatments, and sometimes even the professional monopoly of certain specialties. As different modalities each have their advocates, the market gets fragmented and multiple technologies coexist side by side. In contrast cost considerations have rarely played an important role in these feedback mechanisms.

Medical Innovation and Cost

It is possible that these refinements meet the needs of cost-effectiveness but incentives must be present. Victor Fuchs thus emphasizes the need to “tame technology but not destroy it,” by maintaining the rate of innovation but redirecting it toward cost-reducing quality-enhancing technical change [2]. Recently, competition on the basis of price and operating costs has begun to play a much more prominent role in the medical device industry. Economic considerations will increasingly influence the direction of technological change in the years to come. However the influence of these feedback signals emphasizing the desirability of cost reductions are inherently ambiguous. First, medical research at the more purely scientific end of the spectrum

contains a higher degree of inherent uncertainty, and cost consequences and other features cannot be clearly foreseen. Even at the development and adoption stage many uncertainties remain. New medical technologies, once developed, often interact with other technologies in unexpected ways. Nevertheless, there is a shift in the direction of medical innovation from those interventions that are mainly driven by the search for better clinical results to those that emphasize cost reduction. The time horizon of these changes varies—drug manufacturers have longer time horizons, with the pipeline being 10 years or more, compared to device manufacturers and so these effects will be manifested there later. These long times buffer the impact of any policy change, especially in a political landscape that changes on a much more rapid timescale.

However, even when unit costs are reduced, the dynamics of health care are often such that these improvements in efficiency are not translated into a reduction in aggregate health care expenditures. Due to professional uncertainty about different methods, the adoption and use of technological has been shaped by a complex set of financial , professional, social and institutional factors. High technology medicine is generally regarded as a source of significant professional prestige, and, in a broader cultural sense, strong social values favour its application, particularly in life threatening disease. For hospitals, technology is a way to attract patients and physicians and to stay competitive. Technology and its use then becomes the symbol for the competence of the physician and the hospital, underlying and validating their professional authority.

New technologies also tend to expand in to new areas and create larger markets. In addition, even if they result in lower unit costs, there may be an increase in aggregate costs. There is greater elasticity of demand for medical services than is commonly believed; more precisely, a downward shift in supply may bring about an outward shift in demand with an ultimate increase in total expenditures. When technological change not only reduces costs but also improves quality, expectations of reductions in aggregate expenditures are likely to be frustrated. Thus cost savings obtained at a per patient level are offset by volume increases.

The scientific and engineering knowledge base and the supply-side policies have also stimulated the expansion of the industry. The NIH has the largest basic research budget, and was the only institute to have its budget *increased* during the 1995 budget debate. The industrial sector also has an intense R&D focus, with pharmaceuticals investing roughly 13% of annual sales turnover in R&D, and the device industry roughly 7%. These are among the most-research intense industrial sectors. In 1991, industrial sector invested \$12 billion in medical R&D compared to \$10.7 billion by the federal government.

The behavior of medical practitioners is also shaped by the way in which medicine is divided up into specialties and subspecialties. This is particularly true when a medical condition is treated by different specialties. Since the development and diffusion of technology do not take place reflect vacuum and is influenced by the availability and development of competing technological interventions, interspecialty rivalries can also be a powerful factor stimulating technological change.

5.4 Technology Evaluation

Cost effectiveness

The organizations and individuals who actually make resource-allocation decisions usually have varying objectives that should be recognized in a realistic cost-effectiveness analysis. Cost effectiveness requires information of relevant cost and outcome data. Knowledge of the costs of available clinical strategies is insufficient in most cases to permit unambiguous identification of a single strategy as the most cost effective. A cost-effective application is one that confers an additional benefit worth the additional cost. Thus it includes methods that are less costly and at least as effective, techniques that are more effective and more costly with the benefit justifying the cost, and those that are both less effective and less costly, with the reduced cost outweighing the reduction in effectiveness. The difficulty of this determination reflects the “unavoidable and inherently difficult value judgments that must be made when no single strategy is best with respect to both dollars and health.” Effectiveness must be converted into

a metric of years of life saved or quality adjusted life years saved [40]. The measures of effectiveness of health practices used should be outcome oriented, with length of life and quality of life as the ultimate measures. In measuring the quality of life, the possible tradeoffs between longevity and quality need to be made, in addition to tradeoffs between present and future health benefits and costs.

Technology Assessment

Technology assessment has grown from the determination of safety and efficacy to the measurement of effectiveness, consideration of quality of life and patients' preferences, costs and benefits. It also grapples with broader societal and ethical issues. It is due to this broader perspective that technology assessment is different from cost-effectiveness. However, the inclusion of societal and ethical issues, makes the identity of the actors performing these assessments a critical factor in their widespread acceptance and consequent legitimation. There is little information about who these actors should be and how consensus can be generated. This is a recurrent failing, as was observed in the disingenuous proposal by the Jackson Hole Groups for a National Health Board that could make decisions on "the basis of science and values but not politics."

These assessments must also be integrated into clinical decision making to be useful. In a paper criticizing the uncritical acceptance of medical innovation, David Grimes assigned responsibility primarily with physicians, although consumers have often demanded unproved technologies. He argues that

"Doing everything for everyone" is neither tenable nor desirable. What is done should be inspired by compassion and guided by science—and not merely reflect what the market will bear. As physicians, we are ethically bound to be sure that the tests, procedures, and treatments we provide are worth the money, pain and inconvenience they cost. The methods to assess technologies are well accepted and widely available; what remains to be seen is whether we as a profession and a nation have the moral courage to use them [41]."

Chapter 6

Policy Implications

6.1 Recent Developments in Health Care

The recent passage of the Kennedy-Kassebaum Act by a 98–0 vote in the U.S. Senate is one of the few surviving piecemeal efforts to reform the health care system left over from the major overhaul that was proposed by the Clinton Administration and debated in 1993 and early 1994. While this has been the primary state determined response to the debate, landmark changes have occurred within the health care delivery system itself, especially with the expansion of health maintenance organizations, increasing limits to fees and procedures, as well as greater surveillance of the actions of doctors.

Private interests in the health care sector are clearly in the ascendancy. With the health care system undergoing change at an unprecedented rate, countless questions arise. How does the integration of a hospital and its medical staff affect the care of patients? What forces are driving organizational change, and what will the impact on the system? While the general direction of these changes appears to be an increased reliance on managed care and a more competitive system, the study examined the nature of change that communities were undergoing.

In order to get a snapshot of the sweeping changes taking place, The Robert Wood Johnson Foundation launched a new Health Tracking initiative in 1995 to record and report on the unfolding changes and their impact. The study found important

organizational change taking place in all fifteen of the communities studied. The magnitude of the changes in the delivery of care to patients was lagging behind the magnitude of charges in the organizations that deliver or finance care. Hospital mergers or affiliations had not proceeded to the point of closing duplicative capacity, and integration between hospitals and physicians had not yet proceeded to concrete steps to better coordinate the delivery of care across components of the system. Efforts to better integrate care proceed slowly, if they are pursued at all, because of the difficulty and the resources required and the forces that resist it. Consumers however did not perceive change as being very extensive.

Managed care is more prominent in all of the communities, while fewer people in each community were financing their health care through insurers that passively pay claims. Health plans were steering enrollees to providers that offered a lower price, and were also attempting to influence the nature of services provided. Providers have started to compete for blocs of patients on the basis of price and organizational reputation. Strong pressures still continue to exist on both private and public purchasers to limit health care costs.

The researchers found that communities were not even at different points on a common path, but rather were pursuing completely separate paths, with unique destinations. They attributed these differences to:

1. differences in the relative strengths of existing institutions;
2. the concentration of hospital sectors with large institutions;
3. previous community experience with managed care; and
4. differences in local political and business cultures.

The 1993-1994 health care reform debate had also had an important impact on the changes in communities. It spurred organizations to initiate changes to prepare themselves for the potential world of managed competition. The effect was heightened because of the congruence between the direction in which health care systems were moving on their own initiative and the direction envisioned by the Clinton plan.

Actions by organizations increased pressure on their competitors to act. Mergers by some hospitals put pressure on other hospitals to merge and on health plans to consolidate to exercise countervailing power. The forces driving change are generally the same across the country. Many of the tools that are being developed by providers, health plans, and purchasers to respond to these forces are being watched nationally and quickly adapted for use in other communities [42].

After the defeat of the Clinton, the Jackson Hole Group explicitly dropped its goal of universal coverage. The Group's new plan "Responsible Choices"

"does not promise health insurance for everyone, since that is an impossible goal without raising taxes, creating unfunded mandates, or prolonging the deficit. The Jackson Hole Group has not backed away from its commitment to adequate health protection for everyone but proposes that once the size of the problem is decreased and understood, we can better identify and deal with those still left out of the system [43]."

This admission reflects a major reorientation in objectives, as can be seen in comparison to the special introduction to a 1994 issue of *Health Affairs* devoted to reform in which Hillary Rodham Clinton argued that

"Technical changes that prevent us from reaching the goal of universal coverage are not acceptable to this administration—nor should they be to economists, academics, or the American people. We will not settle for tinkering, only true health reform. Congress will certainly work out the details of any final reform, but, with many different approaches before Congress today, we must insist that any reform guarantee to every American comprehensive benefits that are spelled out in law and can never be taken away. We must not shrink before this challenge. We must not wait, as Uwe Reinhardt and John Iglehart warn in their introduction to this issue, until that "hypothetical better day" when it could cost less to guarantee comprehensive benefits. Now is the time for the United States to guarantee health coverage to its citizens [44]."

6.2 Policy Implications

If the ideas present in this thesis hold out, there will be a one-time adjustment resulting in decreased costs to the health care system after which the rise will continue once more spurred by technological change. The elimination of inefficiencies in the current system can result in lower costs. However after the market adjusts to this new baseline, the effect of technological improvements that expand capabilities while also expanding markets will lead to increased spending on health care. This prediction is backed up by the similar increases in costs observed in different societies and systems. The uncertainties and time lags involved in technological development make them less sensitive to short term policy swings. A reduction in the rate of increase can only come about if societies make explicit decisions about how much they are willing and able to spend on health care. These decisions are essentially a debate on the values of society and its attitudes to health, sickness, old age and death.

As technological forms change, there will be corresponding responses in organizational forms. It is interesting to note, that at a time that major U.S. manufacturers like the automobile companies, A.T.& T. and IBM are deconstructing the integrated delivery systems built up earlier in this century in order to be more flexible in the marketplace, health care has been moving to greater integration of services.

The problem of outcomes and quality of care will continue to create problems until a consensus develops on the values and the methodologies to be used. Given the different viewpoints of the groups affected, this is only likely to take place in the context of a public debate. The complexity of the issues and the nature of political communication make this a fairly remote possibility at the present time. It is not possible to completely extricate the debate on values with the development of methodologies.

The transformative properties of technological change should not be underestimated. The reshaping of abilities that alters market size and structures as well as the continuous specialization that reshapes the professional perspectives of the physicians dispensing care can have enormous impact. The inherent uncertainties and complex-

ities involved in shaping the direction of innovation make it difficult to predict the effect of cost-consciousness on the direction of future technologies. The presence of uncertainty is also undermining the public's perception of the competence of medical professionals.

In addition to the increased specialization and the loss of public confidence, professionalism is also threatened by the encroachment of market relations. Whether this encroachment will have a positive or negative impact is uncertain, and will probably depend on the viewpoint of who is making the decision. Asymmetries have also started to develop between the specialist and the primary care physician, leading to miscommunication and misuse of resources. The information asymmetries between physicians and patients in their contact with each other is unlikely to decrease. However, in many cases, once an initial diagnosis has been made it is often possible to obtain a tremendous amount of information from resources like the World Wide Web. Information gathering firms now offer summaries of the latest research about specific diseases or procedures directly to the public, as many physicians themselves are not able to keep up with the latest developments in practice around the world. This opens up the possibility of patients and physicians acting together in the future to overcome problems of information.

While professionalism appears to be waning, it would be premature to count it out too soon. A majority of the physicians in practice today have been socialized into the profession with certain beliefs and ethics. Behavioral patterns do not change quickly and attempts to move too quickly to impose utilization management and gatekeeping function, is likely to be met by widespread non-compliance, due to the lack of perceived legitimacy of these actions. Financial incentives alone will not be able to change behavioral patterns. The desirability of its disappearance is also questionable. As David Blumenthal notes about the increase commodification of medical care:

“Policymakers and health care managers must realize that physicians are part of the society in which they practice and are influenced by its prevailing beliefs and norms. If current trends continue, they will come to

see themselves more as economic agents and less as professionals, and they will feel less bound by traditional professional obligations. These include improving themselves and their profession through research and learning; resolving conflicts of interest in patients' favour (including the obligation to provide charity care); and supervising the conduct of their fellow professionals through peer review [45].”

Bibliography

- [1] Stewart Wolf and Beatrice Bishop Berle, editors. *The Technological Imperative in Medicine*, New York, 1981. Plenum Press.
- [2] Victor Fuchs. *The Health Economy*. Harvard University Press, Cambridge, Massachusetts. 1986.
- [3] William B. Schwartz. In the pipeline: A wave of valuable medical technology. *Health Affairs*. pages 70–79, Summer 1994.
- [4] Richard A. Rettig. Medical innovation duels cost containment. *Health Affairs*, pages 7–27, Summer 1994.
- [5] John D. Stoeckle. *Encounters between Patients and Doctors*. MIT Press, Cambridge, Massachusetts, 1987.
- [6] The White House Domestic Policy Council. *The President's Health Security Plan*. Times Books, New York, 1993.
- [7] Congressional Budget Office. Economic implications of rising health care costs. Technical report, The Congress of the United States, 1992.
- [8] Order in the Tort, Survey II. *The Economist*, July 18–24 1992.
- [9] Joseph P. Newhouse. Medical care costs: How much welfare loss? *Journal of Economic Perspectives*, 6:3–21. 1992.
- [10] Joseph P. Newhouse and The Insurance Experiment Group. *Free for All? Lessons from the RAND Health Insurance Experiment Group*. Harvard University Press, Cambridge. Massachusetts. 1993.
- [11] Kathleen N. Lohr, Robert H. Brook, George A. Kaumberg, Caren J. abd Goldberg, Arleen Leibowitz, Joan Keesey, David Reboussin, and Joseph P. Newhouse. Use of medical care in the RAND Health Insurance Experiment: diagnosis- and service-specific analysis in a randomized controlled trial. Technical Report R-3469-HHS, RAND Corporation, Santa Monica, CA, 1986.
- [12] M. Susan Marquis, David E. Kanouse, and Laurel Brodsley. Informing consumers about health care costs - a review and research agenda. Technical Report R-3262-HHS, RAND Corporation, Santa Monica, CA, 1985.

- [13] Alain C. Enthoven. Consumer-choice health plan. *N. Engl. J. Med.*, 298:650–658, 709–720, 1978.
- [14] Alain C. Enthoven. Market forces and health care costs. *JAMA*, 266:2751–2752, 1991.
- [15] Alain C. Enthoven and Kronick R. A consumer-choice health plan for the 1990s: Universal health insurance in a system designed to promote quality and economy. *N. Engl. J. Med.*, 320:29–37, 94–101, 1989.
- [16] Paul M. Ellwood, Alain C. Enthoven, and L. Etheredge. The Jackson Hole initiatives for a twenty-first century American health care system. *Health Econ.*, 1:149–168, 1992.
- [17] Alain C. Enthoven. Measuring the candidates on health care. *N. Engl. J. Med.*, 327:807–809, 1992.
- [18] American Medical Association. Letter to the Membership, September 1993.
- [19] Daniel Yankelovich. The debate that wasn't: The public and the clinton plan. *Health Affairs*. pages 7–23, Spring 1995.
- [20] Theda Skocpol. The rise and resounding demise of the clinton plan. *Health Affairs*, pages 66–85, Spring 1995.
- [21] Howard Waitzkin. The strange career of managed competition: From military failure to medical success? *Am. J. Public Health*, 84:482–489, 1994.
- [22] David Blumenthal. The vital role of professionalism in health care reform. *Health Affairs*, pages 252–256, Spring (I) 1994.
- [23] F. Bloch, W. W. Hansen, and M. Packard. Nuclear induction. *Phys. Rev.*, 70:460, 1946.
- [24] E. M. Purcell, H. C. Torrey, and R. V. Pound. Resonance absorption by nuclear magnetic moments in a solid. *Phys. Rev.*, 69:37, 1946.
- [25] Raymond Damadian. Tumor detection by nuclear magnetic resonance. *Science*, 171:1151–1153, 1971.
- [26] P. C. Lauterbur. Image formation by induced local interactions: Examples employing nuclear magnetic resonance. *Nature*, 242:190–191, 1973.
- [27] Stephen R. Barley. Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *ASQ*, 31:78–108, 1986.
- [28] P. Preston Reynolds. Reaffirming professionalism through the education community. *Ann. Intern. Med.*, 120:609–614, 1994.

- [29] Paul Starr. *The Social Transformation of American Medicine*. Basic Books, New York. 1982.
- [30] Charles Lindbloom. *Politics and Markets*. Basic Books, New York, 1977.
- [31] Peter Hall. *Governing the Economy: The Politics of State Intervention in Britain and France*. Oxford University Press. Oxford, 1986.
- [32] James Q. Wilson. *The Politics of Regulation*. Basic Books, New York, 1980.
- [33] Anthony Giddens. *Modernity and Self-Identity*. Stanford University Press, Stanford, California. 1991.
- [34] Herbert Kitschelt. Industrial governance structures, innovation strategies, and the case of Japan: Sectoral or cross-national comparative analysis? *International Organization*, 45:453–493, 1991.
- [35] William Lazonick. *Business Organization and the Myth of the Market Economy*. Cambridge University Press, Cambridge, 1991.
- [36] James R. Kurth. The political consequences of the product cycle: Industrial history and political outcomes. *International Organization*, 33:1–34, 1979.
- [37] Joseph A. Schumpeter. The creative response in economic history. *Journal of Economic History*, pages 149–159, 1947.
- [38] Joseph A. Schumpeter. The instability of capitalism. *Economic Journal*, pages 361–386, 1928.
- [39] Annetine Gelijns and Nathan Rosenberg. The dynamics of technological change in medicine. *Health Affairs*, pages 28–46. Summer 1994.
- [40] Milton C. Weinstein and William B. Stason. Foundations of cost-effectiveness analysis for health and medical practices. *N. Engl. J. Med.*, 296:716–721, 1977.
- [41] David A. Grimes. Technological follies: The uncritical acceptance of medical innovation. *JAMA*, 269:3030–3033, 1993.
- [42] Paul B. Ginsburg. The rwjf community snapshots study: Introduction and overview. *Health Affairs*, pages 7–19, Summer 1996.
- [43] Paul M. Ellwood and Alain C. Enthoven. 'responsible choices': The jackson hole group plan for health reform. *Health Affairs*, pages 24–39, Summer 1995.
- [44] Hillary Rodham Clinton. Meaningful health reform: The time is now. *Health Affairs*, pages 7–8, Spring(I) 1994.
- [45] David Blumenthal. Effects of market reforms on doctor and their patients. *Health Affairs*, pages 170–184, Summer 1996.