MEDICAL TECHNOLOGY AND ITS RELATION TO HEALTH CARE COSTS

THESIS

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

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The purpose of this study is to demonstrate that within the United States health care system, a number of institutions have evolved which have given rise to a perverse set of incentives that direct technological change. As a result of these incentives, the diffusion and utilization of new and existing technologies is carried out in a random and indiscrete fashion, subsequently placing upward pressure on the costs of health care. This analysis relies on the empirical work, observations, and writings of a large number of physicians, social scientists, hospital administrators, and federal bureaucrats.
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CHAPTER I

INTRODUCTION

Background

The central thesis of this study is to demonstrate that within the United States health care system, a number of institutions have evolved which have given rise to a set of incentives that are directing technological change in medical care. As a result of this direction, the diffusion and utilization of new and existing technologies is carried out in a random, haphazard, and indiscrete fashion, with the subsequent result being an upward pressure on the costs of health care.

Medical science, over the last half century, has experienced a dramatic rate of technical change. Beginning in the thirties, and until the early fifties, society witnessed the development and diffusion of many new drugs, including penicillin and a host of other antibiotics. During this period, we also saw the development and use of a variety of new immunological techniques. As these innovations were diffused, society experienced a rapid decline in both morbidity and mortality rates associated with many infectious diseases and the near elimination of many of the common childhood virus diseases. Lewis Thomas, an eminent bio-researcher,
refers to this kind of technical change as "high technology," that is, genuinely decisive technologies that address the underlying disease mechanisms and result in their prevention and cure (3, p. 1368).

Not only were the outcomes of these technologies beneficial in increasing the health status of society, but they were also successful from an economic perspective. They called for no new equipment and facilities for their administration, and they incurred costs only in research, development, and marketing. By way of example, a typical case of lobar pneumonia, before the introduction of antibiotics, required three to four weeks of hospitalization, with very close supervision. Today, this disease, as well as a host of other infectious diseases, can be aborted in a few short days without hospitalization simply by administering antibiotics. To further illustrate this point, consider the following observation by Howard Hiatt: "It has been estimated that the economic benefit of measles vaccine over a ten-year period exceeded $1.3 billion. The savings in terms of lives saved and cases of mental retardation averted are even more important" (2, p. 238). These kinds of innovations or "high technologies" unquestionably represent progress, perhaps even triumph, of medical science.

As we entered the sixties, the rapid pace of technical change continued, however, the direction of change was undergoing a transformation. The focus was on developing new
techniques which were generally resource intensive and required hospitalization of the patient. Examples of such technologies which were based on complex machinery and electronics were the artificial kidney, the pacemaker, the heart-lung machine which has made open-heart surgery possible, intensive care and coronary care units, organ transplants, and electronic fetal monitoring--to name a few. In reference to this type of technology, Thomas called it a . . . "halfway technology." This represents the kinds of things that must be done after the fact, in efforts to compensate for the incapacitating effects of certain diseases whose course one is unable to do very much about. It is a technology designed to make up for disease, or to postpone death (3, p. 1368).

The rapid pace of technical change marched on into the seventies where we witnessed the introduction and diffusion of still more complex, resource intensive technologies, with the CAT scanner being the most oft-cited example. As the costs of medical care were escalating at a rate much more rapid than overall inflation rates, more and more social scientists turned their attentions to the health care industry.

As we enter the eighties, medical science finds itself confronted with essentially the same roster of common major diseases that it was confronted with in the fifties. The knowledge base concerning the underlying mechanisms of these diseases has been extended considerably, but relatively few techniques of the magnitude of "high technology" which
prevent and cure disease have been developed since the early fifties (2). Progress in this pursuit is sporadic, and requires a large commitment of resources to basic research (a commitment which the current administration appears unwilling to make). Medical science has, however, developed and diffused quite an array of what Thomas called "halfway technologies" that postpone death and, in many instances, enhance the quality of life for those who suffer from one or the other of such major diseases.

One challenge to social scientists is to learn more about what factors influence the development, diffusion, and utilization of these halfway technologies. It is becoming clear that the current institutional framework within which this technological process is operating is not working very well. For many of the major diseases these halfway technologies are all we have, and, until medical science can come up with the real cures, the "high technologies," we have an obligation to use these technologies in a more rational and economic fashion.

Method and Scope

The analysis presented in this paper relies heavily on the empirical work, observations, and writings of a large number of physicians, social scientists, hospital administrators, federal bureaucrats, and elected officials. It is an attempt to bring together the work of many of these individuals and to construct an explanation for the way in
which medical technologies are diffused and utilized in the United States health care system.

This thesis is organized into five chapters. The next chapter, Chapter II, explores some background statistics on the current, past, and projected trends of health care spending in this country.

In Chapter III, the major participants in the market for hospital care will be delineated. It will be demonstrated that the organization of this market has a great deal to do with the problem of the diffusion and utilization of medical technologies.

Chapter IV considers the cases of two specific technologies--intensive care and open-heart surgery. These two case studies will demonstrate how the incentives provided by our delivery system are directing the process of technology diffusion and utilization in medical care.

In the chapter that follows, Chapter V, a number of strategies that have been proposed or implemented for the control of medical technology will be evaluated with respect to their appropriateness.

The final chapter, Chapter VI, summarizes and discusses the conclusions of this study. Recommendations for further research will also be suggested.
CHAPTER BIBLIOGRAPHY


CHAPTER II

HEALTH CARE EXPENDITURES: CURRENT, PAST AND PROJECTED TRENDS

As stated in the Introduction, one of the central ideas to be developed in this work is that technological change does contribute to the growth of health care expenditures, particularly in the hospital sector. In order to place the impact of technology on costs in perspective, it is necessary first to examine the current, past, and projected trends in health care spending.

Current Expenditures

National health care expenditures are maintained and published by the Health Care Financing Administration on an annual basis (4). National Health expenditures are the sum of all expenditures for personal health care, prepayment and administration, government public health activities, medical research, and the construction of new medical facilities (1, p. 30).

For the year ending in June, 1980, health expenditures totaled $227.7 billion (5, p. 3). Of that total, $202.7 billion was for personal health care (Table I). Approximately 67 percent of all personal health care expenditures went for hospital services and physicians' payments—45.4
percent and 21.5 percent respectively. The remaining 33 percent went to cover dentists' services, other professional services, drugs and drug sundries, eyeglasses and appliances, and nursing home care.

**TABLE I**

NATIONAL HEALTH EXPENDITURES, BY TYPE OF EXPENDITURE*

<table>
<thead>
<tr>
<th>Type of Expenditure</th>
<th>Year Ending June</th>
<th>Annual Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1979**</td>
<td>1980**</td>
</tr>
<tr>
<td>Total</td>
<td>$200.3</td>
<td>$227.7</td>
</tr>
<tr>
<td>Health Services and Supplies</td>
<td>190.7</td>
<td>217.4</td>
</tr>
<tr>
<td>Personal Health Care</td>
<td>177.1</td>
<td>202.7</td>
</tr>
<tr>
<td>Hospital Care</td>
<td>80.2</td>
<td>92.1</td>
</tr>
<tr>
<td>Physicians' Services</td>
<td>38.0</td>
<td>43.5</td>
</tr>
<tr>
<td>Dentists' Services</td>
<td>12.7</td>
<td>14.7</td>
</tr>
<tr>
<td>Other Prof. Services</td>
<td>4.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Drugs and Drug Sundries</td>
<td>16.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Eyeglasses and Appliances</td>
<td>4.2</td>
<td>4.6</td>
</tr>
<tr>
<td>Nursing Home Care</td>
<td>16.4</td>
<td>19.3</td>
</tr>
<tr>
<td>Other Personal Health Care</td>
<td>4.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Prepayment and Administration</td>
<td>7.9</td>
<td>8.3</td>
</tr>
<tr>
<td>Gov. Public Health Activity</td>
<td>5.7</td>
<td>6.4</td>
</tr>
<tr>
<td>Research and Construction</td>
<td>9.6</td>
<td>10.3</td>
</tr>
<tr>
<td>Research</td>
<td>4.4</td>
<td>4.8</td>
</tr>
<tr>
<td>Construction of Med. Facilities</td>
<td>5.1</td>
<td>5.4</td>
</tr>
<tr>
<td>Addenda:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross National Product</td>
<td>$2,254.1</td>
<td>$2,473.9</td>
</tr>
<tr>
<td>National Health Expenditures</td>
<td>8.9</td>
<td>. . .</td>
</tr>
</tbody>
</table>


**Amounts in billions.

Per capita personal health care expenditures for the year ending June 1980, were $898, up $106 from the previous year (5, p. 5). Included in this figure is $408 for hospital
care and $193 for physicians' services. This represents a 13.5 percent increase in per capita health expenditures over the previous year (5, p. 1). This rate exceeds that of per capita Gross National Product for the same period--8.7 percent (5, pp. 3-5).

As Table II indicates, around three-fifths of all personal health care expenditures were funded by private sources--private health insurance, philanthropy, industrial programs, and direct out-of-pocket consumer payments.

TABLE II
PERCENTAGE DISTRIBUTION BY SOURCE OF FUNDS, FOR SELECTED PERSONAL HEALTH CARE EXPENDITURES*

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>Twelve-Month Period Ending</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>June, 1979</td>
<td>June, 1980</td>
</tr>
<tr>
<td><strong>Personal Health Care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Private Funds</td>
<td>59.9</td>
<td>59.7</td>
</tr>
<tr>
<td>Public Funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Government</td>
<td>40.1</td>
<td>40.3</td>
</tr>
<tr>
<td>State and Local Government</td>
<td>28.2</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>11.9</td>
<td>11.7</td>
</tr>
<tr>
<td><strong>Hospital Care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Private Funds</td>
<td>44.3</td>
<td>44.3</td>
</tr>
<tr>
<td>Public Funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Government</td>
<td>55.7</td>
<td>55.7</td>
</tr>
<tr>
<td>State and Local Government</td>
<td>40.8</td>
<td>41.2</td>
</tr>
<tr>
<td></td>
<td>14.9</td>
<td>14.5</td>
</tr>
<tr>
<td><strong>Physicians' Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Private Funds</td>
<td>73.9</td>
<td>73.9</td>
</tr>
<tr>
<td>Public Funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Government</td>
<td>26.1</td>
<td>26.1</td>
</tr>
<tr>
<td>State and Local Government</td>
<td>19.6</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>6.6</td>
<td>6.2</td>
</tr>
</tbody>
</table>

As the preceding table shows, the remaining two-fifths of personal expenditures for health care was funded by federal, state and local governments.

HCFA statisticians, in analyzing the growth of personal health care expenditures, have allocated relative weights to three factors that affect this growth: price changes of inputs; population changes; and intensity (5, p. 7). It is this last factor, intensity, which has the most relevance to this study. Intensity refers to a composite of types and amounts of resources used per unit of service. It is frequently used in the literature as a proxy measure for technological change as the following passage by Paul Feldstein indicates:

A large portion of what are measured as increases in input intensity are undoubtedly substitutions from a lower to a higher quality of inputs. The kinds of diagnostic tests performed change over time and more expensive (and presumably better) methods replace less expensive ones; for example, new, more expensive drugs replace older ones (1, p. 206).

As Table III indicates, much of the rise in personal health care expenditures can be attributed to price changes of inputs. In addition to inflation, the intensity factor also plays a relatively large role in the growth of health care spending. In the following three chapters this intensity factor will be expanded on considerably. More specifically, an attempt will be made to clarify, more precisely, the linkage between technological change and the ever-rising costs of health care. In the section that follows the
historical trends in health care expenditures will be analyzed.

TABLE III

RELATIVE CONTRIBUTIONS OF FACTORS AFFECTING THE GROWTH OF PERSONAL HEALTH CARE EXPENDITURES

<table>
<thead>
<tr>
<th>Factors Affecting Growth</th>
<th>June, 1979</th>
<th>June, 1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Changes</td>
<td>69.0%</td>
<td>73.0%</td>
</tr>
<tr>
<td>Population Changes</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Intensity of Inputs</td>
<td>24.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>


Past Trends in Health Care Spending, 1950-1978

In 1978, national health expenditures totaled $192.4 billion, or $863 per capita (4, p. 184). Between 1970 and 1978, national health expenditures have more than doubled, increasing at an annual rate of 12.6 percent (4, p. 190). Table IV shows the average annual percent changes in total health expenditures. It appears that the price controls, established during the Economic Stabilization Program which was imposed in 1972, dampened health spending briefly. However, when the controls were lifted in 1974, an increase in expenditures of 13.8 percent followed in 1974-1975 (4, p. 179). As can be seen from the table, with the exception of the
1972-1973 price control period, there has been an upward secular trend in health care expenditures for the past three decades. This rising trend has continued on into 1978, which experienced a 13.2 percent annual increase in health expenditures.

**TABLE IV**

NATIONAL HEALTH EXPENDITURES, AVERAGE ANNUAL PERCENT CHANGES SELECTED YEARS 1950-1978*

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Annual Percent Change</th>
</tr>
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<tbody>
<tr>
<td>1950-1955</td>
<td>6.9%</td>
</tr>
<tr>
<td>1955-1960</td>
<td>8.7</td>
</tr>
<tr>
<td>1960-1965</td>
<td>9.8</td>
</tr>
<tr>
<td>1965-1970</td>
<td>11.7</td>
</tr>
<tr>
<td>1970-1975</td>
<td>12.0</td>
</tr>
<tr>
<td>1970-1971</td>
<td>10.8</td>
</tr>
<tr>
<td>1971-1972</td>
<td>12.0</td>
</tr>
<tr>
<td>1972-1973</td>
<td>10.4</td>
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<td>1973-1974</td>
<td>13.0</td>
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<td>1974-1975</td>
<td>13.8</td>
</tr>
<tr>
<td>1975-1976</td>
<td>13.2</td>
</tr>
<tr>
<td>1976-1977</td>
<td>14.2</td>
</tr>
<tr>
<td>1977-1978</td>
<td>13.2</td>
</tr>
</tbody>
</table>


Health care spending, as a proportion of Gross National Product, has also been increasing over the past thirty years. This simply reflects the fact that society is trading off the purchase of other goods and services in order to purchase more health care. GNP has increased from $284.8 billion in 1950 to 2.1 trillion in 1978, representing an average annual increase of 7.4 percent (4, p. 179). Health expenditures,
on the other hand, were $12.7 billion in 1950 and $192.4 billion in 1978, an average annual increase of 10.2 percent (see Table V). In 1950, 4.5 percent of GNP was devoted to health care while in 1978 9.1 percent of GNP went to health care.

TABLE V

GROSS NATIONAL PRODUCT AND NATIONAL HEALTH EXPENDITURES, SELECTED YEARS 1950-1978*

<table>
<thead>
<tr>
<th>Year</th>
<th>GNP</th>
<th>National Health Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount in Billions</td>
<td>Percent of GNP</td>
</tr>
<tr>
<td>1950</td>
<td>$284.8</td>
<td>$12.7</td>
</tr>
<tr>
<td>1955</td>
<td>398.0</td>
<td>17.7</td>
</tr>
<tr>
<td>1960</td>
<td>503.7</td>
<td>26.9</td>
</tr>
<tr>
<td>1965</td>
<td>688.1</td>
<td>43.0</td>
</tr>
<tr>
<td>1970</td>
<td>982.4</td>
<td>74.7</td>
</tr>
<tr>
<td>1971</td>
<td>1,063.4</td>
<td>82.8</td>
</tr>
<tr>
<td>1972</td>
<td>1,171.1</td>
<td>92.7</td>
</tr>
<tr>
<td>1973</td>
<td>1,306.6</td>
<td>102.3</td>
</tr>
<tr>
<td>1974</td>
<td>1,412.9</td>
<td>115.6</td>
</tr>
<tr>
<td>1975</td>
<td>1,528.8</td>
<td>131.5</td>
</tr>
<tr>
<td>1976</td>
<td>1,700.1</td>
<td>148.9</td>
</tr>
<tr>
<td>1977</td>
<td>1,887.2</td>
<td>170.0</td>
</tr>
<tr>
<td>1978</td>
<td>2,107.6</td>
<td>192.4</td>
</tr>
</tbody>
</table>


Over the last thirty years, increases in the medical care component of the Consumer Price Index have outpaced all other items included in the index. From 1950 to 1978, the price of medical care, as measured by the CPI, has more than quadrupled (4, p. 187). For the same time period, the
overall CPI increased slightly more than 2.5 times. When compared with other major components of the CPI (food clothing, housing, and transportation), medical care prices have, with few exceptions, increased at a significantly higher rate. Over the period as a whole, food and medical care have risen most rapidly (1, p. 49).

With respect to sources of payment, there has been a substantial redistribution from private to public sources. In 1966, with the advent of the Medicare and Medicaid programs, public spending for health care increased dramatically. In 1978, public per capita expenditures were $350.40, 6.5 times the pre-Medicare-Medicaid level of 1965 (4, p. 180). Total public expenditures have increased 1.6 times as fast as private expenditures. Moreover, while public funds accounted for one-fourth of all health expenditures in 1965, they accounted for 40.6 percent in 1978. Contrast this with private expenditures which paid 75.1 percent of the total health bill in 1965 and 59.4 percent in 1978 (4, p. 180).

HCFA statisticians have determined that increased personal health expenditures from 1969 to 1978 have been affected by three factors: (a) prices of inputs; (b) population changes; and (c) intensity. According to their calculations, 63 percent of the increased spending during this period can be attributed to inflation; 7 percent has been due to population changes; and the remaining 30 percent is
due to increased intensity i.e. greater use or changes in the kinds and amounts of services provided (3, p. 4). As was mentioned earlier, it is this "intensity" factor, as a proxy measure of technological change, that is the primary concern in this study.

As can be seen by examining the current and past trends of health care expenditures, it is quite clear that we are faced with a major medical cost spiral. In the section that follows the projected trends in health care spending will be examined.


The projections of national health care expenditures presented in this section are based on the work of three HCFA economists (2). They are assuming in their model that historical trends and relationships will continue and that neither a mandatory cost containment program or national health insurance will be implemented over the period for which the projections are made.

The estimated average annual rate of increase in national health expenditures from 1978 to 1990 is 12.1 percent, essentially the same as the rate of 12.0 percent for the 1970-1975 interval (which included the price control period), but below the 13.5 percent rate maintained during the 1975-1978 period (see Table IV).
Increases in health care expenditures are projected to continue to outpace growth in Gross National Product, with national health expenditures accounting for 9.5 percent of GNP in 1980, 10.5 percent in 1985, and 11.5 percent by 1990 (2, p. 8).

As Table VI demonstrates, expenditures for hospital care have been, and, according to these projections, will continue to be the largest single category of health expenditures. Accounting for 40 percent of total expenditures in 1978, they are projected to be about 42 percent by 1985, and 44 percent in 1990. Increases in hospital expenditures are estimated to increase at an average annual rate of 13.1 percent between 1978 and 1990 (2, p. 12).

Historically, growth in hospital patient days has been slow compared to the significant growth in services per patient day, i.e. increasing intensity. These trends are projected to continue throughout the eighties (2, p. 10).

Expenditures for physicians' services quadrupled during the period from 1965 to 1978—an 11.6 percent average annual increase (2, p. 12). The expenditures for physicians' services considerably understate their overall impact on health care costs, however. To illustrate this point, if all physicians accepted a 20 percent reduction in their incomes, this would result in reducing total health care


<table>
<thead>
<tr>
<th>Type of Expenditure</th>
<th>Historical Years</th>
<th>Projected Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Aggregate Amount</td>
<td>$43.0</td>
<td>$74.7</td>
</tr>
<tr>
<td>Personal Health Care</td>
<td>$37.3</td>
<td>$65.7</td>
</tr>
<tr>
<td>Hospital Care</td>
<td>$13.9</td>
<td>$27.8</td>
</tr>
<tr>
<td>Physicians' Services</td>
<td>$ 8.5</td>
<td>$14.3</td>
</tr>
<tr>
<td>Aggregate Per-Capita</td>
<td>$217.4</td>
<td>$358.63</td>
</tr>
<tr>
<td>Personal Health Care</td>
<td>$188.4</td>
<td>$315.37</td>
</tr>
<tr>
<td>Hospital Care</td>
<td>$ 70.46</td>
<td>$133.39</td>
</tr>
<tr>
<td>Physicians' Services</td>
<td>$ 42.84</td>
<td>$68.81</td>
</tr>
<tr>
<td>Percentage Distribution</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Personal Health Care</td>
<td>86.7</td>
<td>87.9</td>
</tr>
<tr>
<td>Hospital Care</td>
<td>32.4</td>
<td>37.2</td>
</tr>
<tr>
<td>Physicians' Services</td>
<td>19.7</td>
<td>19.2</td>
</tr>
</tbody>
</table>

expenditures by only 3.66 percent.* The physician's primary influence on health care costs lies in his role as the decision maker. All major decisions with respect to allocating health resources are made by the physician: when to hospitalize, when to discharge, what tests to order, drugs to administer, surgery or no surgery, etc.

In this chapter the symptoms of the problem, i.e., the rising costs of health care have been examined. In the chapter that follows, the underlying causes of these symptoms will be analyzed. Much of this cost spiral will be explained by examining the major health care institutions and how they interact with one another.

*In 1978, 18.3 percent of total health care spending was for physicians' services. Hence: (18.3% of total) x (20% cut) = 3.66% reduction.
CHAPTER BIBLIOGRAPHY


CHAPTER III

THE MARKET FOR HOSPITAL CARE IN THE
UNITED STATES

In the previous chapter it was shown that the United States has been faced with a major medical cost spiral over the last thirty years. It is projected that this trend will continue throughout the eighties. Perhaps the most notable of all of the cost statistics is the trend of devoting larger and larger proportions of our Gross National Product to health care. This statistic reflects that we are trading-off the consumption and production of other goods and services in order to purchase more health care.

Had we seen a similar rise in relative expenditures in the durable goods sector most economists would interpret this as the result of informed consumers expressing their preferences in a more or less competitive marketplace. However, the peculiar characteristics of the demand for and supply of medical care services, and in particular hospital care, insulate this industry from conventional market signals.

On the demand side, it has been convincingly demonstrated that consumers are ignorant with respect to medical care services and how consumption of specific services address their health care needs (6, pp. 9-10; 17, pp. 21-22; 26, pp. 5-6). If this is in fact the case, then there is considerable
distortion in the allocative efficiency that is expected in more conventional markets where consumers have, to a greater or lesser degree, "perfect knowledge."

On the supply side of medical care, consumers' ignorance is not offset by the "invisible hand" of competition as it might be in other markets. After all, if producers are engaged in vigorous competition with one another they will go to great lengths to inform the consumer of the relative merits of their products. As Victor Fuchs said, "the profession does little to inform the consumer; in fact it frequently takes positive action to keep him uninformed" (26, p. 6). In the medical care market not only do we see high barriers to entry but also non-competitive pricing which gives the providers of care--hospitals and doctors, varying amounts of monopoly power over consumers. The extent of this control is suggested in the following passage:

... severe restrictions on entry are assured through the medical profession's control of medical schools, licensing requirements, and hospital appointments. Advertising is forbidden and price competition is severely frowned upon. Critical comment concerning the output of other physicians is also regarded as unethical (26, p. 7).

The purpose of this chapter is first to delineate the overall structure and function of the various participants who make up the market for hospital care. The way in which the various participants interact with and influence one another's behavior will be analyzed. It will be shown that
this peculiar institutional structure has given rise to a perverse set of incentives which are directing technological change in medical care. The result of these incentives is that the diffusion and utilization of both new and existing technologies is being carried out in a random, indiscrete, and haphazard fashion resulting in much of the upward pressure on the costs of health care. It is, in effect, an attempt to understand the underlying disease mechanism which is manifested by the symptoms of increasing costs of health care.

The market for hospital care is composed primarily of four constituents. The first two are the providers of care—doctors and hospitals. The third participant is the whole complex of government and private third-party insurers. The fourth group is the patients. First the role of the third-party payers will be examined since they have such a significant impact on the behavior of the remaining three groups.

Third-Party Insurers

The system of third-party payers is composed of both private insurance companies and the government through its Medicare and Medicaid programs. The third-party system has evolved from the philosophy that no one should have to forgo needed medical care because it is beyond their economic capability to purchase it. As far as transforming this philosophy into practice, third-party payers have been
remarkably successful. The majority of United States citizens today do not have to forgo medical care because they cannot afford it. As the following passage indicates, the benefits of medical insurance, both public and private, are widely appreciated. Consumers receive protection against the risk of large, unpredictable medical expenditures, and low-income people are assured of medical care regardless of their ability to pay (44, p. 81).

In 1950, between 40 and 50 percent of all hospital costs were paid for by third parties with the balance being paid directly by the patient (58, p. 2). By 1977, 90 percent of all hospital costs were paid for by third-parties—both public and private, leaving roughly 10 percent to be paid directly by patients (29, p. 402). Remuneration for physicians' services is slightly less generous with 61 percent being paid for by third parties in 1977 (29, p. 402). As was noted in Chapter Two, expenditures for hospital care and for physicians' services are the two largest categories of personal health care expenditures claiming 45 percent and 21 percent, respectively, in 1978 (refer to Table VI).

The proliferation of third-party payers over the last thirty years, particularly Medicare and Medicaid, has substantially minimized the economic barriers that prevented many low-income and elderly citizens from obtaining needed health care. To illustrate this point, in the year before Medicare and Medicaid, visits to physicians per person varied directly with income (44, p. 80). In the year following the
introduction of these two public insurance programs--1967--this relation changed dramatically--those whose incomes were less than $3,000 had as many physician visits as did those in the highest income class, those making over $10,000 (44, p. 80). In discussing these findings, Newhouse and Taylor concluded:

This change was caused by the new federal insurance programs, which were aimed at the poor and the aged and which obviously succeeded in lowering the economic barriers that formerly prevented low-income families from obtaining health care (44, p. 80).

The benefits of both public and private insurance with respect to increasing the accessibility of health care for all citizens, including the elderly and poor, are well documented. There do, however, remain some inequities with regard to race and geographical distribution of benefits (22, p. 27). Although there are many obvious benefits, there are also many disadvantages associated with the growth of third-party coverage. These disadvantages become much more clear when one looks at the system from a macro-perspective. To start with, it is important to understand how the extent of insurance coverage is related to the demand for medical care services generally and hospital care specifically.

First of all, there is a considerable body of evidence that the total amount of spending on medical care is greater with insurance than it would be if consumers paid for that care directly (17, p. 12; 24, p. 210; 45). To be more specific, insurance has the effect of making medical care
less costly to patients by lowering the net price paid by the patient at the point of delivery. A patient who is extensively insured thus has an incentive to purchase more medical care and more costly forms of medical care than he would if he had to pay for that care directly (17, p. 12). Several studies have documented that patients do, in fact, respond this way to insurance coverage (17, p. 12). As Karen David has noted, insured families have more hospitalizations, longer hospital stays, more visits to the physician, and more extensive use of ancillary services such as laboratory tests and X-ray examinations. Furthermore, as insurance policies cover a larger and larger share of the total medical bill, incentives to make even more use of medical services, and particularly more expensive types of service, are compounded (17, p. 12).

Implicit to this argument is the assumption that it is the patient who is making the decisions about his use of hospital care, not his physician. It is true that the physician is the primary decision maker in allocating medical resources, however, the patients' influence on the physician who is acting as an informed "purchasing agent" in the patient's behalf, should not be minimized. After all, it is the patient who takes the initiative to seek the advice and care of a physician and the patient is free to accept or reject his recommended mode of treatment. Even if the physician does make all of the decisions, he is likely to consider the financial impact that the care he recommends will have on his patient (23). It seems obvious that the
physician's concern over the cost of the care he is ordering and providing is minimized in the presence of extensive insurance coverage.

In addition to increasing the demand for medical care, insurance has led to changes in the cost, quality, and types of services that are provided. In the presence of increasing insurance coverage, physicians have been able to charge higher fees for the same services (55, p. 40). To illustrate this point, Sloan and Steinwald determined that physician fees will increase by 0.19 to 0.30 percent for every 1 percent increase in the proportion of the population having major medical insurance (55, p. 40). Government insurance programs have allowed hospital-based physicians such as radiologists, anesthesiologists, and pathologists the opportunity to increase their incomes as well (17, pp. 13-14). In addition to physicians, hospital workers in general have benefited from increased revenues accruing to hospitals from third-party reimbursement (22, pp. 53-73). All of these higher costs are reflected in higher hospital bills for all patients, insured and uninsured alike.

Insurance has also altered the "style" of care as it tends to encourage the use of high-cost hospital care when ambulatory care would be adequate and certainly less expensive. The incentives for the bias towards hospitalization rather than outpatient care are exemplified in the following passage:
Hospital care is the single most expensive component of all health expenditures and it is the most extensively covered by third-party payments, and thus is the service most attractive and financially accessible to consumers. Given a choice between an alternative but less expensive means of receiving care requiring direct payment, and more expensive hospital care covered by some form of third-party payment, the thrifty consumer (and his physician) will choose the latter alternative (43, pp. 85-86).

This disposition to generously reimburse high-cost, inpatient hospital care is not surprising when one examines the historical development of hospital insurance. Hospital insurance was first introduced during the depressed thirties, primarily to assure hospitals with an assured source of revenues (17, p. 20). The original idea was created and implemented by hospital providers. Hospital insurance and its close ties to the hospital industry itself, suggest that much of the present insurance is designed to serve medical care providers, more than it is designed to meet the medical needs of the consumer. For example, in 1970, 56 percent of all local Blue Cross board members were medical providers, with 42 percent representing hospitals and 14 percent representing the medical profession (36, pp. 18-30). The following passage indicates the resistance by providers to shifting the emphasis from high-cost inpatient care to lower-cost substitutes:

Some third-party payers (commercial insurance companies) are attempting to stimulate the use of alternative treatment modes such as outpatient surgery or day hospital care, but all too often opposition to these innovations emanates from the very institutions housing the new programs, the voluntary hospitals. The reason
for this, of course, is that hospitals are not at risk for the total cost of hospital care. They are typically reimbursed at full cost for care delivered, leaving as a loss the fixed costs associated with unfilled beds. Savings from innovative admissions substitutes therefore do not accrue to the hospital, but to the third-party payer (or, rarely, to the patient). Thus the new service is perceived as a threat to the hospital, and the obvious economies to the system as a whole become of secondary import (61, p. 63).

The presence of insurance coverage has placed us in a self-perpetuating spiral: the higher the fees of physicians and the higher the charges of hospitals, the greater will be the demand for insurance coverage. For the community as a whole, the spread of insurance helps bring about higher prices and more sophisticated services which in turn cause a further increase in the demand for insurance coverage. Pauly sums up this "catch-22" in saying, "People spend more on health because they are insured and buy more insurance because of the high cost of health care" (46, p. 13).

Even though health insurance premiums are inflating at rapid rates, there are strong incentives for consumers to purchase more protection. Mark Pauly argues that many groups are overinsured and that this overinsurance is just adding fuel to the inflationary fire (46). The strongest incentives for purchasing more health protection are provided by government tax policies. The government subsidizes the purchase of health care premiums in two ways: (a) under the personal income tax 50 percent of the cost of health insurance premiums up to $150, plus all medical expenses (which include the
remaining premiums) that exceed 3 percent of income may be
deducted; and (b) employers' contributions to employees'
health insurance premiums are not taxable as income (17, p. 15). In this way the government subsidizes both individ-
uals and employers on their employees' behalf for their health
insurance premiums. The following scenario makes the incen-
tives in this arrangement more clear:

The process is simple: If I buy insurance for myself, I do so with after-tax dollars. If I am in a 40 per-
cent tax bracket, I must earn $1,000 to be able to
purchase $600 worth of insurance. If, however, my
employer buys insurance for me, the cost of the
insurance is a tax-free fringe benefit (analogous
to a middle management car). Thus the employer can
purchase $1000 worth of insurance on my behalf, 67
percent more than I could buy, at no cost to him
(if he reduces my wages accordingly) and with no drop
in after-tax income for me. Indeed, if he purchases
$800 worth of insurance for me, I end up with $200
worth of extra insurance and $120 more disposable
income. The employer is just as well off, and I am
better off in all respects. The loser is the public
purse (20, p. 377).

This simplified overview of the health insurance industry
is by no means exhaustive. It does, however, provide some
insights as to how third-party payments insulate both the
providers of care as well as the patients from the considera-
tion of the costs of the care that is actually received. In
the presence of extensive third-party coverage, individual
decisions are made as though medical resources were unlimited.
When the aggregate impact of all of these individual decisions
are examined, it becomes more obvious that this mechanism
which allows medical care to be distributed as a free good is resulting in our trading off resources from other purposes.

In the section that follows it will be shown how the providers of health care are affected by the third-party reimbursement system.

The Hospital

The modern hospital is the keystone of the American health care system. Not only is it central to the delivery of patient care, but it also plays an important role in the training of health care personnel and in the conduct and dissemination of medical research. As the twentieth century has evolved, the hospital has played an increasingly dominant role in the health-care industry. Dowling and Armstrong attribute this evolutionary trend to four factors: advances in medical science have increased the efficacy and safety of hospitals; the development of technological sophistication and specialization have necessitated the institutionalization of much of medical care; the development of professional nursing brought about more humane treatment of patients; and advances in medical education added teaching and research to the hospitals' role (18, pp. 128-130).

In terms of the number of people employed, hospitals are the second largest "industry" in the United States (18, p. 125). In 1978, over 3.75 million people worked in hospitals, representing 57 percent of all persons employed
in the health service industry (30, p. 155). Hospitals are, by far, the largest single component of the health care system--consuming 40 percent of all national health care expenditures in 1980 (refer to Table I).

In any discussion of the hospital and its role in the United States health care system, it is important to note that American hospitals come in all shapes and sizes, and fall under a variety of different kinds of ownership arrangements. Because of the heterogeneous nature of this particular industry one must be cautious when making generalizations about "the" hospital. This analysis is referring to, unless otherwise specified, nonfederal short-term general hospitals as they represent approximately 85 percent of all hospitals. Table VII gives a good indication of the mix and number of hospitals as of 1979.

It is equally important to note that American hospitals are in a constant state of evolution. This section is intended to provide a still-life portrait of hospitals as they exist today and to examine some of the changes that have occurred over the past thirty years in order to provide some insights as to what directions this particular institution will take in the future.

In the following passage, Victor Fuchs suggests many of the contradictions that exist in our hospital system and further empahsizes just how difficult it is to generalize about "the" hospital.
The American hospital is large, impersonal, and dominated by elaborate technology. The American hospital is small, inefficient, underequipped, and understaffed. The American hospital exists primarily to further the professional and economic interests of physicians. The American hospital exists to serve the community. The American hospital is crowded to the point of inefficiency and even danger, and serious delays are encountered in obtaining admission. The American hospital is often half empty, and many of its patients should be at home or in extended-care facilities. The American hospital is the noblest expression of the philanthropic impulse. The American hospital is a business run to show a profit for its owners (28, p. 79).

While Fuchs' remarks enumerate many of the criticisms that have been leveled against our hospitals, the central
problem is that of the rapidly rising real costs of hospital care.

In 1979, adjusted expenses per inpatient day for hospital care were $215.75, representing an 11.3 percent increase over the previous year. These expenditures, incurred by the hospital to provide one day of inpatient care, have been increasing rather steadily since 1965, with an average annual increase of 12.7 percent for the period 1965-1979 (refer to Table VIII). The slower growth rates of 7.6 percent for 1972-1973 and 11.2 percent for 1973-1974 reflect the impact of the wage and price controls imposed under the Economic Stabilization Program; the rapid acceleration to 17.6 percent for 1974-1975 is generally attributed to the lifting of those controls (30, p. 181).

As Table VIII shows, when these figures are adjusted for inflation by expressing them in constant (1967 = 100) dollars, it can be seen that hospital cost per inpatient day has indeed risen at a higher rate than overall prices. Expressed in constant dollars, the average annual increase in cost per inpatient day was 5.9 percent for the period 1965-1979.

As a necessary first step in developing government policies to deal with this abnormally high rate of cost increase, it is imperative to understand just how increases in hospital costs differ from the problem of inflation in other sectors of the economy. The argument that will be
TABLE VIII
AVERAGE COST PER INPATIENT DAY IN CURRENT AND CONSTANT DOLLARS, SELECTED YEARS 1950-1978 (1967 = 100)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Cost Per Inpatient Day Current $</th>
<th>Consumer Price Index 1967 = 100</th>
<th>Average Cost Per Inpatient Day Constant $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>$15.62</td>
<td>72.1</td>
<td>$21.66</td>
</tr>
<tr>
<td>1955</td>
<td>23.12</td>
<td>80.2</td>
<td>28.83</td>
</tr>
<tr>
<td>1960</td>
<td>32.23</td>
<td>88.7</td>
<td>36.34</td>
</tr>
<tr>
<td>1965</td>
<td>40.56</td>
<td>94.5</td>
<td>42.90</td>
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<td>1970</td>
<td>73.73</td>
<td>116.3</td>
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<td>83.43</td>
<td>121.3</td>
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<td>1972</td>
<td>94.61</td>
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</tr>
<tr>
<td>1974</td>
<td>113.21</td>
<td>147.7</td>
<td>76.65</td>
</tr>
<tr>
<td>1975</td>
<td>133.08</td>
<td>161.2</td>
<td>82.56</td>
</tr>
<tr>
<td>1976</td>
<td>152.24</td>
<td>170.5</td>
<td>89.29</td>
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<td>1977</td>
<td>173.25</td>
<td>181.5</td>
<td>95.45</td>
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<td>1978</td>
<td>193.81</td>
<td>195.3</td>
<td>99.24</td>
</tr>
<tr>
<td>1979</td>
<td>215.75</td>
<td>217.4</td>
<td>99.24</td>
</tr>
</tbody>
</table>


developed here is that the increase in hospital costs reflects the changing nature and composition of hospital services rather than the simplistic explanation that it has been due to
higher prices for an unchanged product (24, p. 206). In order to explain hospital cost inflation it is, therefore, necessary to understand why it is that hospitals are providing an increasingly more sophisticated and expensive form of care than they did five, ten, twenty, and thirty years ago. The primary reason for this is that patients are much more willing to pay for expensive care, and physicians are much more willing to order such care, largely because of the increasing share of hospital costs that are being paid for by third-parties (21, p. 19). This position will be developed much more fully in the remainder of this chapter.

Martin Feldstein has offered a useful technique for analyzing hospital cost inflation (21, pp. 19-56). This is a very simple analysis which disaggregates or "decomposes" overall hospital cost inflation into four components: the increased number of personnel per patient; increases in hospital wage rates; the increased use of nonlabor inputs per patient day; and higher prices for those nonlabor inputs. Decomposing overall hospital costs into these components provides for a more in-depth understanding of hospital cost inflation.

Indeed, the hospital industry has become more labor intensive since 1965--hospital labor intensity per patient day increased by 46 percent between 1965 and 1979 (3, p. A7). As Table IX shows, on the average, hospitals employed 272 persons per 100 patients at the beginning of the seventies;
TABLE IX

HOSPITAL EXPENSES PER INPATIENT DAY, PERSONNEL AND NUMBER PER 100 PATIENTS,
AND AVERAGE ANNUAL PERCENT CHANGE, 1971-1979*

<table>
<thead>
<tr>
<th>Year and Period</th>
<th>Adjusted Expenses Per Inpatient Day**</th>
<th>Labor Costs as Percent of Total</th>
<th>Personnel***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Labor</td>
<td>Nonlabor</td>
</tr>
<tr>
<td>1971</td>
<td>$83.43</td>
<td>$53.10</td>
<td>$30.33</td>
</tr>
<tr>
<td>1972</td>
<td>94.61</td>
<td>59.24</td>
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<td>1973</td>
<td>101.78</td>
<td>62.86</td>
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<td>1974</td>
<td>113.21</td>
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<td>1975</td>
<td>133.08</td>
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<td>1976</td>
<td>152.24</td>
<td>88.08</td>
<td>64.16</td>
</tr>
<tr>
<td>1977</td>
<td>173.25</td>
<td>99.63</td>
<td>73.62</td>
</tr>
<tr>
<td>1978</td>
<td>193.81</td>
<td>110.82</td>
<td>83.99</td>
</tr>
<tr>
<td>1979</td>
<td>215.75</td>
<td>122.95</td>
<td>92.80</td>
</tr>
</tbody>
</table>

| Average Annual Percent Change |
|-------------------------------|---------------------------------|-----------------|
| 1971-1979                     | 12.7                            | 11.1            |
| 1971-1972                     | 13.4                            | 11.6            |
| 1972-1973                     | 7.6                             | 6.1             |
| 1973-1974                     | 11.2                            | 9.4             |
| 1974-1975                     | 17.6                            | 14.9            |
| 1975-1976                     | 14.4                            | 11.5            |
| 1976-1977                     | 13.8                            | 13.1            |
| 1977-1978                     | 11.9                            | 11.2            |
| 1978-1979                     | 11.3                            | 10.9            |

| **Average Annual Percent Change | 4.1 | 2.9 |

**Refers exclusively to expenses incurred for inpatient care.**

***Full-time equivalent personnel.**
by the end of the decade, 328 hospital employees serviced every 100 patients. This represents an average annual rate of increase in labor intensity of 2.4 percent over the last decade.

The increase in the size of hospital staffs is partly attributable to the decrease in the number of hours worked (at one time nurses worked twelve-hour shifts, therefore, only two shifts per day were required) and partly to the growing complexity of hospital care (28, p. 91). It is this latter factor, the growing complexity of care, and its relationship to technological innovation in health care, that is of particular relevance to this study. One of the unique characteristics of the hospital industry is that, unlike other industries where physical capital tends to diminish labor requirements, most of the new developments in medicine have tended to increase them (28, p. 91). Much more will be said of this in the following chapter where two prominent medical innovations--intensive care and open-heart surgery will be examined.

In order to determine the impact that payroll expenses have had on hospital costs, it is necessary to look not only at the increasing number of personnel but also to observe their wage increases over time. As Table X shows, hospital wage rates have risen faster than wages in other parts of the economy. The average earnings per hospital employee increased 237 percent between 1960 and 1978, while average
TABLE X

AVERAGE ANNUAL EARNINGS, HOSPITAL AND ALL OTHER PRIVATE NONFARM EMPLOYEES, IN CURRENT
AND CONSTANT (1967 = 100) DOLLARS, SELECTED YEARS 1960-1979

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<tr>
<td>Hospital Employees*</td>
<td>$3240.0</td>
<td>4072.2</td>
<td>5920.7</td>
<td>6529.8</td>
<td>8649.0</td>
<td>9439.0</td>
<td>10097.6</td>
<td>10906.8</td>
<td>11838.9</td>
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<td>Current Dollars</td>
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<tr>
<td>Constant Dollars</td>
<td>3652.8</td>
<td>4309.2</td>
<td>5090.9</td>
<td>5383.2</td>
<td>5365.4</td>
<td>5536.1</td>
<td>5563.4</td>
<td>5584.7</td>
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<tr>
<td>Current Dollars</td>
<td>4196.4</td>
<td>4966.0</td>
<td>6229.6</td>
<td>...</td>
<td>8502.0</td>
<td>9126.0</td>
<td>9828.0</td>
<td>10592.4</td>
<td>...</td>
</tr>
<tr>
<td>Constant Dollars</td>
<td>4731.0</td>
<td>5255.0</td>
<td>5356.5</td>
<td>...</td>
<td>5274.2</td>
<td>5352.5</td>
<td>5414.9</td>
<td>5423.6</td>
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**Statistical Abstract, 1979 Edition, p. 419. Published weekly figures have been converted into annual rates. Data refer to production or nonsupervisory workers.
earnings of all private nonagricultural workers rose only 152 percent over the same period. Although hospital workers had more ground to gain in order to catch up with the comparable wages being earned in other industries, they did, by 1975, reach parity. In fact, over the last half of the seventies hospital workers, on the average, have been earning slightly more than wage earners in other industries.

In light of these statistics on the increasing number of personnel per patient and the increases in their attendant earnings it is not difficult to understand why many hospital administrators have attributed their inflating costs to their increasing payroll obligations. This explanation is, however, inadequate to account for all of the rise in hospital costs over the past several years. A closer look at Table IX reveals that labors' share of expenses per inpatient day have, indeed, risen--at an average annual rate of 11.1 percent over the last decade. However, when the trend of labor costs as a proportion of total hospital costs is examined, it becomes clear that over the period from 1971 to 1979, labor costs, as a percentage of total hospital costs, have actually declined from 63.6 percent to 57.0 percent. This clearly suggests that the increasing cost of labor, alone, is insufficient to explain all of the inflation in hospital costs. In order to account for all of the rise in costs it is necessary to look also at the relative contribution of
nonlabor inputs and the intensity of their use, to hospital cost inflation.

By way of comparison, consider the relative importance of increasing labor and nonlabor costs. Table IX shows that labor costs per inpatient day rose from $53.10 in 1971 to $122.95 in 1979, representing an average annual rate of increase of 11.1 percent. In contrast, nonlabor costs per inpatient day increased from $30.33 in 1971 to $92.80 in 1979, an average annual increase of 15 percent. The overall increase in expenses per inpatient day of 12.7 percent represents a weighted average of the rates of increase of the two components, labor and nonlabor. Each component is weighted by its corresponding share in total cost. Therefore, the 11.1 percent increase in labor cost contributes 6.63 percent to the total cost increase (11.1 x .597, the average labor share of total inpatient costs), and the 15 percent increase in nonlabor costs contributes 6.0 percent to the increase in total costs.* The increase in labor and in nonlabor costs, therefore, each account for about half of the rise in total inpatient cost per day over the period from 1971 to 1979.

These calculations on the relative contributions of labor and nonlabor components to hospital cost inflation over the period 1971-1979 are comparable to those of Feldstein

*6.63 = 11.1 x .597, the average labor share of total inpatient costs.
which were done over a twenty-year period from 1955 to 1975, using the same decomposition technique (21, p. 29). Feldstein, however, went further with his analysis and determined that

the 4.6 percent annual increase in real inputs (1955-1975) therefore accounts for about 75 percent of the relative rise in hospital costs. The remaining 25 percent comes about because the hospitals' input prices increased at a more rapid rate than the general increase in consumer prices (21, p. 31).

Now that the extent of hospital cost inflation has been examined and broken down into its contributing factors, i.e. labor and nonlabor components, it is necessary to analyze some of the peculiar characteristics of the market for hospital care. This should provide considerable insight into why hospital costs are increasing so rapidly.

A number of significant features of the market for hospital care have been cited as contributing factors to hospital cost inflation. They include the nature of hospital competition; the predominance of third-party payment for hospital care through government programs and private health insurance; the fact that many hospitals are reimbursed by third-party payers on the basis of costs incurred; and the significant portion of hospital care that is provided by non-profit institutions. In the remainder of this section the contribution of each of these characteristics of the hospital marketplace to the rapidly rising costs of hospital care will be analyzed.
Hospital Competition

The hospital, just as the patient, is dependent upon the physician—the physician begets patients, patients fill the beds, and keeping the beds filled is the road to economic survival for the hospital. This dependence upon physicians has led to a unique form of competition between hospitals (26, pp. 102-104; 49, p. 231; 52, p. 296; 53, p. 296). It is not price competition for there is little incentive to compete on the basis of price since, in the presence of extensive third-party coverage, physicians and patients are relatively insulated from such considerations. They do, however, compete—they compete for doctors. This competitive imperative and the consequences for institutions who cannot live up to it is exemplified in the following passage.

Most hospital administrators see themselves in competition with other hospitals for physicians, not for patients, since it is only through a physician that an individual may be admitted to a hospital . . . a hospital that cannot retain a satisfied medical staff will soon find its occupancy rate falling, and its ability to function as a health care institution seriously impaired (49, p. 231).

In their efforts to attract doctors as staff members, hospitals must have the very best of facilities. They appeal to the technologically biased predisposition of physicians by offering him the newest, the biggest, and the best of whatever the increasing frontier of medical technology has to offer. The extent of this non-price competition via medical technology acquisition and its impact on the
diffusion of technologies is evident in the following comment by Rettig and Harman:

New technologies may be introduced by hospitals in order to attract physicians or keep them—to entice them to hospitalize their patients in that particular facility. . . . Similarly, the provisioning of a very sophisticated emergency room may be undertaken to increase the prospects of keeping beds "filled." Here again, price competition really doesn't enter. This characteristic of hospital practice may lead to very rapid diffusion of technology (52, p. 10).

This competition based upon prestige results in a great deal of needless duplication of new and often extremely costly technologies (12; 24, p. 212; 34, p. 98). The proliferation of such items as coronary care and intensive care units, CAT scanners, renal dialysis, and facilities for coronary bypass surgery, to name a few, has not always been so much a function of community need as it has been a result of the competition between area providers for a limited number of physicians. It is what Secretary Califano referred to as a "medical arms race" (12, p. 113).

It is important to emphasize that this medical arms race is resulting in substantial excess capacity and unnecessary duplication of expensive services within the hospital system. As R. L. Kane noted, "a complex piece of equipment may make sense if it is the only one in town; but if every hospital has one [the pressure for], utilization increases and costs rise accordingly" (34, p. 98). There is some evidence that when demand or need is insufficient to justify
such capital expenditures there is pressure placed on the doctors by hospital administrators to utilize the equipment more in order to help pay for it. Thus, the introduction of many new technologies does appear to exhibit some characteristics of supply-induced demand (5, p. 55; 34, p. 98). In reference to the building of new hospital beds, "Roemer's Law," which has been substantiated by several econometric studies, says essentially that if we insist on building more hospital beds, they will tend to get filled (28, p. 96). In the following section on the physician, this concept of supply-induced demand will be elaborated upon.

In hospitals' efforts to keep up with the Joneses, so to speak, they have been aided by third-party payers in a very significant way. As Cotterill has noted,

> the growth of third-party financing has had important implications for the supply of complex medical technologies. In recent years debt financing has surpassed philanthropy as the chief financing method employed by hospitals. Debt financing has increased greatly as a result of the fact that debt is a reimbursable expense under the cost-based reimbursement arrangements employed by many third-parties, including Medicare and Medicaid. Ultimately, the critical variable affecting ease of financing is the extent of hospital costs covered by third-party reimbursement (14, p. 7).

As the above passage suggests, in the presence of cost-based reimbursement schemes utilized by third-parties, there are few incentives for hospitals to be more judicious or to restrict unnecessary capital expenditures. They are, in effect, guaranteed against a loss on many new technologies.
The sharing of expensive facilities by area providers might lower their costs substantially but with the current third-party reimbursement system there are no incentives to do so (38, 60).

The Predominance of Third-Party Payment for Hospital Care

In the previous section on third-party payers it was discussed how demand is influenced by third-party insurors. It was pointed out that insurance has the effect of making medical care less costly to patients by lowering the net price paid by the patient at the time that actual care is delivered.

To illustrate the impact that insurance has had on the demand for hospital care consider the following data. In 1950, the average cost per inpatient day was slightly less than $16 (refer to Table VIII). Third-party payers collectively, that is all government programs and private insurors, paid 49 percent of this bill (21, p. 2). Therefore, the average net cost to the patient for a day of hospital care was about $8. By 1978, the average cost per inpatient day had increased to slightly less than $194. But private and public insurors covered 90 percent of this bill, resulting in an out-of-pocket expense to the patient of $19.40. Thus, although the cost of providing a day of hospital care had increased more than twelve-fold (from $16 to $194), the net cost to the patient had slightly more than doubled (from $8
to $19.40). This is in current dollars. When these figures are expressed in constant (1967 = 100) dollars, something even more enlightening is revealed: the net, out-of-pocket payment for a day of hospital care has actually decreased—from $11 in 1950 to $10 dollars in 1978. To sum it up, the net cost to the patient at the time of illness has not, in real terms, changed very much at all over the past twenty-eight years.

It is the opinion of many researchers that it is this method of financing hospital care that is the essence of the cost problem. The predominance of third-party payments separates payer from consumer, and therefore, provides an incentive for consumers to seek, and for providers to supply, more sophisticated and costly medical care (31, p. 103). This has resulted in hospitals providing such care in the relative absence of concern over the costs of that care. Hospital care has, in effect, been made a "free good" in the eyes of both providers and consumers.

Cost-Based Reimbursement and the Non-Profit Status of Hospitals

In addition to the peculiar form of competition and the unique financing mechanism of hospital care, there are two other features of the market for hospital care which deserve mention: cost-based reimbursement and the non-profit status of most hospitals.
In recent years, slightly more than 50 percent of all hospital revenues have been determined retrospectively on the basis of costs incurred (31, p. 104). That is, reimbursement is based upon what the providers say the cost of providing treatment was, after that care has been administered. The implications of this reimbursement scheme are evident in the following remark by Karen Davis.

Direct reimbursement encourages increased health care outlays, since the goal is maximization of revenues rather than the minimization of costs. Direct reimbursement has also provided a blank check for underwriting the rapid adoption of costly new medical technologies, often before their efficacy has been proved (16, p. 203).

As was suggested in the preceding passage, hospitals are not, in general, attempting to minimize costs as we would expect to see in most industries. Out of a total of 6,988 hospitals of all types, only 727 of them are for-profit institutions (3, pp. A7-A8). The non-profit status of most hospitals provides little incentive to seek the least costly (or most profitable) mode of operation for producing a given product or service. The absence of incentives to contain costs that exist in for-profit industries has thus led to waste, inefficiency, and unnecessary duplication of expensive services in the hospital sector (28, p. 103). It has also led to the criticism that hospitals may very well be run primarily for the benefit of physicians (28, p. 103).

In this brief overview of the hospital industry it has been demonstrated that over the last thirty years, the cost
of hospital care has accelerated at rates significantly in excess of overall rates of inflation for the entire economy. Overall hospital costs were then decomposed into labor and nonlabor components, respectively. It was demonstrated that they are each responsible for about half of the overall increase in costs per inpatient day. It was then demonstrated that this unusually rapid increase in costs per inpatient day reflects the changing character of hospital care, the growing labor requirements, and the increasing volume of equipment and facilities, rather than the rise in the price of these inputs.

In an effort to understand what are the reasons behind this problem some of the peculiar characteristics of the market for hospital care were examined--the lack of price competition via technological sophistication; the predominance of the third-party reimbursement arrangement; cost-based reimbursement schemes and the non-profit status of most of the hospital industry. These unique features provide considerable insight into why hospital costs are rising so rapidly.

In the section that follows, the role of the physician as the primary allocator of health care resources will be investigated.

The Physician

In the early sixties the American Medical Association was accused of creating a shortage of physicians by erecting
and maintaining overly restrictive barriers to entry into the medical profession (67, p. 130). It was argued that the maintainance of artificial scarcity was resulting in upward pressure on physicians' fees as well as depriving many people access to adequate medical services, particularly those living in rural areas. Economists confidently argued that if you increase the supply, the price will subsequently come down. Basic supply and demand.

Now, two decades later, many of the restrictive barriers have been lowered and the number of physicians has substantially increased. By 1979, the supply of doctors (M.D.'s and D.O.'s) was two-thirds greater than it was in 1960 (31, p. 79). Between 1970 and 1979 the number of active physicians increased 34 percent to 433,600 (31, p. 188). Not only has the number of physicians grown in absolute terms, but, relative to population growth the number of physicians has increased more rapidly--thus, raising the physician-to-population ratio from 14.2 per 10,000 in 1960 to 19.3 per 10,000 in 1979 (31, p. 188).

However, despite large increases in the supply of physicians, there still remain serious inequities in terms of access to care (31, pp. 79-80). Furthermore, contrary to many economists' predictions, the price did not come down. In fact, over the last two decades, physician fees have steadily increased at rates that significantly exceed the increase in consumer prices generally (4, pp. 199-201; 28, p. 58).
These unexpected results have forced economists and other policy makers to look more closely into the peculiar market for medical care for an explanation. The purpose of this section is to investigate the physicians' role in this particular market in order to understand how his actions affect the costs of health care generally and hospital care specifically.

Although the physician accounts for only 8.7 percent of health related personnel and grosses slightly less than one-fifth of all health care expenditures, he literally controls the total process of care (31, pp. 187, 215). He truly is, as Victor Fuchs has suggested, the "captain of the team" (28, pp. 56-78).

To illustrate this point, it has been estimated that more than 70 percent of all health care expenditures and 93 percent of all hospital expenditures are directly influenced, if not controlled, by the discretion of physicians (51, p. 99; 67, p. 130). The reasons for this are fairly obvious. The patient lacks the ability to diagnose and treat his own illness, he must thus rely on the professional judgment of a physician. The physician, by virtue of his extensive training and expertise, not to mention his monopoly power, makes nearly all decisions on how medical resources should be utilized when treating individual patients. He decides whether or not to hospitalize the patient and when to discharge him, what tests to run and what drugs to administer,
to operate or not to operate, etc. The patient may either accept his physicians' treatment plan or, if he is not satisfied, go to another physician. It is truly a seller's market.

Now that the central role that the physician plays in the allocation of health care resources, particularly those centered in the hospital has been established, it is necessary to investigate some of the institutions and the incentives that these institutions provide that influence the physicians' decisions. They include a predisposition to provide technologically sophisticated, usually hospital-based, care; remuneration based on fee-for-service; the predominance of third-party reimbursement which has the effect of insulating physicians from cost considerations of the care that they provide; and the practice of defensive medicine.

Victor Fuchs, a pioneer health economist, has put forth an explanation which seemingly accounts for many of the decisions that the doctor makes when treating patients. He suggests that physicians are dominated by what he calls a "technologic imperative." In his words,

The problem, as I see it, is that the physician's approach to medical care is dominated by what may be called a "technologic imperative." In other words, medical tradition emphasizes giving the best care that is technically possible; the only legitimate and explicitly recognized constraint is the state of the art. . . . All this sets medical care distinctly apart from most goods and services. Automobile makers do not, and are not expected to, produce the best car that engineering skills permit.
They are expected to weigh potential improvement against potential cost. If they do not, they will soon be out of business (27, p. 197).

This concept of a technologic imperative dominating physicians' behavior is broadly accepted by both physicians and social scientists who are investigating the problem and is well documented in the literature (10, p. 127; 42, p. 251; 43, p. 86; 50; 51, p. 102; 57, p. 356).

Many efforts have been made to estimate the contribution that the increasing reliance on technologically sophisticated diagnostic tests and therapeutic procedures has had on the costs of health care. In a recent review by Fineberg, he revealed an annual increase in test use of 15 percent and estimated that 5 billion clinical tests were done in 1977, absorbing $11 billion in health resources (25, p. 144). Anne Scitovsky, in studying the costs of treating specific illnesses at the Palo Alto Medical Clinic from 1951 to 1971, found that, for seven common illnesses, the number of lab tests increased from two to six times as many tests by 1971. She found similar findings with respect to the increased use of X-rays over the same period of time (62, p. 40). Maloney and Rogers, in their study of the contribution of medical technology to increasing costs, concluded that it was not so much the "big-ticket" technologies as it was the excessive use of "small-ticket" technologies such as low-cost lab tests and X-rays that add up to the "big cumulative cost" (40, p. 1413). The medical literature is overflowing with articles concerned
with the unnecessary use of such "small-ticket" technologies (1, 8, 11, 35, 42, 47, 52).

In 1978, we spent between $12 and $14 billion on laboratory tests and the number of these tests is said to be rising at about 15 percent a year (6). In addition, the total bill for X-rays is escalating rapidly (62). It thus seems reasonable to conclude that the use of diagnostic tests is increasing at a rapid rate and such high levels of utilization account for a significantly large fraction of physician-directed medical expenditures (59, p. 534).

The question then becomes, "is the increased use of technologically-generated data appropriate or is it excessive?" Schroeder and Martin, in attempting to answer this question, believe that it is, in fact, excessive and wasteful. In their words,

specific tests implicated as being used excessively have included complete blood counts, serum electrolytes, blood urea nitrogen, and creatinine, chest roentgenograms, sputum cultures, arterial blood gases, serum glutamic-oxalacetic transaminase, lactic acid dehydrogenase and calcium, prothrombin time, and radiologic procedures. Physician use of diagnostic tests varies extensively without evidence that greater use leads to improved quality of care. A report from one hospital claims that only 5 percent of laboratory chemistry tests affected the clinical decisions for hospitalized patients. Thus, the answer to the ... question appears to be that there is excessive use of laboratory tests (59, p. 534).

Many physicians have argued that this "shotgun approach" to the practice of medicine, which has elsewhere been referred to as "decerbrate medical practice," has evolved
due to the neglect of medical schools in teaching clinical skills such as history-taking and physical examination (19, 39, 41, 56, 68). Many have suggested if more time were spent in direct communication with the patient through history-taking and thorough physical examination that the physician would order tests more judiciously and the results of these tests would make a great deal more sense when correlated with actual observation of the patient (19, 39, 54). Some physicians believe that the technologically generated information does not always make a great deal of sense unless it is coupled with a thorough physical examination. Such a position is expressed by a medical school faculty member in the following passage:

The reasoning process is delegated to automated equipment that is commanded to provide answers on a printout. Inconsistencies between laboratory findings and clinical data go undetected simply because too many physicians are insufficiently disciplined in the proper use of clinical skills and in the analysis of clinical data. Too often, palpably illogical laboratory findings are accepted without question. Confidence in the ability of diagnostic technology to answer all questions has become so overinflated that some authorities seriously advocate delegation of clinical study to nonprofessionals, or better still, to computers. They consider the physician’s task not to establish clinical pathological correlations but to carry out technical procedures and to interpret the findings to patients (19, p. 862).

This technologically biased predisposition to providing medical care is almost given free reign by the institutions which finance health care. The physician is reimbursed on a
fee-for-service basis by the third-party payer. Since the financial impact of his services and the tests and procedures that he orders do not fall directly on the patient, there is no incentive for him to consider the costs of the care he is providing. He is, in effect, dispensing medical resources as if they cost nothing. He bases his decisions solely with respect to potential medical benefit, regardless of how small that benefit may be. To the extent that the physician is dominated by the technologic imperative, there is every incentive for him to order every available test and procedure that has any potential medical benefit because the marginal cost is effectively zero in the presence of extensive third-party coverage. In addition, the physician's income, through fee-for-service reimbursement, is indexed to the number of services he provides or orders—the more services he provides, the greater is his income. This system is, for the physician, the best of all possible worlds—on one hand he is maximizing his income, on the other he is providing the best possible medical care that is available for his patient.

There are additional incentives, both economic and professional, that induce the physician to treat more patients in the hospital rather than on an ambulatory basis in his office. Some of these are suggested in the following:

... the physician can handle a larger and more complex patient load through increased use of the hospital. Thus there are both professional and economic incentives to hospitalize; these incentives are especially strong since the physician does
not have to pay for this service out of practice income either directly or indirectly because of the subsidization of hospitalization by third-parties (53, p. 294).

It is difficult to bring about any cost reduction in the presence of the third-party reimbursement system. To illustrate this point, there has been a trend in recent years to develop a specialty field in family practice which stresses direct communication between the physician and patient—more primary care. However, this is largely frustrated by third-party reimbursement which reimburses specific procedures far more generously than it does primary care (51, p. 102). The following passage illustrates this point.

In some hospitals an all night vigil for the treatment of diabetic acidosis or hepatic coma is rewarded with a standard $8 fee for professional care. In contrast, a 10-minute endoscopy in the same institution earns $100. All sorts of procedures, however routine, however marginally important are abundantly rewarded. The financial returns are generous. . . the commitment of time often brief (63, p. 245).

To further illustrate the technological bias in the reimbursement system, Hsiao and Stason, in reference to Medicare allowances, revealed that a surgeon receives from three to seven times more money per hour spent in surgery than for an hour spent in consultation in the office or at the bedside (32). The estimated net income received for operating time for a gynecologist is five times greater, and for a urologist over 10 times greater, than from consultation in the office or at the bedside (2, p. 225).
(Refer to Figure 1.) As Almy has noted in a recent issue of *The New England Journal of Medicine*,

time spent in office visits--time for listening, observing, deciding, advising, explaining, consoling and instructing--is in fact the least rewarded activity in fee schedules. That the individual attention of personal physicians is in such short supply, and that our rates of technologic procedures exceed by far those in other countries, must in part reflect the usual influence of price levels on the supply of goods and services (2, p. 225).

![Fig. 1--The Value of the Physician's Time, Selected Specialties. Source: Thomas P. Almy, "The Role of the Primary Physician in the Health-Care Industry," New England Journal of Medicine, 34 (January 22, 1981), 226.](image)

Belloc and Breslow, in an article in *Preventive Medicine*, concluded that time spent with the patient trying to get them to change their health habits and in modifying life styles is likely to have greater impact on health than all other health
services combined (9). Although there are very few sources of data available, those that do exist suggest that physicians are spending less time with their patients in personal encounters. For example: Internists spend an average of twenty-two to twenty-six minutes conducting initial visits with new patients, and an average of about seventeen minutes in follow-up visits. Family practitioners devote an average of about fourteen minutes to both initial and subsequent visits. The results of one study revealed that, on the average, contact time between doctors and patients was but 7.5 minutes and only 5 percent of all visits lasted longer than fifteen minutes (2, pp. 226-227). As Almy has noted with respect to the reimbursement system's role in this trend, "revision of fee schedules to remove the penalties for 'technologic restraint' might not only save money but also improve the health status of the population as a whole" (2, p. 227).

No discussion of the physician and his mode of practice would be complete without mentioning the practice of defensive medicine. It seems fairly clear that a number of procedures and tests that are ordered are in response to the threat of malpractice suits. It is difficult to quantify just how much the practice of defensive medicine increases the number of tests, but one estimate suggests that 30 percent of all X-ray examinations may be a result of the doctor simply protecting himself from the threat of litigation (48).
Although estimates have not been established, it is probably fair to conclude that the threat of malpractice suits and the resultant practice of defensive medicine, does result in the physician ordering more tests and procedures than are perhaps medically efficacious.

Over the past thirty years the hospital has more and more become the center of health care delivery in the United States. In this analysis the monetary costs associated with this phenomenon have been emphasized. However, there is another kind of cost which has been associated with the increased use of the hospital. In addition to increasing monetary costs, there is an increased incidence of iatrogenic illness. Iatrogenic illness refers to, "the production of disease by the manner, diagnosis or treatment of a physician or some other member of the health care team" (33, p. 149). Iatrogenic illness has become a well-recognized phenomenon for the last quarter of a century and is well documented in the medical literature (64, p. 638). The extent and frequency of this problem is suggested in the following:

A computerized listing of medical journal citations on iatrogenic reports on surgery and drugs over a 30-month period uncovered almost 200 articles. They read like a shelf of gothic novels, a testimony to Murphy's law. One dramatic description of the extent of iatrogenic illness notes that the number of deaths and nonfatal hospitalizations directly attributable to medical intervention equals or exceeds the average number of deaths and nonfatal casualties from either the Korean or Vietnam wars (33, p. 149).

In a very recent article in The New England Journal of Medicine researchers, conducting a one-year prospective study,
identified thirty-six cases of iatrogenic illness associated with one hospital's department of surgery (15). In two-thirds of the cases the illness was due to an error of commission: an unnecessary, defective, or inappropriate procedure. Twenty of the patients died and in eleven death was directly attributable to the error. Five of the sixteen survivors were discharged with serious physical impairment and a satisfactory recovery occurred in only eleven cases. The average hospital stay for these patients was forty-two days (ranging from 1 day to 325 days); the total cost for all thirty-six patients was $1,732,432.

It may well be that the current system, with all of its incentives for excessive use of tests and procedures, is making it more and more difficult for physicians to live up to the stringent requirements set forth in the hippocratic oath (7). Particularly the part which says, "I will use my power to help the sick to the best of my ability and judgment; I will abstain from harming or wronging any man by it" (13, p. 9). But, then again, only 25 percent of all medical school graduates are required to take the oath today so there is no inconsistency in violating an oath that one has never taken (37, p. 56).

In this section the supply of physicians was examined and it was demonstrated that, contrary to the conventional wisdom, increasing the supply of doctors did not result in lower fees. To the contrary, there are many who believe that
the ability of physicians to exercise discretionary, demand-inducing behavior has resulted in the perverse result that fees have been raised in order to offset the deterioration in income levels which has resulted from increases in the physician-to-population ratio (31, p. 103).

The behavior of physicians under the extant institutions of third-party payments and fee-for-service reimbursement was then examined. These institutions, along with the practice of defensive medicine, have resulted in giving free reign to an expensive, technologically biased, often hospital-based form of care which has, in turn, made substantial contributions to the increasing costs of hospital care. This picture of the health care market will be completed by briefly investigating the role of the patient.

The Patient

It was previously explained how the presence of medical insurance has resulted in significant increases in the demand for medical care as the net, out-of-pocket expense to the patient has been substantially lowered. It has also been pointed out that, when it comes to health care, the consumer is largely ignorant as to what he actually needs. Therefore, he goes to a physician who acts as an expert "purchasing agent" in his behalf. It is in this way that the physician has become the primary determiner of the demand for health care resources (24, pp. 84-85). The patient does, of course, have
some influence over his physician. After all, it is the patient who takes the initiative to seek the advice and care of a physician and, in many cases, the patient may reject such advice and seek out a second or third opinion.

Martin Feldstein has suggested that, among other things, one of the determinants of a patient's demand for hospital care is the patient's perception of the quality of care at a particular institution (21, pp. 133-135). If this is true then the following passage illustrates how patients may influence hospital care and the direction it takes in the future.

If, too, patients perceive quality in terms of high levels of sophistication in the delivery of services, including the application of many and frequent diagnostic tests, performance of equipment-bound procedures, and increases in the number and training level of health care personnel, then physicians and hospitals will respond by emphasizing those inputs. .. Thus to the extent that it does exist, the source of the technologic imperative rests largely on the value that patients and hospital decision makers place on technological sophistication for its own sake (66, p. 269).

Thus, as the above remark suggests, the patient, in combination with his physician, may have an influence on the style of care that hospitals provide.

This chapter has presented an overview of the market for hospital care by examining the respective roles and behaviors of third-party payers, hospitals, physicians, and patients—the major participants in the market. To summarize: The patient, who is largely ignorant as to what kind of care he
actually needs, once in the hospital, does want to receive the very best care available. The cost of this care is of little concern to him in the presence of extensive third-party coverage. The modern physician, who is by training predisposed to practicing a technologically biased mode of care, is inclined to use any and all services that might, no matter how marginal their contribution, improve his diagnosis or reduce the risk of a malpractice suit. The physician, due to the predominance of third-party coverage, has little concern over the costs of care that he is providing and, in fact, the more care he provides the greater will be his income. The hospital administrator is concerned that his institution has all of the latest equipment and facilities in order to attract and retain physicians on the hospital staff. This requires very little risk to the hospital as the majority of hospital insurance payments are based on costs incurred. If costs increase as a result of more intensive utilization, performance of more complex, equipment-bound procedures, or more staff, then higher reimbursements will be forthcoming.

This peculiar market structure has specific results: uneconomic provision of services; excess capacity and needless duplication of often extremely costly equipment and facilities; and excessive utilization of hospital resources. All of these outcomes have resulted in increasing the costs
of providing care at rates which far exceed prices in other sectors of the economy.

In the chapter which follows, two medical innovations will be examined. It will be demonstrated that this peculiar market structure has a very significant impact on both the diffusion and utilization of medical technologies.
CHAPTER BIBLIOGRAPHY


38. Litman, T. J. and O. G. Johnson, "Sharing Services: The Dynamics of Institutional and Administrative Behavior," Hospital and Health Services Administration, 25 (Fall, 1980), 7-22.


44. Newhouse, Joseph and Vincent Taylor, "How Shall We Pay for Hospital Care?," The Public Interest, 23 (Spring, 1971), 78-92.


47. Phibbs, Brenda, "The Abuse of Coronary Arteriography," The New England Journal of Medicine, 301 (December 20, 1979), 1394-1396.


54. Rogers, David E., "On Technologic Restraint," The Archives of Internal Medicine, 135 (October, 1975), 1393-1397.


64. Steel, Knight and others, "Iatrogenic Illness on a General Medical Service at the University Hospital," The New England Journal of Medicine, 304 (March 12, 1981), 638-642.


CHAPTER IV

PERSPECTIVES ON THE DIFFUSION AND UTILIZATION OF TWO SPECIFIC TECHNOLOGIES

In the previous chapter the institutional framework of the United States health care delivery system was examined. It was pointed out that within this system, a number of perverse economic incentives have evolved which may be directing the allocation and utilization of health care resources. In this chapter the history of two specific technological innovations which have developed within the context of these incentives--intensive care and open-heart surgery, will be examined.

Before proceeding to the two cases it is necessary to point out that this report has been conducted from an economic perspective and economists are frequently predisposed to analyze problems within the framework of costs and benefits. Although this is not explicitly a cost-benefit study, it does include some analysis of the costs and benefits associated with these two technologies. No conclusions will be drawn with respect to the benefits of these two or any other technologies. This is a task that falls heavily on the shoulders of physicians. The concern of the economist is with the rational allocation of resources. The analysis
of benefits is to demonstrate that these two technologies have proliferated even though their efficacy has not been firmly established by the medical community. It appears that there are a substantial number of economic incentives that have contributed to this phenomenon.

Intensive Care

Intensive care is largely an organizational innovation which is based on the logically appealing idea that critically ill patients who need constant observation, and who may require immediate medical intervention, can be most efficiently treated in a central location. The intensive care unit epitomizes the sophisticated equipment and highly trained personnel of the modern hospital.

The first year that intensive care was included on the American Hospital Association's list of recognized hospital departments was 1958. In that year, about 25 percent of the largest community hospitals (300 or more beds) reported having one (42, p. 43). By 1976, nearly all community hospitals with 200 or more beds had one, 90 percent of hospitals with 100 to 199 beds reported having one, and almost 50 percent of all hospitals with fewer than 100 beds had one.

Closely related to the ICU is the coronary care unit, which first appeared in 1962. These units applied the intensive care philosophy to the treatment of patients with
myocardial infarction (heart attack). By 1976, nearly all hospitals with 300 or more beds had a separate CCU (42, p. 43). Fifty-seven percent of hospitals with 200 to 299 beds had one, 29 percent of hospitals with 100 to 199 beds reported one, and even 18 percent of hospitals with fewer than 100 beds had one.

The intensive care philosophy did not stop with coronary care. There are now specialized intensive care units for medical and surgical patients, stroke units, respiratory units, renal units, burn units, neonatal units, and pediatric units. The larger the hospital, the more likely it is to have these highly specialized intensive care units (42, p. 43). In this section the primary focus will be on intensive care and coronary care units.

Intensive care has had a significant impact on the cost structure of hospitals over the last twenty years. It is clearly a resource intensive innovation. Compared to other areas of the hospital, particularly general medicine floors, intensive care units use much more of almost everything. On the average, it utilizes nearly three times as many nursing hours per patient day as do the general floors (26). In addition to nurses, a modern, up-to-date ICU utilizes a formidable staff of paramedical and other professional personnel. The paramedical and professional staff of the Presbyterian-University Hospital of Pittsburgh, for example, lists the following full-time staff in one ICU: respiratory therapist, respiratory technician, physical therapist,
blood-gas laboratory technician, biomedical electronics technician, social worker, unit manager, bacteriologist, bacteriology technician, physiologist, physiology technician, computer scientist, computer technician, and computer programmer (48, p. 84). In reference to the paramedical staffing needs of the ICU, Ake Grenvik said it is anticipated, "that the number of both new and conventional types of paramedical specialists in ICUs will continue to increase rapidly" (48, p. 85).

The specialized capital equipment needed to support an intensive care unit is equally formidable, as the following suggests:

In most units an electrocardiograph for each patient is standard. X-rays and lab tests--blood gas analyses to check on respiration, for example--are done much more frequently in the ICU than in the wards, and many units have their own labs and X-ray equipment for these procedures . . . closed circuit television and computers . . . Pacemakers, defibrillators, ventilators, kidney dialysis machines, and other therapeutic and life-support equipment are ready to be brought into use (42, p. 46).

The design of the unit requires more space per bed than conventional care; a core laboratory; sleeping quarters for doctors on call; office space for unit director and other personnel; nursing stations; storage areas; conference and inservice education rooms; nurses lounge; and waiting rooms for relatives and other visitors (48, pp. 83-84).

The daily costs of treating a patient in an intensive care unit ranges from 3 to 3.5 times the daily cost of
treating a patient in a conventional hospital bed (16; 42, p. 47). Russell, in her empirical analysis of intensive care, has determined that this one innovation, the ICU, accounts for 15 percent of all hospital costs (42, p. 48). To put this statistic in perspective, 15 percent of all hospital costs go to support and maintain intensive care beds which constitute only 5.2 percent of all hospital beds (42, p. 48). This statistic demonstrates more clearly the resource intensity that is associated with this particular innovation.

There is, of course, the possibility that the introduction of ICUs lowers the costs of care for conventional floors that previously took care of these critically ill patients. Perhaps the increase in costs per patient in intensive care have been offset by reductions in the cost of providing care on the conventional floors. If this is true then the adoption of an ICU represents a rearrangement of resources rather than an additive increase.

Although the above hypothesis cannot be rejected, what little evidence that is available does not support it. For example, Griner determined that the establishment of an ICU at the University of Rochester Medical Center was not followed by any reduction in the staff of the conventional floors where these patients had been previously treated (16, p. 583). In another study conducted at the Peter Bent Brigham Hospital, it was reported that between 1960 and 1972,
total employees grew from 700 to 1700, with the largest increases following the establishment of mixed and coronary care units (27, p. 445). These two studies seem to contradict the hypothesis that intensive care is simply a rearrangement of resources, and lend some evidence that they represent cost-raising innovations.

Paul Griner has addressed the issue of the benefits and costs of intensive care in a number of studies over the last decade. In one study, he examined the outcomes of patients with acute pulmonary edema over the year before and the year after the introduction of an intensive care unit at the Strong Memorial Hospital in Rochester, New York (17). He found no differences in mortality between the groups receiving intensive care and those who received conventional floor care. He further found that the duration of hospitalization was 2.3 days longer and the average hospital bill was 46 percent higher for patients who received intensive care. In his conclusion he states,

The data presented here indicate that the most noticeable change in the overall experience of adult patients hospitalized with acute pulmonary edema at this institution since the opening of an intensive care unit has been a marked increase in the cost of rendering care to these patients (17, p. 505).

In another study, Griner and Piper investigated the effect of intensive care on patients who had attempted suicide by overdosing on drugs (34). They found no difference in mortality between groups receiving intensive care
and those receiving conventional floor care. They did, however, find that patients who received care in ICUs had fewer complications and shorter hospital stays, but neither difference was statistically significant. The shorter stays were attributed to better discharge planning in the ICU rather than better care. Although the ICU group had shorter stays they did have slightly higher average bills.

There have been a number of studies on the benefits or outcomes of intensive care for treatment of myocardial infarction in coronary care units (6, 7, 22, 28). The results of these studies are mixed and there is by no means an emerging consensus. Some of the studies demonstrate a reduction in the mortality rate due to intensive care, but at least an equal number do not. One very interesting study compared the outcomes of patients treated for myocardial infarction at home as opposed to intensive care treatment in the hospital (24). The authors concluded that there was no difference in mortality between heart attack victims who were treated at home and those who received intensive care in the hospital. It is important to note that this last study, unlike the majority of studies on the efficacy of intensive care conducted during the sixties, was a prospective, randomized, controlled trial, therefore, its conclusions are considerably more valid than the earlier uncontrolled, nonrandomized studies (53, p. 1261).
Stroke is one of the leading causes of death in the United States and a substantial number of specialized intensive care units have been adopted, especially by larger hospitals to deal with it. One study evaluating the benefits of such a stroke unit concluded that, "stroke intensive care units modeled on coronary care units do not have a significant impact on stroke mortality" (35, p. 737). In another, more comprehensive study, the authors concluded that the mortality rate was no better in hospitals with stroke units than in those without (12). They did, however, find that patients who were treated in stroke units had fewer complications than patients treated on conventional floors.

The review of the literature concerning the benefits and efficacy of intensive care presented here is by no means conclusive. It does, however, demonstrate that intensive care units have proliferated even in the absence of convincing evidence as to its efficacy. In the section that follows some of the characteristics of the market for hospital care that may be contributing to this phenomenon will be examined.

Factors That Influence the Adoption and Utilization of Intensive Care

A number of financial and structural characteristics such as the cost-plus nature of third-party reimbursement and the threat of malpractice suits, which clearly provide incentives leading to the indiscriminant adoption and utilization of many technologies such as intensive care,
have previously been discussed (46). Another characteristic of the market for hospital care that was previously examined is the rather unique form of competition that exists between hospitals. In order for a hospital to survive it must keep its beds as nearly full as possible. The hospital must attract a large number of doctors to practice on its staff because doctors beget the patients who keep their beds filled. The result being that area hospitals compete with one another for available doctors. In order for hospitals to attract doctors they must have the most sophisticated equipment and facilities possible. Intensive care units are one of the many such facilities that each individual hospital must have in order to attract physicians. It is difficult to determine to what extent the availability of specific technologies such as intensive care units influence physicians in selecting particular hospitals in which to practice. However, "anecdotal evidence suggests that pressures for specific technologies, such as CT scanners, coronary care units, and cobalt radiation units are substantial and account for considerable redundancy in technologic facilities" (46, p. 190).

Bloom and Peterson have thus suggested that we cannot leave the decisions about providing expensive technologic services and facilities to individual institutions due to the peculiar incentives that they are faced with (7). As they have stated,
It is clear from recent history that if decisions about provision of coronary care units are left to individual hospitals, excess capacity and inefficiency will result. These decisions must be made by bodies that are more disinterested and have a broader view than that of a single institution (7, p. 77).

Another factor that deserves mention is that, as nurses increasingly handle the most critically ill patients in intensive care units, nursing skills on the general medical floors have deteriorated. As Matz has noted,

Nurses in general medical units now express legitimate concern when faced with the handling of acutely ill patients with a variety of problems. The nurses in many of these units are no longer accustomed to dealing with diseases and problems that once were commonplace. . . . This, of course, becomes a self-perpetuating process and increases the demand by physicians and nurses for more special-care beds (25, p. 758).

There are, no doubt, many other factors which influence the adoption and utilization of intensive care units in acute-care hospitals that have not been mentioned in this study. It is, however, clear from the evidence presented here, that the questions as to the efficacy of this technology remain largely unanswered. The proponents of this technology are obviously convinced that the use of intensive care and other specialized units is efficacious. When suggestions are made that there need to be more randomized clinical trials to more conclusively demonstrate efficacy, they argue that the performance of these trials would be unethical because the control group would be deprived of the benefits of intensive care treatment. Bloom and Peterson have, in light of the
studies that have been conducted to date, argued that the performance of prospective, randomized, controlled trials would not be unethical. As they have concluded,

clearly, when the most rigorous study shows no advantage for intensive care and another less rigorous but carefully conducted study disagrees, the issue of effectiveness of intensive care is not settled. Under these circumstances, randomized clinical trials to settle the efficacy of expensive care are not unethical. Is it ethical to spend scarce medical dollars on unproved treatment when these funds could be used in other areas where medical care is known to be effective? The uncontrolled growth of this expensive and unproved treatment stands in marked contrast to the requirement for proof of effectiveness before a new drug is allowed on the market (7, p. 77).

As has been demonstrated in this section on intensive care, a vast amount of resources are being committed to this particular form of treatment. As the costs of health care continue to rise we must begin to take stock in what it is that we are buying. With respect to testing the effectiveness of intensive care we must, in order to provide more valid conclusions, conduct more prospective, randomized, controlled trials (37). Conducting such studies will not be an easy task as ethical and practical objections will beset attempts to test the efficacy of a technology that is already so widely diffused. Nevertheless, the effort must be made.

The case of another technology, open-heart surgery, will be examined in the following section.
Open-Heart Surgery

It was not until the introduction of the extra-corporeal pump oxygenator in the fifties that open-heart surgery became possible. This rather remarkable machine temporarily takes over the functions of the heart and lungs, thus enabling the surgeon to perform extensive surgery on the heart. Procedures that are currently being performed today include the surgical repair of valves and the walls of the heart, the implantation of artificial valves to replace defective ones, and the most common procedure of all—the coronary bypass graft. Coronary atherosclerosis, also known as ischemic heart disease, is one of the leading causes of death in this country. Over the past twenty years medical science has developed a variety of techniques, both surgical and medical, to relieve this condition. The coronary-bypass procedure represents the surgeon's "solution" to this disease.

The first coronary bypass operation was performed in 1967. The procedure, used to relieve coronary artery blockage (stenosis), involves taking a vein out of the patient's leg and grafting one end of it to the aorta and the other end to the unobstructed portion of the coronary artery, thus detouring the blood around the blocked area and subsequently improving blood supply to the myocardial tissue. The efficacy of this procedure has been the subject of a rather intense debate for the past decade. There are many physicians
who believe that, in a significant number of cases, this highly invasive procedure is not warranted. They argue that, in many situations, the same or even better health outcomes can be achieved with less invasive and less costly forms of therapy. The extreme reaction to this particular form of therapy can, to some extent, be measured by the flood of editorials in medical journals over the last ten years (8, 10, 15, 18, 19, 30, 37, 39, 43, 50, 51, 54). The titles of many of these editorials and studies concerned with the subject suggest the intensity of this debate. As an example, one of the more revealing titles was that of an editorial by Eugene Braunwald: "Direct Coronary Revascularization: A Plea Not To Let the Genie Out of the Bottle" (10). Another title worth mentioning was "Medical Perspectives in Coronary Artery Surgery--A Caveat" (13).

In spite of this heated debate, the performance of this procedure has rapidly proliferated since its introduction. In fact, the bypass graft procedure has been the major contributor to the growth of open-heart surgery over the past several years (42, p. 106). In 1967, about 14,000 open-heart procedures were performed. By 1971, the number had grown to 38,000 (42, pp. 106-107). *Time*, in a recent article, reported that from 1975 to 1980, about 540,000 bypass procedures alone were performed (52, p. 54). Surgeons are currently performing about 120,000 such procedures a year. Although there are substantial difficulties in determining
the exact cost of this procedure due to the variation in hospital charges and the lack of uniformity in accounting procedures used by different hospitals, it is very expensive—about $15,000 per operation (23, p. 409; 52, p. 54). This figure represents direct costs only.

An examination of both the labor and nonlabor inputs that are necessary to support an open-heart facility will suggest reasons why this procedure is so expensive. In 1975, The Surgery Study Group of the Inter-Society Commission for Heart Disease Resources (ICHD) published guidelines for regional health planners to follow when considering the introduction of an open-heart facility (45). This report describes the optimal clinical and physical environment, as determined by a team of clinical surgeons, cardiologists, and cardiovascular nurses, in which cardiac surgery can be performed efficiently, effectively, and safely. The capital requirements necessary to support such a facility are staggering. A specialized surgical suite, blood gas core laboratory, extensive monitoring equipment, radiologic facilities, pump oxygenators, and a cardiac intensive care unit to name just a few of the necessities.

The labor inputs are equally impressive. These include a cardiac surgeon, assistant surgeon, cardiologist, a cardiac catheterization team which requires a number of highly specialized technicians, anesthesiologist, pump technician, cardiovascular nurses, and a pathologist.
Open-heart surgery is clearly a resource intensive innovation. As was pointed out earlier, due to the complexities of fee calculations, it is very difficult to derive reliable national average cost figures for this procedure. Total costs vary from hospital to hospital and from region to region. Appendix A includes a listing of all of the direct costs associated with this procedure.

Due to the extremities in the ranges of estimates for both the number of procedures performed annually, as well as the costs of those procedures, no attempt will be made here to estimate the annual aggregate cost of coronary bypass surgery. It has, however, been determined that about 10 percent of the total cost is borne directly by patients, with the balance being paid for by private and public third-party payers (36, p. 157). Therefore, if we accept the Time estimate of $15,000 per procedure, the direct, out-of-pocket cost to an individual for a bypass operation is around $1,500.

Now that the degree of resource intensity and, to some extent, the costs associated with this procedure have been examined, it is necessary to return for a moment to the ICHD recommendations. It is important to emphasize that the Commission's recommendations were not meant to serve as minimal standards for all hospitals that would like to install or maintain an open-heart facility. Rather, its purpose was to demonstrate the extensive resources that are required in order to ensure that optimal care and results are provided
as efficiently, effectively, and as safely as possible. In the words of the Commission,

It is hoped that it (the recommendations of the study) will be useful to those responsible for the care of patients who need cardiac surgery and to those involved with the planning of medical facilities and the allocation of resources within a community or region (45, p. A23).

The important phrase in the preceding passage is, "planning of medical facilities and the allocation of resources within a community or region." It was in response to the proliferation of open-heart facilities at institutions that could not realistically expect to perform enough procedures to maintain even minimal skills and quality of care that the Commission conducted its study. As was demonstrated in the last chapter on the institutional framework of hospital care, hospitals may very well be engaged in competition with one another via technological sophistication. With respect to the introduction of open-heart facilities there does appear to be evidence that this has been the case. That is, the proliferation of many such facilities may not have been so much a function of community need, as it has been a result of the perverse incentives provided by the institutions that make up the market for hospital care (45, p. A27). The consequences of this are quite alarming—not only does it lead to unnecessary duplication, which results in further increases in costs, but the existence of many facilities whose case loads are marginal, may lead to deterioration in
both the safety and the effectiveness of open-heart procedures performed (2, p. 609; 9, p. 1469; 19, p. 1; 31, pp. 180-181; 41, p. 248; 42, p. 108; 44, pp. 197-198; 45, pp. A27-A28). Due to the high level of skill and coordination required of the cardiac surgical team, it is imperative that they perform these procedures fairly often. Otherwise those skills will deteriorate which may result in poor outcomes for the patient.

A number of studies have demonstrated that there is a strong relation between the number of cases a facility performs and patient outcomes as measured by mortality rates and the incidence of complications. Not only has this relation been established for bypass surgery, but it has also been found to be the case for facilities performing coronary arteriography, which is a diagnostic procedure that frequently accompanies coronary bypass surgery. For example, Adams and others, in a national survey of 173 hospitals, determined that the mortality rate in institutions performing less than 100 coronary arteriograms a year was eight times higher than in hospitals performing more than 400 such examinations a year (2, p. 609). In another study, Selzer found, in a survey of the risk of coronary arteriography, that mortality increases at least twenty-fold and morbidity six-fold when the procedure is executed in laboratories with a low case load, as compared with institutions with high case loads (47). As they stated in their conclusions,
Often thought of as a "prestige item," an angiographic laboratory is organized in a community hospital without consideration of the necessary team approach. One should therefore seriously question the propriety of having coronary arteriography performed in any institution other than one with a complete, active cardiac medical and surgical team (47, p. 6).

In addition to the studies which demonstrate the increased risk associated with coronary arteriography procedures in institutions with small case loads, it is also widely accepted that there is also a significant relation between case load and outcomes for coronary bypass procedures (19, pp. 1-3; 30, pp. 179-181). Over the last decade one of the most frequent criticisms of open-heart surgery facilities was that too many such units were being underused (42, p. 108). Roche and Stengle, in a 1971 study, found that 62 percent of the hospitals with open-heart facilities were performing fewer than 100 such procedures a year (38). At that time the Inter-Society Commission for Heart Disease Resources was recommending that 200 operations per year be the minimal case load required to maintain the skills of the cardiac-surgical team (45, p. A27). As the Commission stated,

What concerned the Study Group most was the random proliferation of cardiac surgical programs developed without long-range considerations of cost, manpower, and the needs of a given community. It would be naive to equate quantity with quality and the Study Group recognized that a qualified surgical team could well start with a smaller number of cases if there were realistic expectations that an adequate case load would soon be generated (45, p. A27).
The Commission based its conclusions and recommendations on the following considerations (45, pp. A27-A28).

1. Optimal care for this complex procedure requires that the same individuals work together regularly and frequently, preferably four to five times a week.

2. Twenty-four-hour-a-day coverage by confident and experienced personnel must be available to handle emergencies. This capacity is difficult if not impossible to maintain in low-volume programs.

3. Where case loads are low, the experienced and highly specialized cardiac care personnel must engage in activities not directly related to their area of expertise. This represents both expensive and inappropriate use of manpower.

4. Competing low-volume programs in close geographic proximity drain cases from each other thus making it more difficult for any one facility to develop an adequate case load.

As the popularity and incidence of bypass surgery has grown, more and more physicians have been inquiring into its benefits (42, p. 108). An increasingly large number of studies and trials have been conducted over the last decade which concerned themselves with the benefits of this procedure. As Dunkman and his associates have noted with respect to bypass procedures, "Bypass grafting has already become a therapeutic intervention of considerable economic and logistic significance before its beneficial effects have been
firmly established" (13, p. 187). The previous statement was made in 1974 and today, roughly 600,000 bypass procedures later, the question as to its superiority over other, less invasive and less costly forms of treatment, remains largely unanswered.

No attempt will be made here to draw conclusions with respect to the efficacy of bypass surgery. The reason for including the discussion of efficacy that follows is to point out a fairly common sequence of events that has been taking place over the last twenty years with respect to a number of medical technologies: the diffusion and dissemination of many technologies, some very costly, has preceded well designed trials and studies of their efficacy (13; 18; 37; 42, p. 108).

According to Eugene Braunwald, there is little dispute that severe angina that is unresponsive to medical treatment is an indication for coronary bypass surgery (8). There also appears to be a consensus that the surgery improves the chances of survival for patients who have main left coronary artery disease and stable angina (42, p. 109). Beyond these common grounds of general agreement the consensus begins to disintegrate, especially with regards to the impact that bypass surgery has on survival (8).

In one Veterans Administration study it was determined that there was no statistically significant difference in survival for patients treated medically, and patients treated
with coronary artery surgery at a follow-up interval of twenty-one months (29). At the end of thirty-six months of follow-up, 87 percent of the medical group and 88 percent of the surgical group were alive. This study sparked quite a response in the medical community as measured by the number and intensity of letters to the editor of *The New England Journal of Medicine*, the journal in which the results were published (49). The response ranged from applause to condemnation. As Louise Russell commented in reference to it, "The study is not the first, although it is probably the most persuasive, to suggest that the use of open-heart surgery is being pushed to the point of negligible benefit" (42, p. 110).

In another, more recent randomized trial, it was determined that for patients who had suffered from a recurrent myocardial infarction, there was no significant advantage for the randomized surgical over the randomized nonsurgical groups in terms of survival rates (32). As the authors of the study stated, "the results suggest that in the absence of disabling angina or left main coronary artery stenosis, coronary artery surgery need not be advised for survivors of recurrent infarctions who have severe coronary artery disease" (32, p. 785).

It is a difficult task to enumerate all of the reasons why the bypass graft, a procedure that is so costly and whose efficacy has yet to be proven to the satisfaction of
the entire medical community, has proliferated so rapidly over such a relatively short period of time. In the previous chapter the institutional framework of the United States health care system was examined. It was within this framework that open-heart surgery evolved and it may be that an examination of the economic incentives provided by this system will provide an explanation for the above phenomenon.

**Factors That Influence the Adoption and Utilization of Open-Heart Surgery**

There are a number of operative factors in the American health care delivery system that may be influencing the incidence of coronary artery surgery. Perhaps the most important influence is the fee-for-service system of physician reimbursement. As Preston has commented with regards to the various factors that influence the performance of this procedure, "The fee-for-service method of payment is the primary personal incentive that may have direct influence on physicians and surgeons" (36, p. 164).

The fee-for-service system, coupled with the fact that most patients are extensively insured, which reduces the economic barriers to the patient, may further influence the physician's decision to operate. There is some rather persuasive evidence that insurance, by itself, appears to increase the incidence of surgery in general. Odin Anderson has reported that operation rates for insured persons are double that of uninsured persons (5). On the other hand, the
effect of insurance on increasing rates of surgery diminishes substantially when individuals go from indemnity to prepaid programs (11, p. 137). Under this type of insurance or health plan there are economic disincentives to the performance of expensive elective procedures. In this type of program the performance of additional procedures do not contribute more to the physician's income, rather they drain available resources. As Bunker states,

It is now well established that rates of operations for prepaid group health plans such as the Health Insurance Plan (HIP) in New York City, the group-practice option of the Federal Employees Health Benefits Program and the Kaiser Foundation Health Plans are approximately half those of the usual Blue-Shield fee-for-service plan (11, p. 137).

It is impossible to determine to what extent, if any, the financial incentives have on the number of coronary artery bypass procedures performed in the United States. It does, however, seem plausible that such lucrative compensation does influence the performance of more operations than might occur in a system that provides less favorable economic incentives for the providers (36, p. 159). As Ross has noted,

There are also economic factors at work which make it difficult to be objective. There are cardiac surgical teams in hospitals in this country which have been doing only an occasional case—one to two per week—who now, for the first time, see an opportunity to utilize the equipment and personnel and fully profit economically from them (40, p. 1170).

Another factor which deserves mention is that the number of surgeons and cardiologists and the number of beds available
have been found to be significantly related to the number of operations performed (14, p. 32). There is, in the opinion of many researchers, an excess supply of thoracic surgeons in the United States (36, p. 163). There were more new thoracic surgeons certified in the United States in 1971 than the total number of consultants in thoracic surgery in all of England and Wales (14, p. 759). Bunker has reported that there are twice as many surgeons in proportion to population in the United States as in England and Wales, and they perform twice as many operations (11, p. 135). In his discussion of this fact Bunker explained that

fee-for-service, solo practice and a more aggressive therapeutic approach appear to contribute to the greater number of operations in the United States. More frequent use of consultation, closely regulated and standardized surgical practices and restrictions in facilities and numbers of surgeons appear to contribute to the lower rates of operations in England and Wales. Indications for surgery are not sufficiently precise to allow determination of whether American surgeons operate too often or the British too infrequently (11, p. 135).

Charles Lewis, in his study of the incidence of surgery, concludes that there are substantial supply-induced demand factors which do influence the number of operations performed in this country. As he said in his conclusion,

The results presented here might be interpreted as supporting a medical variation of Parkinson's Law: patient admissions for surgery expand to fill beds, operating suites and surgeons' time (21, p. 884).

Is the increased number of cardiac surgeons in response to a justified demand for their services, or is the excess
of surgeons generating an excess number of coronary bypass operations? This question really has no definitive answer. Regardless of which factor is dominant, the facts reveal that there is a large number of cardiac surgeons in the United States and most of them are financially dependent on coronary artery surgery (36, p. 163).

On the other side of the provider's coin there are hospitals. The hospital sector has found that facilities for open-heart surgery can be important revenue generators for the hospital. When total costs per procedure are allocated, the hospital receives the largest percentage for various services and tests associated with the procedure (36, p. 167). This fact has likely contributed to the rapid growth of such facilities across the country. In 1972, 432 hospitals had facilities for open-heart surgery (36, p. 167). By 1974, this figure had increased to 540 units (38, p. 224).

Russell, in her empirical work on hospital technology, has provided some evidence that the proliferation of open-heart facilities has been more in response to self-serving economic factors than it has been in response to justifiable community need. In fact, she found that areas with lower mortality rates due to heart disease were more likely to have open-heart facilities than were areas with higher mortality rates from this condition. She stated in her results,
open-heart surgery units have been adopted more frequently where there are fewer deaths from heart disease. It might be tempting to conclude that the relationship is causal—that open-heart surgery reduces death from heart disease—but the years covered by the data, 1968 through 1971, rule out this interpretation for this period. Open-heart surgery, and particularly the coronary bypass procedure, was just getting started in those years and had not been around long enough to have had any measurable effect on mortality statistics for the entire population. Instead, the results must be interpreted as meaning that hospitals did not respond to the local incidence of heart disease in deciding to adopt an open-heart surgery unit and that the factors they did respond to produced a pattern in which units are more common in areas where mortality is already lower (42, p. 127).

In this chapter it has been shown how extant institutions may be influencing, perhaps even directing, the diffusion and utilization of two technologies. In the chapter which follows, a number of the strategies that have been proposed to deal with this problem will be evaluated.


22. Martin, Samuel P. and others, "Inputs into Coronary Care During 30 Years," Annals of Internal Medicine, 81 (September, 1974), 289-293.


52. Toufexis, Anastasia and others, "Taming the Number One Killer," Time, 117 (June 1, 1981), 52-58.


CHAPTER V

STRATEGIES FOR THE CONTROL OF

MEDICAL TECHNOLOGY

In the previous chapter it was demonstrated how the incentives provided by our health care delivery system have influenced the diffusion and utilization of two specific technologies--intensive care and open-heart surgery. The purpose of examining these two technologies was not to suggest that the rising cost of hospital care is directly attributable to these two "big-ticket" technologies. Rather, it was to demonstrate specifically how the incentives in our system influence the providers of care and their decisions to adopt and utilize certain procedures.

A great deal of the literature that is concerned with the subject of medical technology is focused on the more impressive "big-ticket" items such as open-heart surgery, intensive care, renal dialysis, CT scanners, and electronic fetal monitoring. It is also true that most of the policies that have been proposed to deal with the problem of technology in medicine have been focused on these expensive, capital intensive items. Often overlooked is the fact that there are, in addition to these large, impressive innovations, a myriad of smaller, less impressive technologies
that are also contributing to the increase in hospital costs (21).

A study by Anne Scitovsky found that the main cost-raising factor in the management of certain common illnesses, was the increased use of ancillary services, such as laboratory tests and X-rays (36). For example, laboratory tests, per case of perforated appendicitis, increased from 5.3 tests in 1951, to 31 tests in 1971. Tests per maternity case, rose from 4.8 in 1951, to 13.5 in 1971. As she stated in her conclusion,

> It is hoped that this paper has shown convincingly that when the effect of technological change on medical care is examined, it is not enough to look only at the spectacular innovations such as brain scans, renal dialysis, open-heart surgery, and so forth, important as these are. The changes going on in the treatment of common conditions, which require less spectacular intervention and which, taken together, probably account for the biggest share of our expenditures for medical care, must be examined far more closely than to date. In particular, the use of ancillary services in the treatment of these conditions needs more attention. . . . What is also needed, of course, is an evaluation of the relation between the use of ancillary services and the quality of care. Is more care--more laboratory tests per case, more X-rays, more electrocardiograms really better care (36, p. 54)?

In this chapter a number of the strategies that have been proposed, or are being implemented, to control costs through the harnessing of medical technologies will be investigated. It will be demonstrated that any attempt to control costs through technology, must focus not only on the "big-ticket" items, but also on the "small-ticket"
technologies, that, in the aggregate, add up to a very large cumulative cost. Finally, four strategies will be posited that will allow for the restructuring of economic incentives to lead to a more discerning use of all technologies, both big and small.

Incomplete or Inappropriate Strategies

Strategy One

This strategy recommends the placement of limits on the development of certain technologies while they are still in the stage of research and development.

According to Iglehart, in the past there has been very little appreciation by politicians for the relationship between the development of technology and the government's massive financial commitment to biomedical research (19, p. 50). However, in recent years, as medical costs have spiralled, there have been increasing public demands that the scientific community account for its government support. Questions have been raised by legislators about the link between technology and biomedical research (19, p. 50). A number of legislators, spearheaded by Senator Edward Kennedy, have suggested that we establish mechanisms by which we can determine which research projects have a strong potential link to a tangible, definable clinical application (19, pp. 51-54; 21, p. 1414). Those who champion this point
of view suggest that support for research projects that cannot demonstrate a specific clinical goal, be curtailed.

While this strategy may, on the surface, appear to be a viable one, it nevertheless reflects a basic misunderstanding of the way in which scientific knowledge develops (21, p. 1414; 22, p. 235; 27, pp. 3-8). It is clear from a study of the history of medicine that many of the most beneficial clinical innovations were the by-products of unfocused basic research (6; 21, p. 1414; 26). Perhaps the classic example is the discovery of X-rays by Wilhelm Roentgen (26). Roentgen, a physicist, was studying a basic problem in the physical properties of rays emitted from a Crookes' tube and, by serendipity, discovered X-rays. His research, which was totally unrelated to any medical goal, immediately became one of the fundamental diagnostic technologies in the practice of medicine. Another such example is that of Louis Pasteur who, while under the employment of the French government, was assigned a number of practical problems to solve. Among these were how to keep wine from turning to vinegar, how to cure ailing silkworms, and how to save sheep and chickens from dying due to anthrax and cholera (6, p. 735). His wrestling with these problems resulted in his discovery of bacteria which led to the creation of an entirely new field of medicine--bacteriology.

Comroe and Dripps, in their investigation into the evolution of the present knowledge base which underlies the
current medical treatment of cardiovascular and pulmonary disease, determined that, over the last thirty years, 529 research publications appeared that are considered essential to these fields (6). Of these 529 articles, 41 percent represented work by researchers who had no direct interest in the clinical problem. Their interest was solely in expanding the general knowledge base of science.

These examples emphasize the fact that medical progress does not proceed in a single straight line path, but depends on many independent contributions from various fields each of which may, or may not, be concerned with the clinical applicability of their research (21, p. 1414). For this reason, the placement of restrictions on the development of new knowledge may have an adverse effect. As Marks has stated,

To approach the problem of containing health care costs by placing inappropriate or ill-conceived constraints on the generation of new knowledge may undermine our best chance to develop the very technology that will both improve quality and be cost-effective (22, p. 235).

**Strategy Two**

Another strategy that has been proposed and that received very strong support from some policy makers is to utilize cost-benefit studies as a basis for the development and distribution of technologies.

This strategy is summarized as follows. For each technology, make an assessment of the costs incurred from its
use, and the benefits that it provides. Based upon this assessment, we can then prioritize technologies according to those with the greatest surplus of benefits over costs. Society can then adopt those technologies with the most favorable benefit to cost ratios, up to some predetermined level that we are collectively willing to spend (21, p. 1414).

This approach, at least initially, sounds very appealing, primarily due to its apparent simplicity. Maloney and Rogers, who do not advocate this approach, have said, "It is, in effect, much like the idea of buying household appliances on a priority basis up to some fixed limit of one's monthly budget" (21, p. 1414). This particular strategy is advocated quite frequently in the medical literature and, in many instances, is presented as a near panacea for the control of medical technology. Herbert Klarman has provided us with an excellent review of the literature concerning cost-benefit analysis in health care (20).

A more detailed examination of this approach reveals that it is not quite as simple as it first appears. There are a number of vexing problems associated with this technique. First of all, cost-benefit analysis requires that all outcomes be expressed in common units so that costs and benefits can be compared. The measurement of benefits in dollar terms represents a formidable conceptual problem. The most common approach has been to measure benefits in
terms of future potential earnings as the following example illustrates:

A $20,000-a-year steel worker with fifteen years until retirement might be worth $300,000; a $15,000-a-year nurse with five years until retirement, $75,000. The technologies that might save the lives of aged persons or certain minority citizens might systematically be found to be of less benefit than those useful to a larger percentage of more highly paid, younger workers. Clearly such cost accounting would have odious overtones unacceptable to most Americans (21, pp. 1414-1415).

Not only is the measurement of benefits in dollar terms difficult, perhaps even arbitrary, but there are also considerable difficulties associated with the measurement of costs (20). Klarman has pointed out that the ability to measure costs depends upon a firm producing a single good or service (5, p. 5). This certainly does not characterize the heterogeneous "product" of medical care.

There are other equally disturbing problems associated with the measurement of costs. For example, how does one measure the costs of being sick: pain, discomfort, and grief? None of these carries a price tag (5, p. 5).

There is also the problem of obtaining "truly objective" results from this procedure. Users of specific technologies, as well as technology developers and suppliers, are apt to be biased in their analysis. The potential for this kind of bias is particularly well pointed out in Waitzkin's inquiry into the development of coronary care technology (39). In the report of his findings he revealed that a number of
the studies which provided support for the increased proliferation of coronary care units were financed by Warner-Lambert and Hewlett-Packard. The source of the funding for these studies was not made evident in the publication of results. These two corporations produce a substantial amount of the devices and electronic instrumentation that have made coronary care units possible.

There are also strong financial disincentives to perform this type of evaluation by those who use the technology, as the following passage suggests:

To evaluate a technology means to admit the possibility that the technology is not worth adopting. When introduction of a new technology such as the CT scanner into one medical center can produce a threefold increase in radiologic billings in two years, it is no wonder that there is a reluctance to conclude that the technology makes no difference to the patient (33, p. 195).

For these reasons, the application of cost-benefit analysis to the assessment of technologies is considered an inappropriate approach to the control of technology-induced hospital costs.

Strategy Three

According to this strategy, we should simply eliminate the use of technologies of no clinical value.

There are a number of researchers who believe that a large number of the procedures that are performed in medical care are of no clinical value (11, p. 1234; 21, p. 1415). They therefore suggest that considerable cost savings could
be realized, with no decrease in the quality of care, by simply eliminating all needless procedures (11, pp. 1234-1235; 16, pp. 3-5). As Maloney and Rogers characterize it, Eliminating truly needless procedures would be a clean, clear-cut way to save dollars without relinquishing potential medical benefits. It preempts the debate as to whether a benefit is large or too small (21, p. 1415).

Schwartz and Joskow have conducted a comprehensive analysis of the potential savings that would accrue to society if totally unnecessary procedures and services were eliminated (35). In a report of their preliminary findings they state,

So far, public discussion of health care costs has taken for granted that the principal culprit is money spent for no return whatever. We doubt, after a rather close look at the available evidence, whether pure production inefficiency and care that yields no medical benefit account for more than a small fraction of the rising cost of health care. The largest proportion of expenditures, we believe, will prove to be of the type that buys at least some medical benefits. The key question is to what extent such care is purchased at excessive cost and to what extent we are prepared to forego other investments to provide such care (35, p. 1464).

As has been argued previously, there is considerable evidence to suggest that there are a considerable number of unnecessary procedures being performed, particularly technology bound procedures. However, as Schwartz and Joskow have suggested, if the overwhelming number of procedures do have some medical benefit, then eliminating those of no value will achieve little savings (21, p. 1415). Thus, the
elimination of procedures and services of no value is not a viable approach for controlling health care costs via the harnessing of technology.

The previous three strategies that have been discussed are considered here to be inappropriate or incomplete approaches to deal with the problem of technologically-generated hospital costs. They are inappropriate because, for the most part, they ignore the total institutional framework within which hospital care is provided. The financial incentives that are provided in our system are so strong that providers will and have found ways to circumvent such approaches.

In Chapter three the incentives that are provided by our health care delivery system were examined. It was demonstrated how these incentives influence the behavior of doctors, hospitals, and patients. Most notably, it was pointed out that today's system of fee-for-service for the physician, cost-reimbursement for the hospital, and third-party financial intermediaries to ostensibly protect consumers, has resulted in rewarding the providers of care for cost-increasing behavior and has left the insured consumer as well as his doctor with little or no incentive to consider the costs of medical care. As Enthoven describes it,

In the system of fee-for-service, cost reimbursement and third-party intermediaries that dominates health care financing today, the question of
efficient use of resources does not even arise. The problem of how best to spend a given amount of money for the health care of a population is not posed. Providers are not required to set priorities, look at alternatives and make hard choices. From the point of view of the provider, there is an apparently unlimited amount of money. This system rewards cost-increasing behavior with more revenue; it punishes cost-reducing behavior with less revenue. Such a system must produce inflation in prices and waste in the use of resources (11, p. 1229).

In the remainder of this chapter four rather broad alternative strategies will be discussed to deal with the problem of over-diffusion and over-utilization of medical technologies. In contrast to the three approaches that have already been discussed, the proposals that follow will directly address the incentives which are provided by our current system. It will be argued that only by restructuring current incentives, will we be able to provide an economically rational plan which will reward people—doctors, hospital administrators, and patients—for finding ways to deliver better care at less cost.

Appropriate Strategies for the Control of Technology

**Strategy One**

This first approach consists of instituting regional planning agencies for the purpose of assisting and directing the distribution of big and expensive technologies within communities.
This approach takes the position that many expensive technologies such as open-heart surgery facilities, CT scanners, specialized intensive care units, and renal dialysis programs, should be considered scarce public resources, and should, therefore, be rationed to communities or regions based upon need. These health planning agencies can help to facilitate the consolidation of many of these programs in order to provide greater economies of scale, as well as better health outcomes resulting from higher volumes.

A number of studies have demonstrated that for certain types of procedures, economies of scale can be achieved, if production is consolidated into those facilities which produce at an efficient volume (11, pp. 1235-1236). For example, Finkler, in his examination of the costs of open-heart surgery as a function of annual case loads determined the following:

At fifty patients per year, the cost per patient would be about $21,000; at 500 patients per year, the cost would be about $8,700. The average costs per unit decreases with volume mainly because many of the costs of a heart-surgery center are fixed (11, p. 1235).

He further examined the distribution of open-heart operations in California and found that, in 1975, 15,000 operations were performed in 91 hospitals for an average of 163 operations per hospital. In 48 hospitals fewer than 100 operations were performed during the year. He concluded that if all of the open-heart procedures had been performed
in 30 centers, each doing about 500 cases annually, that this consolidation would have resulted in a savings of $44 million in 1975 for California alone (11, p. 1235).

Not only would such consolidation lead to lower costs but, as the ICHD studies and a number of other studies have demonstrated, health outcomes are better in facilities that perform this complex procedure in large volume (1).

Other services that exhibit decreasing costs associated with increasing volume include clinical laboratories, CT scanning facilities, maternity and neonatal intensive care units (11). Pettigrew has estimated that the costs of an efficient minimum-capability maternity unit are approximately $1,245 per admission in units with 500 yearly admissions, and $653 per admission in units handling up to 1,200 admissions annually (11, p. 1235). Evens and Jost have determined that the cost per CT scan is around $157 at a volume of 40 patients a week, and $89 at 80 patients per week (12).

While there does appear to be strong evidence that consolidation of many types of facilities would result in lower costs and, in many instances, higher quality care, the attitude of the current administration is not at all receptive to regional planning of health care facilities. To the contrary, the Reagan administration has proposed phasing out all of the federal health planning programs (13). In
summarizing the current administration's stand on health planning Foley states,

In accord with a philosophical position that national regulatory programs should be dismantled, the administration has stated that the current health planning program inhibits the market forces needed to strengthen competition and to provide less costly services. Consequently, a $28 million reduction in funding is proposed for 1981, with a total reduction from this year's fiscal base of $145 million to zero by 1984 (13, p. 970).

There is some evidence that our attempts at health planning, primarily through Certificate-of-Need legislation, have not been very successful in controlling hospital investment (31, 32). However, in light of the human efforts and the public funds that have been committed to the planning program--the establishment of 204 regional health systems agencies and 57 state agencies--it seems appropriate to explore the value of revising our planning system, rather than passively accept its extinction (13). After all, most state Certificate-of-Need programs that emphasized cost containment have been implemented in the last three years--hardly enough time to measure their impact.

Health planning, by itself will not be the panacea for the problem of rising hospital costs. It might, however, if coupled with the restructuring of incentives, help to eliminate a great deal of the needless duplication of expensive equipment and facilities that now exists.
Strategy Two

The second strategy would involve making financial incentives neutral with regard to technology.

In order to reduce the amount that we spend for technologically-related services and procedures it is imperative that we change the way we reimburse physicians. The current reimbursement system provides strong financial incentives for physicians to practice technology-intensive medical care and equally strong disincentives for the practice of low-technology care (18; 19; 21, p. 1416; 33, p. 180). These incentives are a result of the high financial reward given to technological procedures as opposed to consultative services. To illustrate this point, consider the following:

... a periodic physical exam that takes about forty-five minutes of the physician's time carries a charge of approximately $40. On the other hand, administering and reading the results of a chest X-ray or of an electrocardiogram (EKG), both of which take no more than a few minutes of a physician's time, carry fees of approximately $28 each. Without arguing the clinical efficacy of these tests, it is clearly in the physician's financial interest to order technological procedures (33, p. 181).

Not only does the reimbursement system encourage primary care practitioners to practice a high-technology style of care but it also encourages more physicians to go into specialty fields (21, 33). There are a great many medical educators, as well as other interested and informed parties, who believe that we have far too many specialists and not
enough primary care physicians. This imbalance may be due to the fact that medical reimbursers simply do not reward the practice of primary care (3, 21). Seldin, in the following passage, summarizes the conflicting messages being sent by medical educators on the one hand and medical reimbursers on the other.

On the one hand the critical importance and moral dignity inherent in the role of family physicians are emphasized; on the other, social emoluments in the form of financial rewards, leisure, prestige, are disproportionately rewarded to the specialist. In some hospitals an all-night vigil for the treatment of diabetic acidosis or hepatic coma is rewarded with a standard $8 fee for professional care [visit]. In contrast, a ten minute endoscopy in the same institution earns $100 (37, p. 247).

Maloney and Rogers have noted four trends in the current reimbursement system that steer physicians away from a discerning use of technology (21, p. 1416).

First of all, the practice of high-technology medicine results in much greater income than merely using one's "head and hands." A phenomenon that has elsewhere been called "decerbrate medical practice" (29, p. 56).

Secondly, reimbursement rates for the use of technology have increased much more rapidly than payments for physician-patient interactions. They point out that between 1975 and 1978, technological procedures reimbursed by Blue Shield of Washington, D. C., increased more than 50 percent, while reimbursement for physician time spent with the patient increased only 20 percent.
Thirdly, specialists receive more money than generalists, even when using the same technologies and performing identical procedures.

Finally, physicians may, by simply modifying the mix of services and procedures that they perform, increase their incomes threefold. Schroeder and Showstack have demonstrated that a physician can change his annual net income from $31,500 to $90,000 simply by including three easily defensible procedures to his standard patient work-ups: a two-view chest X-ray, a treadmill cardiovascular stress test, and an automated twelve-channel blood chemistry test (33, pp. 181-182).

Although no attempt to make an assessment of the medical efficacy of the standard use of these ancillary services will be made here, it is important to note that there is a considerable amount of evidence which questions the efficacy of such procedures in standard work-ups (2, 4, 7, 9, 24, 25, 30). Just as we saw in the two cases of coronary-bypass procedures and intensive care, physicians are performing many of these other, less dramatic procedures, with great frequency, in spite of the fact that their efficacy is still very much in question (8, 14, 34). Although it is impossible to determine to what extent the financial incentives are influencing physician's decisions to order tests, the incentives do, nevertheless exist. It certainly seems
plausible that they could have a significant influence.

Schroeder and Showstack sum up the situation as follows:

Under our current reimbursement mechanism, no constraints limit the ordering of these procedures. While it can be argued that a physician is medically justified in ordering many of them, and that many patients expect these procedures to be part of a routine office visit, we question whether the reimbursement system should provide the demonstrated financial incentive to do so (33, p. 183).

Favorable reimbursement for technology-bound procedures did, in the past, have an important purpose (21, p. 1416). First of all, it encouraged physicians to take the time to learn new procedures and to incorporate them into their practice. It also encouraged hospitals to make many of the new technologies available. In retrospect, it appears that these incentives were logical and appropriate. However, over time they have collectively created an imbalance which now deserves serious attention. As the following passage suggests:

The time has come to move the pendulum back to the middle--to allow physicians to choose either a low-technology or high-technology practice style without penalties for technologic restraint (21, p. 1416).

It appears plausible that two beneficial outcomes would accrue to society as a result of making financial incentives neutral with regard to technology. First of all, it would likely result in significantly lower costs for health care. For example, one study has demonstrated that the theoretical cost difference for the over 600 million yearly office
visits in this country, between a low technology-intensive practice and a high technology-intensive practice, exceeds $6.5 billion (33, p. 182).

Secondly as we discussed in an earlier chapter, the possibility that medical care can do harm as well as good is a real and growing one. David Rogers seriously questions his profession's growing reliance on technology as the following passage illustrates.

As our interventions have become more searching, they have also become more costly and more hazardous. Thus, today it is not unusual to find a fragile elder who had been able to walk into the hospital, but is now slightly confused, dehydrated, and somewhat the worse for wear on the third hospital day because his first forty-eight hours in the hospital were spent undergoing a staggering series of exhausting diagnostic studies in various laboratories or in the radiologic suite. . . . I believe that our technology is sometimes seducing us and that the undesirable side-effects of the hospital work-up commonly used nowadays now sometimes outweigh its obvious advantages (28, p. 1394).

As the above passage suggests, and as was demonstrated in the previous discussion of iatrogenic illness, it may very well be the case that too much medicine may be just as harmful, and in many cases more harmful, than too little medicine. Neutralizing the financial incentives with respect to technology is a necessary first step to take in order to provide for a more discerning and thoughtful use of all technologies, both big and small. As Rogers concluded in
his presidential address to the Association of American Physicians,

Restraint tends to make for kind physicians. We need them. Discrimination tends to make wise ones. We need them too. . . . Applying proper restraint to our technology, and using it in a discriminating manner, would help demonstrate to our public that we have proper concerns about American medicine and that we are moving responsibly to improve the quality of its application (28, p. 1397).

Strategy Three

This strategy suggests that medical educators in both medical schools and in post-graduate teaching hospitals teach their students the value of cost-effective medicine.

This strategy emphasizes that any significant and long-lasting change in the cost of medical care must be accompanied by a change in the values that physicians acquire during the course of their academic and clinical training (10, 15, 17). As medical care grows more technological, the decision-making process becomes more complex for physicians. This strategy appears to be gaining wider acceptance, if the number of articles in the literature is any indication of acceptance. Implementing it would involve adding a major course to the medical curriculum that teaches the principles of cost-effective clinical decision-making to medical students. As Eastaugh describes it,

If we are to make intelligent decisions on how to improve quality of care and contain costs, it is our responsibility to discover the most effective means of training physicians to make economical
decisions. Formal training in decision analysis and economics might yield more rational decisions, and perhaps better patient outcomes—or at least more informed decisions in cases where cost savings conflicts with delivery of the highest possible quality of care (10, p. 28).

A study that was conducted by John Nagurney indicates that there is a definite need to educate physicians as to the economic implications of the care that they are providing (23). In his study he determined that 81 percent of the house staff and all of the attendings correctly estimated the daily semi-private room rate at one large urban university hospital, but only 15 percent of each group correctly estimated the charge of a serum potassium, a commonly ordered laboratory test. Answers were considered to be correct if they were within plus or minus 20 percent of the true figure. Roughly half of the various questions about third-party benefit plans were answered incorrectly. He concluded that if his findings were generalizable then they "suggest that a directed teaching program in simple economic facts and principles may be useful at all levels of physician training" (23, p. 727).

A number of academic medical centers have already implemented such programs and the results have been most favorable. Griner has reported the results of one such program that was instituted in 1970 at the Strong Memorial Hospital in Rochester, New York (17). He reported a significant decline in the numbers of chemistry tests and no
growth in the numbers of microbiology or hematology tests as well as no growth in the number of X-rays between 1970 and 1977. These findings are more meaningful when compared with the national hospital averages that demonstrate, for the period from 1970 to 1975, there was a 13.8 percent average annual increase in the number of laboratory tests. Significant cost savings accrued to the hospital due to the decreased use of these ancillary services.

The National Fund for Medical Education estimates that if these education programs are incorporated into medical programs now, by 1990 more than a third of the physician population will have been affected (15, p. 85). This translates into thousands of physicians practicing with the benefit of some knowledge of the principles of cost-effective clinical decision-making. When one considers the crucial role that the physician plays in the allocation of health care resources, particularly those that are centered in the hospitals, this strategy could result in a significant impact on increasing the quality of care and concurrently reducing its cost.

**Strategy Four**

This strategy involves replacing the retrospective cost-based reimbursement scheme used by many third party payers with a system of prospective reimbursement. Prospective reimbursement would impose more rigorous economic
constraints on providers by presetting the amount of revenues a hospital may acquire in a given year (33, p. 199).

It is actually being implemented in many states to control hospital costs and the proliferation of new technologies. As we described in Chapter three, in the past hospitals have been reimbursed on a cost-plus basis and have therefore been able to pass cost increases due to new technology acquisition directly to the third-party payers. Prospective reimbursement should help to slow the acquisition and use of new technologies by presetting the amount of revenues a hospital may acquire in a given year. The amount of revenues would be determined as a function of such things as case mix and admissions in various facilities, with a 5 to 10 percent increase built in to account for unforeseen changes in case loads or increases in the cost of inputs.

Under the old cost-plus method, hospitals were essentially guaranteed reimbursement for acquisition and use of all technologies. There was little incentive to economize, in fact, there was an incentive to run up costs in order to increase revenues.

With fixed revenues per admission, it is possible for hospitals to earn a surplus by being more judicious in their acquisition of new technologies as well as a more discerning use of those that are already in place.
Some critics have argued that hospital administrators simply do not have enough control over physicians and their use of ancillary services such as laboratory tests and radiological procedures for this strategy to work (33, p. 200). However, as Schroeder and Showstack have suggested, changing the structure of hospital organization, such as having the medical staff work with administrators to limit the acquisition and use of technological services, might enable prospective reimbursement to be effective as a means to control both costs and technology. Baltimore's John Hopkins Hospital has undergone just such a reorganization and they have managed to reduce the hospital's inflation rate by half—to 7.9 percent in 1978. Contrast this with an overall inflation rate for all hospitals in the same year of 12.5 percent (38). In reference to Hopkin's success at controlling costs and technology, one researcher has remarked,

One of the keys to holding the line on health costs . . . is giving physicians a stake in the organization dispensing care, whether it is an HMO or a hospital like Hopkins. That way, the doctors become financially accountable for their actions (38, p. 154).

A prospective reimbursement system will enable hospital administrators (those most concerned with overall hospital revenues), to rationalize the hospital budgeting process in order to limit technology-related cost increases. However, as the above passage suggests, physicians must be included
and must play an integral part of the organization dispensing care. That is, they must be held financially accountable for their actions in order for this strategy to be effective.

Summary

Health care in the decade of the eighties is faced with something of a dilemma: there is continued concern over the rapidly rising costs of health care, while there is also a growing aversion to federal regulation and central planning. In light of this political climate it is believed that these last four strategies would be appropriate ways of dealing with the problem of technologically-induced health care costs. Not only would they result in less costly health care but they would do so with only a modicum of federal regulation.

In the beginning of this chapter a distinction was made between "big-ticket" and "small-ticket" technologies. It was argued that any policy, if it is to be effective in controlling technologically-generated costs, must address both types of technologies.

Precisely because of the very high fixed costs associated with technologies such as open-heart surgery facilities, renal dialysis, CT scanners, specialized intensive care units, and highly automated clinical laboratories, these capital-intensive facilities should be consolidated within
regions. It was demonstrated that this consolidation would result in increased economy as well as better health outcomes for the patient. The first strategy that we suggested was to utilize regional health planning boards to make these determinations and assist in facilitating consolidation.

Three additional strategies were proposed which together would lead to the more discerning use of all technologies, big and small. We must find ways to make the payment for medical care neutral with regard to technology. Those responsible for educating physicians must begin to teach the principles of cost-effective clinical decision-making. Finally, third-party payers must find ways to encourage hospital staffs and private practitioners to reduce the collective costs of their standard use of technology—prospective reimbursement was posited as one such approach.

In the final analysis, policy-makers must concern themselves with the cost of medical care, appropriate resource allocation, and ways to improve the health status of all Americans. It is believed that these four strategies, taken together, would lead to a more rational allocation of medical resources and, at the same time, encourage the use of clinically necessary and economically efficient medical technology. It seems plausible that a more discerning approach
to the use of technology will result in better health care for everyone.
CHAPTER BIBLIOGRAPHY


8. Daniels, M. and S. A. Schroeder, "Variation Among Physicians in Use of Laboratory Tests, II. Relation to Clinical Productivity and Outcomes of Care," Medical Care, 15 (June, 1977), 482-487.


11. Enthoven, Alain C., "Cutting Cost Without Cutting the Quality of Care," The New England Journal of Medicine, 298 (June, 1978), 1229-1238.


15. Friedman, Emily, "Changing the Course of Things: Costs Enter Medical Education," Hospitals, 53 (May, 1979), 82-85.


CHAPTER VI

SUMMARY AND CONCLUSIONS

This analysis began with an examination of the current, past, and future trends of health care spending in the United States. It was demonstrated that, with the exception of the 1972 to 1973 period, during which price controls were in effect, there has been an upward secular trend in health care expenditures for the past three decades (9, p. 181). It is expected that this trend will continue to persist well into the eighties (7). Not only have health care expenditures increased significantly in absolute terms, but, as a proportion of Gross National Product, health spending has increased rather steadily. In 1950, 4.5 percent of GNP was devoted to health care. By 1978, health care expenditures represented 9.1 percent of GNP (Table V). This reflects that society is trading-off the production and consumption of other goods and services in order to devote more resources to health care.

Social scientists and other professionals interested in the health industry are certainly justified in their concern over the rapidly rising costs of care. However, it is important to point out that the rising costs of health care are merely a symptom—the manifestation of an underlying
problem in the way that we produce, distribute, and consume health care resources. When a physician treats only the symptoms of a disease, he is frequently frustrated in his attempt to cure his patient. If policy-makers concern themselves solely with controlling the costs of health care they too, will be frustrated.

There is a broad consensus that something is wrong with our health care system. It is, in effect, running a fever, i.e. rapidly rising costs. But, just as the physician cannot cure a disease simply by controlling the patient's temperature, neither can policy-makers "cure" the problems of our health care system by simply trying to control costs. If we are to effectively deal with the significant problems that exist in this industry, it is imperative that we first understand the underlying problem.

This analysis has been primarily concerned with the hospital sector as it is the largest component of the health care industry, consuming slightly more than 40 percent of total national health care expenditures (10, p. 214). As a necessary first step toward understanding the problem it is important to identify the network of institutions that, taken together, make up the market for hospital care. It is then necessary to understand how each of these groups interact and influence one another's behavior.

In Chapter III, the four primary constituents of the hospital care market were delineated. The first two are the
providers of care—doctors and hospitals. The third participant is the entire complex of public and private third-party insurers. The fourth group is the patients.

A brief summary of how these four groups interact with and influence one another is as follows: The patient, who is largely ignorant as to what kind of care he actually needs, once in the hospital, does wish to receive the very best care that is available. In the presence of extensive third-party coverage, the cost of this care is of little concern to him. The physician, who is by training pre-disposed to practicing a technologically biased mode of care, is inclined to utilize any and all services that might, no matter how marginal their contribution, improve his diagnosis or reduce the risk of a malpractice suit. The physician, due to the predominance of third-party coverage, has little incentive to concern himself with the costs of the care that he provides. In fact, as a result of a fee-for-service reimbursement scheme, the more care that he orders or provides, the greater will be his income in all probability (15, p. 102). The hospital administrator is concerned that his institution has all of the latest equipment and facilities in order to attract and retain physicians on the hospital staff. This requires very little risk to the hospital as the majority of hospital insurance payments are based retrospectively on costs incurred. If costs increase as a result of more intensive utilization;
performance of more complex, equipment-bound procedures; or more staff, then higher reimbursements will be forthcoming.

In Chapter IV, the history of two specific technologies were analyzed. These two innovations, intensive care and open-heart surgery, evolved within the institutional framework described above. The analysis of these two innovations demonstrate very clearly how the incentives which are provided by our delivery system influence, even direct, the diffusion and utilization of medical technology. With respect to these two technologies a number of common characteristics were identified.

1. Both of these technologies were rapidly diffused even though their efficacy has not been firmly established by the medical community (6, 16).

2. Within the hospital sector, there exists a significant amount of excess capacity and needless duplication of these two highly specialized, resource-intensive innovations (2, 18).

3. Intensive care may be utilized, and coronary-bypass surgery may be performed, in many instances where less costly and less invasive modes of treatment would result in the same, if not better, health outcomes (3, 16).

The purpose of selecting these two particular technologies for analysis was not to suggest that the rising cost of hospital care is directly attributable to them.
Rather, it was to demonstrate specifically how the incentives in our system influence the providers of care and their decisions to adopt and utilize certain procedures. A similar process can be seen with other expensive technologies as well, such as renal dialysis, CT scanning, and electronic fetal monitoring, to name just a few (1).

In Chapter V, a number of strategies that have been proposed to deal with the problem of medical technology were evaluated. It was argued that, for policies to be effective in dealing with the problem of overdiffusion and over-utilization of medical technologies, they must address not only the big, impressive innovations such as intensive care and open-heart surgery, but also the "small-ticket" technologies. Such ancillary services as laboratory tests and radiologic procedures, while on an individual basis do not appear to be very expensive, they do add up to a very large cumulative cost (14).

Four strategies were suggested that, taken together, might lead to the more discerning use of all technologies. First of all, because of the very high fixed costs associated with such resource intensive technologies as open-heart surgery and intensive care, they should be consolidated within regions. The availability of such facilities should be based upon a region's medical need. This would result in increased economy as well as better health outcomes for the patient (18). Regional health planning agencies could
direct this planning function. Secondly, we must find ways to make the payment for medical care neutral with regard to technology. Thirdly, those responsible for educating physicians must begin to teach the principles of cost-effective clinical decision-making. Finally, third-party payers must find ways to encourage hospital staffs and private practitioners to reduce the collective costs of their standard use of technology--prospective reimbursement was suggested as one such approach.

In the final analysis, social scientists and others who are concerned with the health of the health care system must first understand the underlying disease mechanism. The problem is not technology per se, as some have argued (5). As Louise Russell has noted, "New technologies are only some of the things that we spend our money on, not the reason we spend it--a symptom, not a cause" (19, p. 2). Nor is it simply a matter of containing costs (21). Ours is a system in which a number of perverse incentives have evolved which are, to a large extent, directing the diffusion and utilization of new and existing technologies--both big and small. It has resulted in a situation in which medical resources are effectively treated as free goods.

Society is now facing a dilemma: the conflict between a desire to make all medical resources available to everyone, and a reluctance to accept any further increases in the cost of health care (8). In short, society is beginning to realize
that medical care, like other goods and services, is, at least in the short-run, a scarce resource.

Economists are ultimately concerned with the production, distribution, and consumption of scarce resources. It seems plausible that economists can assist physicians, hospital administrators, insurers, and the public in restructuring the incentives, which are now directing their behavior, in order to provide for a more rational allocation of medical resources, and, at the same time, encourage the use of clinically necessary and economically efficient medical technology.

We must try. We must experiment boldly. The cost of not doing so may be very great indeed.

Suggestions for Further Research

As is usually the case in any research project, more questions are raised than are answered. In this last section three rather broad suggestions will be made as to further research that would help to guide policy-makers who are concerned with the nation's health.

First of all, many of the technologies that are routinely used in this country have never been subjected to rigorous tests to establish definitive evidence as to efficacy (11, 16). This was seen in the cases of intensive care and open-heart surgery. As Relman has noted,

The cost and psychologic stress of ICU treatment would be justifiable if such units were known to reduce mortality and morbidity from levels achievable with less costly and intensive modes of hospital care.
However, there have been no prospective, randomized, controlled trials to supply such data. Comparisons with historical and non-randomly assigned controls have indicated that certain types of patients do better in ICU's but the evidence is suggestive at best, and it must be admitted that the effectiveness of much of what is done in ICU's, like so much treatment elsewhere in the hospital, has not been rigorously tested (16, p. 965).

The first suggestion is that new and existing diagnostic and therapeutic practices be subjected to the kind of rigorous testing that Relman has suggested. If the practice is found to be clinically valid then it should then be subjected to another test. It must be shown to be more effective than other practices used for the same problem. If the second requirement is satisfied, still one more barrier should be in place before its dissemination--its value must be shown to be greater than the value of the practices that its adoption would displace (11, p. 240).

This type of research would pose many problems, particularly ethical ones. It is, however, necessary and it certainly is possible. As Hiatt has commented, "A people that was sufficiently aroused to create a Food and Drug Administration to control pharmaceutical preparations will surely find mechanisms for controlling medical and surgical procedures when the effects of inadequate restraints become more widely evident" (11, p. 240).

The second recommendation for further research concerns the development of better measures of health. It would be very helpful for policy-makers to have more complete
information on the impact that various policies have on the nation's health. There are simply no wholly adequate measures of health by which we can determine how best to allocate resources for health care (8, p. 405). It may very well be the case that resources devoted to improving nutrition, housing, education, and the environment in general, may be more productive than devoting ever greater amounts of resources to medical and hospital services. This determination is, however, very difficult to make without the ability to measure health and the quality of life in general. Further research in this area would certainly be of benefit to those who are making the allocation decisions.

Finally, it is important to point out that this study has taken a partial view of the United States health care system. It has focused primarily on hospitals, physicians, public and private third-party insurers, and patients. These four groups represent only one dimension of the health care industry. As Relman has suggested, our health care system has evolved into what he has called the "medical-industrial complex" (17). The following passage provides an indication of just how complex this system really is.

A wit once referred to the entangled webs of organizations which carry out our society's domestic missions as a "crazy quilt." True added another observer, but a multidimensional one. There are in each community in this land, scores of agencies, private and public and semi-public, local, branches of state, and arms of federal ones, pure and mixed agencies, supervisory and regulating, and others. They vary in competence, justification and size. Some disregard all others;
others try to cooperate; others--created to provide coordination--add to that which must be coordinated. Attempts have been made to conceptualize the relationships among these various agencies in neat models, whose main virtue is the economy of conception . . . such simplifications are too far from the socio-political reality to serve us (13, p. 11).

While there may be a fairly strong consensus that our health care system is in a state of "crisis," there really is no consensus as to how we should deal with the problem. On one end of the spectrum there are those who propose mild reforms of the present system and, at the other end, there are those who propose what amounts to a medical and political revolution (14, 12, 20).

It seems imperative that before we begin making major changes in the way we provide health care in this country that more research be done in two areas. First we must identify the entire network of agencies and institutions that are involved in the process of providing health care. We must then consider the various patterns of linkages that exist among these institutions, as well as their significance for transforming the health system (12, p. 16).
CHAPTER BIBLIOGRAPHY


An outline of the items that make up the total costs of evaluation, open-heart surgery, and follow-up.*

I. Evaluation
   1. Professional fees (cardiologist, surgeon)
   2. Exercise tolerance test
   3. Other laboratory tests (electrocardiograms, X-ray, blood chemistry)
   4. Echocardiogram (optional)
   5. Cardiac Catheterization
      a. Hospital room charge, 2 days
      b. Professional fee for cardiac catheterization
      c. Catheterization laboratory fee
      d. Radiologist's fee
      e. Physician's fee for hospital care
      f. Other laboratory studies

II. Operation
   1. Surgeon's fee (additional charge for each graft)
      a. Single bypass graft
      b. Double bypass graft
      c. Three or more bypass grafts
   2. Anesthesiologist's fee
   3. Anesthesia (includes monitoring)
4. Operating room charge
5. Pump oxygenator
6. Aortic balloon catheter (optional)
7. Operating room implant items (urimeter bag, pacing wires, medicines, etc.)
8. Intensive care unit, 1 to 4 days
9. Hospital room charge, 2 to 7 days
10. Clinical chemistry (blood gases, enzymes, electrolytes)
11. Clinical hematology (hemoglobin, WBC, etc.)
12. Microbiology (blood culture, other)
13. Pathology
14. Respiratory therapy
15. Electrocardiograms
16. Blood services (blood, platelets, cross-matching, services)
17. Drugs and IV solutions
18. X-rays
19. Coagulation studies
20. Central supply (catheters, suction machines, electrodes, hose, tubing, etc.)
21. Professional fees for hospital care
   a. Surgeon
   b. Cardiologist
   c. Other consultants
III. Follow-up (post-hospitalization)

1. Professional fees

2. Exercise tolerance test

3. Other laboratory tests

4. Repeat cardiac catheterization (optional)

BIBLIOGRAPHY

Books


Bailey, R. M., Clinical Laboratories and the Practice of Medicine, Berkeley, McCutchan, 1979.

Carlson, Rick, The End of Medicine, New York, John Wiley and Sons, 1975.


**Articles**


Barr, David, "Hazards of Modern Diagnosis and Therapy--The Price We Pay," *Journal of the American Medical Association*, 159 (December 10, 1955), 1452-1456.


Bloom, Bernard S. and Osler L. Peterson, "End Results, Cost and Productivity of Coronary-Care Units," The New England Journal of Medicine, 288 (January 11, 1973), 72-78.


Dales, L. G., "Multiphasic Check-Up Evaluation Study: 3. Outpatient Clinical Utilization, Hospitalization and Mortality Experience After Seven Years," Preventive Medicine, 2 (1973), 221-235.

Daniels, M. and S. A. Schroeder, "Variation Among Physicians in Use of Laboratory Tests, II. Relation to Clinical Productivity and Outcomes of Care," Medical Care, 15 (June, 1977), 482-487.


Dunkman, Bruce W. and others, "Medical Perspectives in Coronary Artery Surgery--A Caveat," Annals of Internal Medicine, 81 (December, 1974), 817-832.


Enthoven, Alain C., "Cutting Cost Without Cutting the Quality of Care," The New England Journal of Medicine, 298 (June, 1978), 1129-1238.


Friedman, Emily, "Changing the Course of Things: Costs Enter Medical Education," Hospitals, 53 (May, 1979), 82-85.


__________, "Treatment of Acute Pulmonary Edema: Conventional or Intensive Care?," Annals of Internal Medicine, 77 (October, 1972), 501-506.

__________, "Use of Laboratory Tests in a Teaching Hospital: Long-Term Trends," Annals of Internal Medicine, 90 (February, 1979), 243-248.


Kane, R. L., "Iatrogenesis: Just What the Doctor Ordered," Journal of Community Health, 5 (Spring, 1980), 149-158.


Litman, T. J. and O. G. Johnson, "Sharing Services: The Dynamics of Institutional and Administrative Behavior," Hospital and Health Services Administration, 25 (Fall, 1980), 7-22.


Martin, Samuel P. and others, "Inputs into Coronary Care During 30 Years," Annals of Internal Medicine, 81 (September, 1974), 289-293.


Matz, Robert, "Intensive-Care Units," The New England Journal of Medicine, 303 (September 25, 1980), 758.


Newhouse, Joseph and Vincent Taylor, "How Shall We Pay for Hospital Care?," The Public Interest, 23 (Spring, 1971), 78-92.


Phibbs, Brenda, "The Abuse of Coronary Arteriography," The New England Journal of Medicine, 301 (December 20, 1979), 1394-1396.

Piper, Kenneth W. and Paul F. Griner, "Suicide Attempts with Drug Overdose: Outcomes of Intensive vs. Conventional Floor Care," Archives of Internal Medicine, 134 (October, 1974), 703-706.


Rogers, David E., "On Technologic Restraint," The Archives of Internal Medicine, 135 (October, 1975), 1393-1397.


"Special Care Units: Guidelines for Organization, Staffing, and Costs," Modern Hospital, 118 (January, 1972), 83-85.

"Special Correspondence: A Debate on Coronary Bypass," The New England Journal of Medicine, 297 (December 29, 1977), 1464-1470.


Steel, Knight and others, "Iatrogenic Illness on a General Medical Service at the University Hospital," The New England Journal of Medicine, 304 (March 12, 1981), 638-642.

Toufexis, Anastasia and others, "Taming the Number One Killer," Time, 117 (June 1, 1981), 52-58.


, "A Marxist View of Medical Care," Annals of Internal Medicine, 89 (August, 1978), 264-278.


Reports


Unpublished Materials
