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Analysis of Physician Pricing Behavior, Third Party Administrative Practices and Effects of Financial Incentives and Reimbursements Upon Supply of Physician Services

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Chapter 1

Introduction and Overview

Introduction

Health care has grown to be a major sector of the economy, consumed $362 billion in 1983, accounts for close to 11 percent of the Gross National Product. Federal health care financing program - Medicare and Medicaid - is the third largest federal program - exceeded only by social security and national defense. With an estimated increase of 12.1 percent from 1983 to 1984, Medicare and Medicaid will be the fastest growing federal programs. The size of the federal health care financing programs and especially their rapid rate of increase have brought unprecedented public attention to reimbursement policies for hospitals and physicians. With the enactment of a new prospective reimbursement system for hospitals based on DRGs, the Administration and Congress are turning their attention to physician payment policies.

Until the mid-1970s when this and other studies of physicians were funded by the Health Care Financing Administration, there had been precious few systematic studies of physician fees, physician economic behavior, and physician market structure. Public policies on medical care were based on the naive assumption that physician services operate in a competitive market. Patients' demand determines fees and quantity of services. The role of third-party payor was passive, insurers' and governments' reimbursement policies were simply to replicate what the market has produced on price and quantity. But when faced with continuous rapid inflation of medical care cost, the federal government began to take an active role in discovering how the physician market functions. This knowledge is crucial in

formulating rational public policy.

Medical services in the United States is organized based on an exchange economy. However, unlike the typical products, medical service has many unique features which complicate its demand and supply. The uncertain efficacy of medical procedures and complexity of medicine gives unusual discretionary economic power to physicians. Several economic theories and numerous econometric studies have concerned themselves with these problems, all with disappointing results. None has produced an adequate model that explains or predicts the price-quantity of medical service.

Risk and uncertainty alter the normal economic relationship between patient and doctor. The uncertainty of illness that leads to widespread purchases of health insurance not only affected the demand for medical services, but altered the bilateral relationship between patient and doctor. Thus, the provision and financing of medical care has become a tripartite relationship: patient, doctor and insurer. Each has his own objective function and faces his own constraints, yet they were related to each other, thereby forming an interlocking series of simultaneous pressures which impact on allocative efficiency.

Most studies have ignored insurance firms as an active economic force in the medical service market, treating insurance instead as a passive factor that reduces monetary price of medical services, and thus only affects the demand. The interactions between the insurance firm, the doctor, and insurance buyer are totally omitted from these models. Yet insurance firms have their own corporate objectives, face their own special constraints, and operate within the limits of their own market structure. Therefore, a

realistic theory of the medical service market has to incorporate these three related components: doctor, patient and insurance firm.

Medical knowledge is complicated. A patient presents symptoms to the doctor rather than a definite illness. A symptom can be associated with many diseases. A physician exercises considerable amount of judgment in diagnosing diseases. Moreover, a "best" treatment for a given illness rarely exists; often an illness can be treated in several ways. The therapeutic value of many procedures are uncertain because their efficaciousness have not been evaluated scientifically. Furthermore, recovery from disease is as unpredictable as is its incidence. It is difficult, costly and time consuming to assess the efficacy of a procedure. As a result, physicians have to exercise judgment in the application of one course of medical intervention over another. This gives physicians discretionary power over both the type and the quantity of service patients consume.

The superior knowledge of physicians over medical technology and the uncertainty in the efficacy of medical diagnosis and treatments form the basis for physicians' market power. Doctors command over the allocation of medical resources and control price-quantity decisions. Both the patient and insurance firms must reckon with this professional control.

The preeminent position of the physician in medicine is further strengthened by law and customs. Physicians are granted professional autonomy by our legal system. They have official monopoly over the right to define health and to treat illness, free from control by outsiders. Victor Fuchs puts it succinctly: "Physician is the captain of the medical ship . . . it is impossible to make significant change in the medical field without changing physician behavior." According to conventional wisdom,

70-80 percent of the decisions in regard to resource use in medical care are made by physicians. Therefore, any policy that tries to contain medical care cost must address the issue as to how we can influence the physician decisions on resource use, fees and quantity. This reality, however, was not recognized by policymakers until the last few years.

In an exchange economy, price is the primary allocative instrument. Physician fees determines how many services would be supplied, which modality of treatment would be offered and performed, how many people would be hospitalized, how many would become physicians, where they would locate their practices, and what specialty medical students would pursue. In sum, fees is the key factor that determines medical cost, resource use and resource allocation.

Government Policy

Government has only a few macro policy instruments to effect the efficient use of resources. Price is one. From the beginning of legislative debate for the Medicare and Medicaid programs, the government wrestled with the question of how to establish the price for physician services. During the legislative debate, the Congress and Administration were misled by Blue Shield (U.S. Senate Committee on Finance, 1970) to believe that physicians were being paid largely on a usual and customary fee (UCR) basis. But in fact that was not true. In 1964, only a small percent of physicians were paid on UCR basis. To placate organized medicine's opposition to Medicare and Medicaid, Congress accepted the UCR method as the basis for payment of physicians. The rationale was that government does not wish to disturb or alter whatever the market practices were then.

The UCR method of payment is inherently inflationary. It encourages physicians to raise their fees with the third party payors. Faced with rapid increase in expenditure for physician service under Part B of Medicare while the program's revenue is limited, the federal government began in the early 1970s to use administrative sanctions in attempts to control fee increases. By delaying the update of physician fee profiles and by limiting the increases in prevailing fees to economic indices, the federal government tried to moderate fee inflation. But these efforts had almost no impact on expenditures because of physicians' economic discretionary power. They made up whatever reduction in fees by "procedure creep", by fragmentation of bills, and by increasing the quantity of services. Many physicians also shifted the cost to patients by not accepting assignment.

The past several years witnessed a rising interest in reforming physician payment. Instead of the UCR system, many people have suggested in establishing fee schedules. A fee schedule can be promulgated by the government or established through negotiation with organized medicine. Another suggested reform is the revision of the relative value schedules (RVS). Legislation has been introduced in Congress to revise the RVS. Moreover, Congress also mandated the Health Care Financing Administration to undertake a feasibility study on paying physicians based on diagnostic related groupings (DRGs).

When legislation passed in 1983 to pay hospital care base on prospective DRG rates, some lawmakers wish to extend the same concepts that underlie DRG - prospective rates and grouping of services - to physician payments. Moreover, if the same DRG for hospital care can be used for physician services, then a single rate can be established to pay for both ser-

vices instead of separating physician and hospital payments. Since physicians control the use of 70%-80% of hospital resources, a combined DRG rate would integrate the financial incentives into the hands of one decision-maker. But physician DRG rates is faced with many technical difficulties, including data to produce the physician expenditures for each DRG. But a DRG system would solve one of the major problems in physician payments, the proliferation of procedural codes.

The unit of physician service are ill defined. Physician services is fungible. The procedure code for physician services has increased by three-fold during the past 15 years, from approximately two thousand to more than six thousand. By having more procedural codes, physicians can maximize their income by selecting the most renumerative code that fit the service performed to bill third party payors or patients. However, the problem is more complicated than the fragmented codes. Often a surgical charge cover packaged services which include pre- and post-operative care in the hospital as well as the surgical operation itself. In order to improve efficiency, to control cost and to maintain quality of care, the question of what services are to be included in a given charge has become a policy issue.

In addition to the issues of appropriate fees, procedure codes, and packaging, physician reimbursement policy is confronted with another problem: quantity of services. As a result of their preeminent position in medical care, physicians have wide discretion in influencing demand for medical services. Their dominating position gives physicians the power in determining the number of services and modality of procedures to be performed for a given illness.

The expenditure of medical services is the product of fees (p) times quantity (q) (p x q); so is physician income. When government or private insurers regulate the fees, physicians can alter the quantity and modality of treatment within a broad range to offset any reduction in physician income. Therefore, any fee regulation may not result in reduction in cost, but simply a displacement between price and quantity. Thus a critical policy question is to what extent physicians would alter quantity demanded in response to fee regulation.

Policy Research

A basic question about physician market is how the fees are being determined. This is an empirical question, yet little knowledge existed. Fees, being the primary allocative mechanism, determine the quantities of services supplied, modality of treatment selected, specialty choice, participation rates, patient selection, and location choice.

When government or private insurers want to decide rationally on what fees to pay for services, these third party payors have to know whether physicians are price-takers or price-setters. Also whether or not the fees clear the market. The third party payors may wish to follow the existing fee structure if it is determined by a competitive market. However, if physicians are local monopolists and able to set fees, individually or collectively, then an UCR payment system would institutionalize the monopolistic practices.

Assertions are abundant as to how physician fees are determined. Many assume physicians are price-takers and fees are the result of competition. In adopting the UCR payment system, the U.S. Congress had accepted this

premise. Others assert physicians are local monopolists, setting their fees to achieve a target income. Meanwhile many economists assume that the fee structure was set by Blue Shield plans which had been captured by physicians. Which one of these assertions is closer to the truth can only be discovered by empirical research.

Another crucial empirical knowledge needed in policy formulation is the relationship between fees and quantity of services supplied. If government or third party regulate fees, what changed would occur on quantity of services and modality of treatment provided? A corollary question is to what extent expenditure for physician services can be reduced or altered by regulating fees? This information is critical if the third party payor seek to control medical cost while minimizing perverse side effects. The early Canadian experiences in Ontario Canada found that when the government only regulated fees, the total medical expenditure did not decline. There was an equal displacement in increases in quantity. Ontario found it had to regulate both fees and quantity in order to contain medical expenditures.

Finally, there are two major options available to the government in regulating physicians. First is to strengthen market competition through government intervention. Alternatively, the government can rely on its direct regulation to influence physician behavior. In either case, the government needs to know what influences physician decisions and what factors constrain them? What economic and social factors affect their practice patterns and fees? Do the market forces play an effective role in affecting physicians? What roles do private insurers play in the market for physician services? The answers to these questions can be obtained

through comprehensive market studies and through modeling of physician markets.

Objectives of this Research Project

This research study focuses on three central questions. First, how prices for physician services are being determined. What influence do the patients and private insurers' reimbursement policies have on physician fees? Second, what is market structure and organizational behavior of health insurers? How do they affect physicians? Third, what economic and social factors influence physician fees and how do the fees influence physician supply decisions?

This research project pursued several investigations in order to answer the three central questions described above:

1. What is the pricing practice of physicians? Do they price discriminate within a market area? What is statistical patterns of fees?

2. Does organized medicine set fees through some collective action, such as promulgating a relative value schedule? Do physicians follow the published relative value schedule?

3. How were the relative value schedules determined? Do they represent the marginal cost of production? If the relative value schedules are arbitrarily set, how much do they differ from the relative prices that a competitive market would have produced?

4. What is the market structure for health insurers? How do the insurance firms behave, especially in their relationship with

physicians? To what extent do the private insurers try to influence physician fees? To what extent can the insurers control physician practices?

5. Is physician services a homogeneous product? Do physicians have different styles of practice that differentiate their products from each other?

6. Using econometric models, can we ascertain how much the market forces constrain physicians, and which variable has the greatest influence on physicians' economic and medical decisions?

Field Study

A major part of this research project consisted of an extensive field study of the two most prevalent types of health insurance organizations: Blue Shield plans and commercial health insurers. In addition, we interviewed a number of practicing physicians, particularly those who are serving on the Board of Directors of Blue Shield plans, physician-employees of commercial insurers, and leaders of medical communities. We limited our study to the traditional role played by insurer. We didn't examine what roles insurers are playing in promoting alternative organizations of health services. The descriptive findings from this field study and its detailed design are reported by Hsiao and Stevens in 1979 to HCFA.

Blue Shield plans are organized on a regional basis. Most of them follow state boundaries. There exists a national organization which certifies and coordinates the various plans. The association also serves an important function in providing financial settlements among plans. When a

person is insured by one Blue Shield plan, but obtains medical care at a location which is in the jurisdiction of another plan, the latter plan pays the claim and receives a reimbursement from the former plan. The National Association of Blue Shield Plans acts as the clearing house for the inter-plan settlements.

The nature of the insurance market divides Blue Shield plans into two categories: leading plans and local plans. Because many buyers of group insurance are large corporations which operate in many states, the insurance that they purchase from a particular plan affects the type of coverage and reimbursement procedure throughout the states where their employees reside. Meanwhile, some group insurance buyers are local firms, the type of insurance they purchase only affect that local community. Blue Shield plans in large industrial states such as New York, Pennsylvania, Michigan, etc. are called leading plans because their products and reimbursement policies affect the practices adopted by other Blue Shield plans in all states. Meanwhile, plans that have very little influence outside of their own region are called local plans.

Organization of Blue Shield plans vary. Some are independent organizations. Others are merged with their counterpart, Blue Cross, which provides insurance for hospital services. In the past decade, there has been rapid movement toward mergers. Because the scope of our research is limited to physician services, we focus our attention on Blue Shield plans. Also, we use Blue Shield in this study as a generic term to represent both types of organizations: independent Blue Shield plans or merged Blue Cross/Blue Shield plans.

We selected a sample of six Blue Shield plans and four large commercial insurance companies to be objects of intensive study. The six Blue Shield plans were chosen to represent four major regions of the United States: the Northeast, South, Midwest and the West. There were two leading plans in our sample, while the other four were local plans. The size of the plans ranged from very large to very small. Two-third of the plans that we studied were independent Blue Shield organizations, and the remainder were combined Blue Cross/Blue Shield plans.

The four commercial health insurance companies were all large national firms. Fifty-eight percent of health insurance policies sold by commercial insurers were supplied by 25 firms. They operate on a nationwide basis for marketing, servicing, and claim processing. The four companies selected for our sample were typical of large commercial firms. In total, the four companies had thirteen percent of the health insurance market.[10]

Interviews were conducted at each one of the ten sites. We interviewed twenty to thirty people at each firm. Every meeting lasted approximately one hour. Before the interviews, we first digested the written material obtained from each organization. This included annual reports, operational manuals, reimbursement and claim procedures, insurance policy forms, premium rate filings, and internal memorandums. At each firm, we interviewed its executive staff including the President, members of the Board of Directors, marketing and financial Vice Presidents, actuaries, Director of Professional Relations (i.e., relation with physicians), corporate counsel, managers of underwriting and claim operations. Our questions were focused on three major organizational concerns: marketing, finance and professional relations. In each case, the information col-

lected was further supplemented by written material.

Besides a field study of health insurers, we also interviewed more than twenty-five physicians in various communities. We tried to solicit information on their pricing decisions, why and how they cooperate with insurers, and how do they exercise peer control. We were interested to learn the objectives they seek to attain, their sensitivity to consumer demand, their reaction to competition, and the degree of freedom they have in making medical decisions.

The findings from these field studies are presented in the later chapters of this report. The next section describes the organization of this report.

Organization of the research project

This research project is organized into four major parts: (A) Data collection of physicians' fees and analysis of their statistical patterns. Comparison of RVS with a normative standard to ascertain price distortions. (B) Evaluation of the market for health insurance and insurers' organizational behavior. A study is specifically devoted to the investigation of insurers' interactions with physicians. (C) Analysis of physician market structure, referral patterns, reimbursement policies of insurers and physician economic behavior. (D) Modeling of physician economic behavior, and testing hypotheses.

The results from our statistical analysis of physician charges are presented in Chapter 2. We collected the data tapes of actual charges made in 1971 from 24 states. The data base consists of more than 100 million transactions between the doctor, patient, or insurer. It would be too

expensive to analyze all the 100 million records. We took a stratified sample for our study. The sampling technique and statistical methods used to analyze this data are presented in Chapter 2. The findings on the statistical distributions of physician charges, their dispersion and skewness, are summarized. To the best of our knowledge, this is the first comprehensive statistical analysis of physician fee patterns. In addition, Chapter 2 presents our research findings as to whether physicians are still practicing price discrimination and whether or not physicians are adhering to the relative value schedules promulgated by Blue Shield plans. We had to develop special statistical methods to address these questions. The methodology we developed and the results are also presented in Chapter 2.

Our evaluation of the relative value schedule is presented in Chapter 3. It became clear to us that after assessing the history of relative schedule, the RVS in current use can't represent the prices produced by the current market conditions. Relative value schedules were originally derived in 1956 in California by tabulating the charges in that State. The RVS based on this tabulation were revised through negotiation by California Blue Shield and various medical societies representing the sub-specialties. These resultant relative value schedules were then put into use. They were revised periodically by arbitrary administrative actions and by negotiations. As a result, the present relative values could not represent the market price yielded through competition. During the past three decades, there have been vast changes in both the demand and supply of physician services. Those changes could not be adequately reflected in the relative value schedule that was established based on 1956 charges. Consequently, we developed a method to measure the input resource cost for selected pro-

cedures. They would approximate the long run marginal costs of these procedures. The method of deriving the input resource cost is described in Chapter 3. The comparison between the relative value and the input resource cost is also presented in Chapter 3.

Our findings of the health insurance market are presented in Chapters 4, 5, and 6. We first analyzed its market structure, the insurance firms' objectives and the environment in which the firms operate. Next we investigated the major constraints of which insurance firms are faced. Then we developed two models that depict the organizational behavior of the insurance firms and their interactions with physicians. From these investigations, we found that contrary to the common assumptions, Blue Shield plans are not simply captured by organized medicine. They have an organizational life of their own such as corporate goals to serve the community, to increase the plans' own surplus, etc. As a result, Blue Shield does negotiate with physicians for lower fees and quantity controls whenever the plans have the market power to do so.

The descriptive analysis of physician market structure is presented in Chapter 7. We investigated both the supply and demand factors that operate in this market. Physician manpower is unevenly distributed among geographical locations. That would affect fees. In addition, professional medical ethics prescribe how much physicians are allowed to compete with each other and how much information can be given to patients. The impact of the professional ethic codes on competition are analyzed in Chapter 7 along with demand analysis.

Two models are developed in this research study. They are presented in Chapters 8 and 9. The first one is to model the individual physician

behavior. Physician practices differ. The services they provide are heterogeneous. The model and discussion presented in Chapter 8 try to capture the major variables in determining a typical physician behavior and evaluate how public policy can effect the typical doctor.

The second model we developed is for the whole physician market, brought together the three principal players: physician, patient and insurer into one system. In order to model this trilateral relationship, we designed a recursive model and collected the necessary data to test the hypotheses generated from the model. The results are reported in Chapter 9.

A summary of this research project and its findings is presented in the final chapter. In chapter 10, we describe briefly the objectives of this study, the methodology used in the research, and the data collected to conduct the research. Then our research findings are summarized and their implication for reimbursement policy are evaluated. This chapter then concludes with recommendations for future research on physicians' market.

CHAPTER 2

Statistical Analyses of Physician Fees

Prices charged by physicians have gained national attention over the past decade. Physician fees are a major factor in determining the total cost of medical services. It is the key economic variable that determines the supply of doctors, influences physicians in their choices of specialty and geographic locations.

Yet little is know about the actual patterns of physicians' fees. Most empirical studies in health economics have examined the average fees and average rate of inflation in fees. While these aggregate measurements can be used for econometric studies, they do not give us a basic understanding of physicians' pricing patterns. Without the empirical information about the statistical patterns of fees, we cannot answer certain important policy questions such as the financial impact of reimbursing doctors on a fee schedule.

Price of a service is the principal economic signal from which consumers determine their demand and producers decide what to produce and the quantity to produce. Until recently, medical prices have not received much attention from consumers because of two reasons. First, health insurance pays a large portion of the medical bills for many. This reduces the concern and sensitivity that consumers would have toward prices charged by physicians and hospitals. Second, there is a social inhibition for consumers to find out the prices that doctors or hospitals charge. Patients frequently defer all the judgments, medical and economic, related to an illness to physicians. Moreover, in cases which are life threatening or with intensive pain, few people would think of price shopping nor even want to give the appearance that economic consideration should enter into who and how the illness should be treated.

Many people have argued that the consumers may not be significantly influenced by the medical price. Nevertheless, the producers - physicians and hospitals - are aware of the prices and could be greatly influenced by them.

In the market for physicians' services, the differences in the prices of medical procedures between specialties affect the supply of doctors by specialty. The geographical choice may be influenced by the price differential between locations. More importantly, the difference in relative prices between different procedures or modality of treatment of a given disease may have effects on doctors' decisions in selecting the method of treatment.

In the past, there seems to be a prevalent practice of price discrimination by doctors. The rapid growth of health insurance which equalizes patients ability to pay may have altered that practice. We should find out whether doctors are currently practicing price discrimination. This question can be answered by a study of physicians' charges. Also, some government agencies such as the Federal Trade Commission has alleged that there is price fixing by organized medicine. A study of actual physician charges would offer some empirical evidence to support or refute these allegations.

This chapter is divided into three sections. The first section describes our data base. The second presents the statistical profiles of physicians' charges. Histograms of the actual charges are plotted. The statistical distribution of charges are analyzed as to their means and variance. The charges made by individual doctors were tabulated to examine whether or not physicians charge different fees to different patients. Another part of the statistical analysis is the study of fees charged by general practitioners versus specialists for the same procedures. The third section is an analysis whether or not doctors are adhering to a relative value schedule.

I: *Data Base*

In any given year, more than one billion encounters take place between physicians and their patients. Each encounter, except under pre-paid group practice plans, results in a fee being charged for service rendered. The volume of the data is staggering. For our study, we selected a sample of actual physician charges, stratified by geographic location, urban and rural areas.

The actual charges made by physicians were obtained from insurance carriers for 24 states. These insurance carriers maintain the most comprehensive set of computer records of the fees charged in their state because their insurance covered a significant percentage of the people in that state and they were carriers for the Medicare program.

The data tapes include information about the procedure preformed, where it is done, the specialty of the doctor, the fees, charged, and the amount of reimbursement made by the insurance carrier.

The 24 states that we have selected include all regions of the United States. Among the urban areas included in our sample are New York City, Chicago, Massachusetts, and Indiana. Among the rural areas included are Idaho, Vermont, Louisiana, Oregon and New Mexico.

The claims records represent the services provided between January 1, 1971 and December 31, 1971. There is an important reason for selecting the 1971 data for our study. When this statistical analysis was undertaken in 1977, this was the latest period of data available and was not affected by the sever disturbance in the marketplace created by the Economic Stabilization Act. Between 1972 and 1974, the rate of increase in physicians' fees was controlled by the government. After it was decontrolled in 1974, the rate of increase in fees accelerated. Also physicians change their fees more

frequently. It is plausible the inflation in fees between 1974-76 is the result of a market disequilibrium. Therefore, the pattern of physicians' fees could be distorted. Meanwhile, we are interested in studying the patterns of fees when the market is relatively stable. Therefore, the 1971 data were used.

II: *Statistical Analysis of Physicians' Charges*

A. *Statistical Profile of Physicians' Fees*

Thirteen medical and surgical procedures were selected for our study. These procedures were selected based on two criteria. First, all 13 are performed frequently. One of the purposes of our study is to analyze the movement of prices by individual physicians for a fixed procedure, or set of procedures. In order to carry out this analysis, it is essential that the physicians we study perform the procedure(s) frequently enough to allow for possible changes in prices. The second criterion was to select those procedures which are standard enough in definition, and hopefully in practice as well, so as to minimize the possibility of unusual cases or rare medical conditions. If a procedure is open to high degree of variation in terms of the skills and time required to perform it, then it is expected that these differences would show up in their prices. This second criterion is more difficult to control in that no two patients are exactly identical, but by choosing only those procedures with relatively high frequencies there should be enough observations to be able to identify any unusual cases.

After the procedures and States were selected, the data base was then reduced further by sampling. Without any additional sampling the data base for the 13 procedures would have contained over five million claims. With it, the file was reduced to less than one fourth this amount, or approximately one million claims. The method used to select the records is stratified random sampling. It is consistent with our research

interests, which is to study the variation of physicians' prices. The sampling was carried out in three steps. First, the optimal sample sized were computed for each state, and whenever possible for each physician specialty. Second, the number of physicians necessary to satisfy these sampling sizes was estimated. This estimate was based on the criterion that we would select physicians and then take their entire profile, thus allowing variations within physicians to be studied. And last, the physicians were randomly selected based on the results from the first two steps.

It is necessary to note the specialty designation for each physician in the data base is self-designated. Each doctor indicates his specialty on the claim form. It was not possible to verify the self-designated specialty to ascertain whether they are truly specialty board certified (or eligible).

This study began with some basic statistical analysis by computing for each one of the 24 geographic areas, the frequency distribution, histograms and summary statistics. The charges for the medical services were rounded to the nearest 50¢ and charges for surgical procedures rounded to the nearest $25.

The frequency distributions and summary statistics for four sample states are shown in Tables 1 through 4. The summary statistics at the bottom of the tables were based on one of two values; if the statistic is based on centiles, such as the median, then the value is the rounded charge. All other statistics, such as the moments about the mean, which are based on real values, used the actual charge.

Also two medians are calculated. One median is computed according to the standard definition. That is the value of the middle case after all cases were ranked in increasing order. It is a useful and a "resistant" estimate of location when the data is categorical, but it is not the appropriate measurement for the middle value when the

Table 1

ALABAMA

ROUTINE OFFICE VISIT

CHARGE*	ABS FREQ	REL FREQ(%)	CUM FREQ(%)
0.50	188	0.41	0.41
1.00	76	0.16	0.57
1.50	11	0.02	0.60
2.00	146	0.32	0.91
2.50	5	0.01	0.92
3.00	1047	2.27	3.20
3.50	12	0.03	3.22
4.00	1983	4.30	7.52
4.50	2	0.00	7.53
5.00	13524	29.34	36.87
5.50	5	0.01	36.88
6.00	6024	13.07	49.95
6.50	76	0.16	50.12
7.00	8167	17.72	67.84
7.50	827	1.79	69.63
8.00	5680	12.32	81.96
8.50	6	0.01	81.97
9.00	171	0.37	82.34
10.00	7452	16.17	98.51
10.50	2	0.00	98.52
11.00	6	0.01	98.53
12.00	248	0.54	99.07
12.50	2	0.00	99.07
13.00	2	0.00	99.08
14.00	3	0.01	99.08
15.00	353	0.77	99.85
16.00	8	0.02	99.87
17.50	2	0.00	99.87
18.00	1	0.00	99.87
20.00	49	0.11	99.98
24.00	1	0.00	99.98
25.00	7	0.02	100.00
50.00	1	0.00	100.00
75.00	1	0.00	100.00

N =	46088			MEDIAN =	6.50
MEAN =	6.74	MODE =	5.00	ADJ MEDIAN =	6.39
STD DEV =	2.223	VARIANCE =	4.944	SKEWNESS =	1.642
KURTOSIS =	24.786	(H3+H1)/2 =	6.51	COEF OF VAR =	0.330

MEDICAL PROCEDURES ROUNDED TO NEAREST $.50 - SURGICAL TO NEAREST $25

Table 2
ARIZONA
ROUTINE OFFICE VISIT

CHARGE*	ABS FREQ	REL FREQ(%)	CUM FREQ(%)
3.50	922	0.32	0.32
4.00	164	0.06	0.37
4.50	250	0.09	0.46
5.00	7296	2.51	2.97
5.50	6904	2.38	5.35
6.00	15336	5.28	10.62
6.50	10470	3.60	14.23
7.00	43039	14.81	29.04
7.50	18966	6.53	35.56
8.00	70972	24.42	59.99
8.50	8886	3.06	63.05
9.00	17210	5.92	68.97
9.50	9453	3.27	72.24
10.00	49066	16.89	89.12
10.50	6574	2.26	91.38
11.00	3246	1.12	92.50
11.50	2525	0.87	93.37
12.00	9274	3.19	96.56
12.50	2472	0.85	97.41
13.00	10	0.00	97.41
13.50	447	0.15	97.57
14.00	1391	0.48	98.05
14.50	858	0.30	98.34
15.00	4638	1.60	99.94
15.50	178	0.06	100.00

N = 290586

MEAN =	8.42	MODE =	8.00	MEDIAN =	8.00
STD DEV =	1.924	VARIANCE =	3.701	ADJ MEDIAN =	8.05
KURTOSIS =	1.434	(M3+M1)/2 =	8.47	SKEWNESS =	0.871
				COEF OF VAR =	0.228

MEDICAL PROCEDURES ROUNDED TO NEAREST $.50 - SURGICAL TO NEAREST $25

Table 3

MASSACHUSETTS
ROUTINE OFFICE VISIT

CHARGE*	ABS FREQ	REL FREQ(%)	CUM FREQ(%)
0.50	217	2.00	2.00
1.00	60	0.55	2.55
1.50	33	0.30	2.85
2.00	36	0.33	3.19
3.00	44	0.41	3.59
3.50	18	0.17	3.76
4.00	100	0.92	4.68
4.50	5	0.05	4.72
5.00	2606	24.00	28.72
5.50	3	0.03	28.75
6.00	422	3.89	32.63
7.00	2906	26.76	59.39
7.50	22	0.20	59.59
8.00	952	8.77	68.36
9.00	60	0.55	68.91
10.00	2785	25.64	94.56
12.00	15	0.14	94.70
12.50	1	0.01	94.71
15.00	543	5.00	99.71
20.00	27	0.25	99.95
25.00	1	0.01	99.96
30.00	3	0.03	99.99
35.00	1	0.01	100.00

N =	10860			MEDIAN =	7.00
MEAN =	7.55	MODE =	7.00	ADJ MEDIAN =	6.99
STD DEV =	2.918	VARIANCE =	8.515	SKEWNESS =	0.764
KURTOSIS =	3.166	(H3+H1)/2 =	7.51	COEF OF VAR =	0.387

MEDICAL PROCEDURES ROUNDED TO NEAREST $.50 - SURGICAL TO NEAREST $25

Table 4
MINNESOTA
ROUTINE OFFICE VISIT

CHARGE*	ABS FREQ	REL FREQ(%)	CUM FREQ(%)	CHARGE	ABS FREQ	REL FREQ(%)	CUM FREQ(%)
1.00	50	0.06	0.06	24.00	5	0.01	99.95
2.00	105	0.12	0.18	25.00	10	0.01	99.96
2.50	26	0.03	0.21	28.00	2	0.00	99.96
3.00	333	0.38	0.59	30.00	3	0.00	99.97
3.50	405	0.47	1.06	34.00	1	0.00	99.97
4.00	1949	2.24	3.30	35.00	2	0.00	99.97
4.50	250	0.29	3.59	38.00	1	0.00	99.97
5.00	17432	20.07	23.66	40.00	2	0.00	99.97
5.50	3763	4.33	28.00	42.00	10	0.01	99.99
6.00	30468	35.09	63.08	44.00	2	0.00	99.99
6.50	1043	1.20	64.29	46.00	1	0.00	99.99
7.00	14233	16.39	80.68	63.50	9	0.01	100.00
7.50	1380	1.59	82.26				
8.00	7489	8.62	90.89				
8.50	265	0.31	91.19				
9.00	920	1.06	92.25				
9.50	194	0.22	92.48				
10.00	4641	5.34	97.82				
10.50	34	0.04	97.86				
11.00	89	0.10	97.96				
11.50	37	0.04	98.01				
12.00	113	0.13	98.14				
12.50	22	0.03	98.16				
13.00	22	0.03	98.19				
13.50	35	0.04	98.23				
14.00	56	0.06	98.30				
14.50	27	0.03	98.33				
15.00	250	0.29	98.61				
15.50	18	0.02	98.64				
16.00	3	0.00	98.64				
16.50	11	0.01	98.65				
17.00	11	0.01	98.66				
17.50	2	0.00	98.67				
18.00	20	0.02	98.69				
18.50	18	0.02	98.71				
19.00	9	0.01	98.72				
20.00	7	0.01	98.73				
21.00	11	0.01	98.74				
22.00	1	0.00	98.74				
22.50	9	0.01	98.75				
23.50	1035	1.19	99.94				

N =	86838			MEDIAN =	6.00
MEAN =	6.63	MODE =	6.00	ADJ MEDIAN =	6.06
STD DEV =	2.546	VARIANCE =	6.484	SKEWNESS =	5.498
KURTOSIS =	54.359	(N+1)/2 =	6.24	COEF OF VAR =	0.384

MEDICAL PROCEDURES ROUNDED TO NEAREST $.50 - SURGICAL TO NEAREST $25

data is continuous. For these cases, an interpolated median is often used. The advantage of this estimate is that it locates more accurately the middle observation which is generally reported as being within a category. If there are other cases within this category then it is misleading to say the median is equal to the average value of the category. Instead, it is more accurate to interpolate the median as being the average value of the sub-category within the category which contains the middle case. In the output this median is referred to as the "ADJ MEDIAN," (adjusted median). To actually compute this estimate, it is assumed that the cases are linearly distributed within a category and that each case has its own sub-interval. Because our data is not truly continuous and the categories are relatively small, these assumptions are not restrictive.

The other term in the summary statistics is "(H3+H1)/2." It is simply the average of the first and third quartile which are the 25th and 75th percentile. It is another relatively "resistant" estimate of location.

The histograms show that the distributions do not appear to be normal. The summary statistics support this visual conclusion. These visual graphs give a better overall understanding of the data. The four graphs presented all show the charges are not normally distributed. Also they are asymmetric and have unusually shaped tails. In the case of Massachusetts these tails are uneven about the median, and in Alabama they appear to straggle. These frequency distributions and summary statistics lead us to believe that we have to use non-parametric tests on the date rather than the standard statistical methods.

A comparative analysis was done to examine the pattern of physician charges between states. One medical service and one surgical procedure were selected for the study. Table 5 summarizes the comparison for the medical procedure - routine office

Table 5

ROUTINE OFFICE VISIT

STATE	N	MEAN	MODE	MEDIAN	ADJ. MEDIAN*	C.O.V.**
MISSISSIPPI	61347	5.64	5.00	5.00	5.16	.300
OKLAHOMA	659340	5.71	5.00	5.00	5.19	.210
SOUTH DAKOTA	76237	5.20	5.00	5.00	5.10	.238
TEXAS	561400	6.22	5.00	5.00	5.23	.297
COLORADO	47263	5.87	5.00	5.50	5.33	.226
KANSAS	78815	6.39	5.00	6.00	6.17	.311
MINNESOTA	86838	6.63	6.00	6.00	6.06	.384
N. CAROLINA	46047	6.39	5.00	6.00	6.16	.228
TENNESSEE	37071	6.59	5.00	6.00	6.19	.341
VIRGINIA	68947	6.62	5.00	6.00	6.24	.273
WYOMING	43855	5.88	5.00	6.00	5.85	.252
ALABAMA	46088	6.74	5.00	6.50	6.39	.330
IDAHO	45235	6.97	6.00	7.00	7.01	.232
INDIANA	135672	7.08	8.00	7.00	7.08	.281
LOUISIANA	88085	6.49	5.00	7.00	6.77	.270
MASSACHUSETTS	10860	7.55	7.00	7.00	6.99	.387
OREGON	87710	7.18	7.50	7.00	7.15	.153
NEW MEXICO	32549	7.16	6.00	7.50	7.44	.193
ARIZONA	290586	8.42	8.00	8.00	8.05	.228
ILLINOIS	115794	8.74	10.00	8.50	8.34	.339
NEVADA	73729	8.80	10.00	8.50	8.62	.220
NEW YORK	1491	14.45	10.00	12.00	11.75	.727

*ADJ. MED. -- ADJUSTED MEDIAN

**C.O.V. -- COEFFICIENT OF VARIATION = $\frac{\text{STANDARD DEVIATION}}{\text{MEAN}}$

visit. The mean charges between states vary by almost three-fold. Meanwhile, there is less variation in modal charges or median charges. Another interesting fact is the mean charges are consistently larger than the modal or median charges across most states.

Table 6 gives the comparative summary statistics for a surgical procedure, cholecystectomy, across 22 states. The relative difference in the charges are smaller than those for the medical procedure. Meanwhile, the mean charges are quite close to the median charge which is again from the medical charge. It seems price differences between states are less for this surgical procedure than that for the selected medical service.

Table 7 shows the values for the medical procedure to be drifting in the opposite direction of the surgical procedure. For routine office visit, the mean is usually greater than the other estimates, indicating that in general the tails on the right side are relatively longer, and the mode is equal to the median in half the cases and greater than median in most of the remaining cases.

Table 7

Procedure	Mean > Mode	Mode > Median	Mode = Median	Median > ADJ Median	N
Routine Office Visit	18	7	1	8	22
Cholecystectomy	12	13	5	13	22

If the average distribution for this procedure were plotted it would have the following shape:

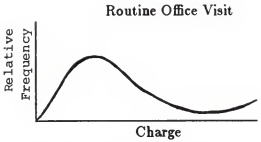
Table 6

CHOLECYSECTOMY

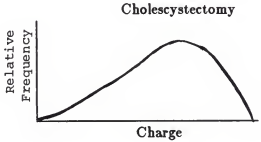
STATE	N	MEAN	MODE	MEDIAN	ADJ. MEDIAN*	C.O.V.**
MISSISSIPPI	504	305.80	300.00	300.00	306.87	.228
SOUTH DAKOTA	365	314.67	300.00	300.00	309.33	.203
VIRGINIA	584	306.59	300.00	300.00	308.55	.278
WYOMING	68	300.68	325.00	300.00	308.93	.206
INDIANA	1637	324.15	300.00	325.00	319.91	.249
ALABAMA	857	317.97	350.00	350.00	344.92	.355
IDAHO	131	345.27	300.00	350.00	346.43	.181
KANSAS	359	342.38	350.00	350.00	352.24	.264
LOUISIANA	849	368.57	350.00	350.00	355.54	.290
MINNESOTA	446	336.02	300.00	350.00	339.79	.170
N. CAROLINA	1274	347.20	350.00	350.00	346.05	.247
OKLAHOMA	625	347.31	350.00	350.00	346.42	.139
TENNESSEE	1031	330.90	350.00	350.00	342.06	.266
TEXAS	3944	355.92	350.00	350.00	355.12	.331
MASSACHUSETTS	1466	356.13	400.00	375.00	370.17	.389
NEW MEXICO	412	350.00	375.00	375.00	371.85	.234
OREGON	121	382.62	375.00	375.00	375.81	.154
COLORADO	206	390.23	425.00	400.00	391.53	.118
ARIZONA	473	415.19	400.00	425.00	414.27	.138
ILLINOIS	593	454.71	500.00	475.00	473.75	.287
NEVADA	95	506.76	500.00	500.00	507.14	.134
NEW YORK	1073	628.52	500.00	600.00	591.24	.604

*ADJ. MED. -- ADJUSTED MEDIAN

**C.O.V. -- COEFFICIENT OF VARIATION = $\frac{\text{STANDARD DEVIATION}}{\text{MEAN}}$



The distribution has the tendency to increase away from the central values. The shape for the pricing pattern of cholecystectomy appears to be just the opposite and looks like:



The mode is generally greater than the median, as is the mean, and the adjusted median is very similar to the median. This suggests that the distribution is more skewed to the left and that prices, as they are increasing, seem to increase together towards a common point.

There seems to be a difference in the pattern of charges for medical and surgical procedures. Part of this difference could be due to the lack of precise definitions for the selected medical procedure -- routine office visit. A more plausible explanation is that the market conditions for these two services are not the same. There is no way for us to test this hypothetical explanation by pure statistical means. We can only tentatively conclude the pricing patterns for these two procedures are different.

Another statistical analysis we have conducted is comparing the mean and median prices of various geographical areas. It was expected that there would be significant

differences among areas because of varying costs and different market conditions. The method we used is the K-sample median test. The chi-square statistic evaluating the differences between the number of medians less than or equal to the pooled median and the number of medians greater than the pooled median. It showed the medians are not equal, and probably quite different. The actual results are shown in Table 8.

We also plotted the scatter diagram of the mean values versus the coefficient of variation. They are shown on Graphs 1 and 2. The actual spread between the minimum and maximum values is greater than shown in the graphs because New York was excluded. Values for New York are significantly greater than other states and they are off the scale shown on the graph.

We observe the relative amounts of variation differ among procedures. For instance, charges for unlike routine hospital visits have much greater variation. The coefficient of variation changes by as much as four-fold, and there doesn't appear to be any central tendency. Meanwhile, charges for routine office visits seem to cluster about a coefficient of variation of three.

The one surgical procedure included here, cholecystectomy, is between these two extremes. It has only a two-fold difference in variation, but the actual amounts do not appear to be moving towards any one value. For this procedure it is difficult to make comparisons with the others because the scale of mean charges is much different, but even if the scale was altered, the variations would not be as standard as for routine office visit.

B. *Price Discrimination - Do Physicians Practice It?*

An important concern to the policy makers is whether physicians practice price discrimination, i.e., do physicians charge varying price for a given procedure according to

Table 8

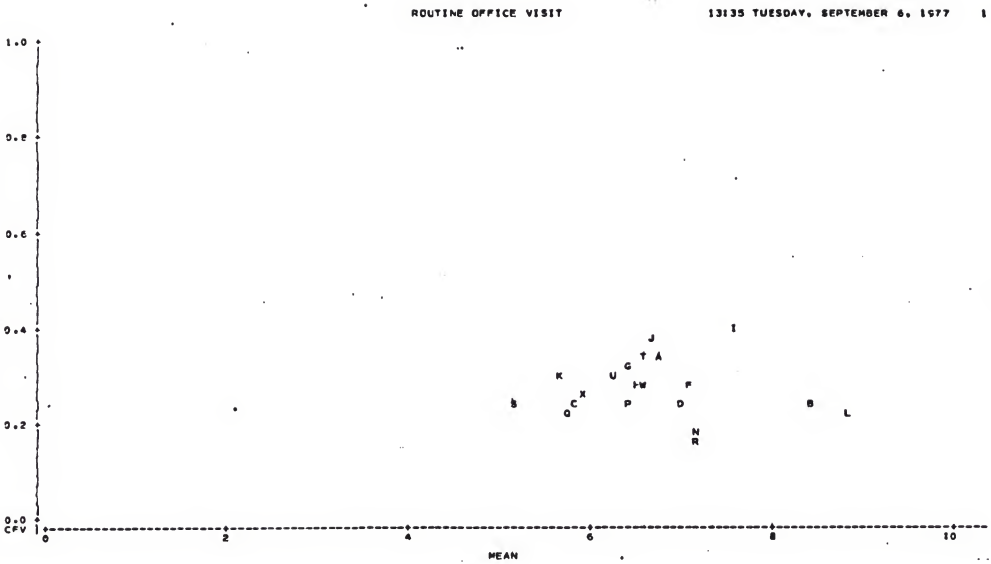
ROUTINE OFFICE VISIT

K - SAMPLE MEDIAN TEST
(in thousands)

State	Physicians' Charge > Pooled Median	Physicians' Charge ≤ Pooled Median
Alabama	21	23
Arizona	259	31
Colorado	10	33
Idaho	27	17
Illinois	97	18
Indiana	81	52
Kansas	37	39
Louisiana	45	42
Massachusetts	7	3
Minnesota	30	54
Mississippi	13	49
Nevada	67	6
New Mexico	20	14
New York	1	0
North Carolina	21	24
Oklahoma	133	529
Oregon	67	21
South Dakota	4	71
Tennessee	17	17
Texas	181	382
Virginia	35	34
Wyoming	10	34

Pooled Median	Chi-Square	DF	Significance
$6.00	647.010	21	.000

Graph 1


ROUTINE OFFICE VISIT
13135 TUESDAY, SEPTEMBER 6, 1977
1
1.0
0.8
0.6
0.4
0.2
0.0
CFV
0
2
4
6
8
10
MEAN
J
T
A
I
G
K
U
H
F
X
C
S
Q
P
D
B
L
N
R

Codes For Scatter Plots

State	Code
Alabama	A
Arizona	B
Colorado	C
Idaho	D
Illinois	E
Indiana	F
Kansas	G
Louisiana	H
Massachusetts	I
Minnesota	J
Mississippi	K
Nevada	L
New Hampshire	M
New Mexico	N
New York	O
North Carolina	P
Oklahoma	Q
Oregon	R
South Dakota	S
Tennessee	T
Texas	U
Vermont	V
Virginia	W
Wyoming	X

patients' ability to pay? One of the problems encountered here is imprecision in some of the procedure definitions (particularly medical procedures), i.e., procedures which cover large variations in time and work involved. For such procedures it is difficult, if not impossible, to sort out whether a physician is practicing price discrimination or whether the content of service provided varies. Of course, if we discover that physicians charge a fixed price for these procedures, then it will be clear that physicians are not practicing price discrimination.

As the first step in our analysis we focus our attention on a procedure having a greater uniformity with regard to time and work involved. The procedure is defined exactly and very few complications ever arose from it. A random selection of 30 physicians was taken from Massachusetts having performed at least five unilateral lens extractions. Moreover, we also studied the fees charged by each individual physician in Indiana for lens extraction. The resulting within-physician distribution of charges from Massachusetts is shown in Table 9.

It appears that most physicians (20/30) in the sample charge one fixed price for a lens extraction. A few more (5) charge a fixed price for all but one service while the remaining five physicians charge various prices. However, these physicians who charged different prices might be due to different time period in which the procedure was performed. For example, as a physician might have changed his fee on October 1, therefore our tabulation would show this physician charged two fees for the same procedure.

As an indicator of when it will be necessary to take samples of physicians from other procedures, we can look at $\hat{\sigma}_w^2$, the estimate of within-physician variance. If $\hat{\sigma}_w^2$ is close to zero, this says that most physicians charge a fixed price or a very tight distribution of charges for the procedure involved and thus there is no need to examine this

TABLE 9

PROCEDURE - EXTRACTION OF LENS

DISTRIBUTION OF CHARGES FOR 30 RANDOMLY CHOSEN

PHYSICIANS IN MASSACHUSETTS

PHYSICIAN	CHARGE	FREQUENCY
1	500	5
2	500	14
3	500	48
4	400	49
5	450	27
	500	25
6	400	17
	500	9
7	500	10
8	500	6
9	500	24
10	500	48
	550	1
11	500	8
12	400	1
	500	13
13	400	9
	500	4
14	500	22
15	400	31
16	400	12
17	500	8
18	350	4
	500	1
19	400	38
20	400	6
	450	4
21	500	7

TABLE 9--continued

PHYSICIAN	CHARGE	FREQUENCY
22	500	55
23	400	1
	500	7
24	490	1
	500	10
25	400	81
26	500	190
27	500	66
	750	7
28	500	45
29	400	1
	450	24
	500	6
	550	3
	555	1
	560	1
	565	1
	600	1
30	500	5

further. If $\hat{\sigma}^2_w$ is larger, this doesn't necessarily mean that most physicians charge a distribution of fees, but it does indicate that further exploration is necessary. The values of $\hat{\sigma}^2_w$ have been calculated for each procedure as part of the CRVS analysis. They are included on the attached sheets and are labelled as "SIGSQW."

C. *Difference in Charges Between Specialties*

A given medical or surgical procedure may be performed by numerous specialists who had varying length of professional training. In a competitive market where patients perceive the service as being the same quality regardless what specialty is performing it, we would expect there is no difference in their fees by specialty. However, if patients perceive a difference, real or imagined, in the quality of a given service that varies with specialty, this difference would likely be reflected in prices. Of course, there could be other reasons that caused price differentials. It includes the possibility that each specialty is able to set its own prices and somehow able to enforce the individual doctors to conform to the set prices.

It is a basic question to find out whether or not different specialties charge different prices for the same procedure in the current market. Although our data base has fee records for 24 states, four states did not record the physicians' specialty. Therefore, this analysis is done for 20 states only. The four states being excluded are: Kansas, Massachusetts, New York and South Dakota.

Three medical procedures and four surgical procedures were selected for the study. They are:

Medical procedures

Routine Office Visit

Initial Office Visit

Routine Hospital Visit

Initial Hospital Visit

Surgical procedures

Colectomy

Cholecystectomy

Inguinal Hernia

T.U.R.

The results of this comparative analysis are shown in Tables 10 through 17. Some generalizations can be made from the tables:

1. *General Practitioners (GP) and General Surgeons charge similar fees for office visits.* In about one half of the states, the GP's charge more than General Surgeons for office visits, while in the other half of the states surgeons charge more than GP's. This result is summarized below. We tabulated the number of states where GP's charge more equal or less than the general surgeons for medical procedures.

TABLE 10

ROUTINE OFFICE VISIT

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	5.51	5.60	7.34	7.36	8.81
	(1.48)	(1.76)	(2.13)	(1.93)	(3.74)
	9676	5659	21909	363	1116
	24	17	56	21	12
Arizona	7.35	7.56	9.93	8.30	8.45
	(1.04)	(1.44)	(1.78)	(1.68)	(1.72)
	135886	16499	76813	1744	7896
	641	202	236	113	77
Colorado	5.36	5.36	6.95	5.42	5.70
	(0.81)	(1.01)	(1.49)	(1.06)	(0.92)
	22121	6343	12934	212	1209
	299	99	153	13	34
Idaho	6.04	6.33	7.83	5.87	6.12
	(0.89)	(1.25)	(1.48)	(1.24)	(1.32)
	12136	4150	22293	1023	1628
	57	41	86	21	25
Illinois	7.15	8.00	9.75	8.46	10.28
	(2.30)	(2.71)	(2.65)	(3.24)	(3.64)
	34556	14570	45598	3924	1060
	196	119	198	83	47
Indiana	6.46	5.67	7.75	5.65	5.73
	(1.95)	(1.59)	(1.88)	(1.65)	(1.56)
	58597	3029	19330	51	260
	190	100	178	14	11
Louisiana	5.62	5.88	7.27	6.73	7.94
	(1.14)	(1.21)	(1.69)	(2.31)	(3.38)
	31797	5373	26289	441	1079
	52	30	69	18	15
Minnesota	6.23	5.97	7.46	6.92	8.08
	(2.88)	(1.11)	(2.21)	(0.45)	(1.98)
	47068	4631	27360	361	25
	96	36	117	14	17

TABLE 10--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	5.29	5.26	6.75	5.39	7.50
	(1.59)	(0.95)	(1.74)	(1.21)	(1.89)
	42478	3507	9203	115	112
	115	44	100	11	13
Nevada	7.94	8.07	10.56	8.87	9.63
	(1.46)	(1.30)	(1.62)	(1.63)	(2.12)
	34461	6718	19282	575	1950
	157	57	43	31	23
New Hampshire	7.30	6.72	7.78	5.07	6.22
	(10.23)	(3.11)	(2.93)	(1.70)	(2.50)
	20151	15974	23983	2097	1002
	37	82	32	8	16
New Mexico	5.92	6.67	7.56	6.39	7.20
	(1.26)	(1.15)	(1.28)	(1.12)	(1.36)
	2836	3261	19167	1046	1730
	8	11	26	9	5
North Carolina	5.24	6.33	6.93	7.36	5.91
	(0.76)	(1.60)	(1.36)	(2.15)	(1.28)
	12232	2660	25610	155	1327
	29	40	87	21	20
Oklahoma	5.35	5.68	6.92	6.59	6.83
	(0.71)	(1.00)	(1.89)	(1.46)	(1.46)
	464519	53273	72998	4598	6271
	927	215	242	126	82
Oregon	6.47	6.79	8.56	6.26	8.00
	(0.76)	(0.77)	(1.23)	(0.24)	(0.0)
	21456	2532	4797	587	383
	100	11	6	3	1
Tennessee	5.11	5.79	7.15	6.06	7.58
	(1.19)	(1.82)	(2.22)	(1.94)	(4.96)
	6866	5314	20228	109	785
	22	35	76	15	11
Texas	5.68	5.21	6.82	7.00	8.90
	(1.46)	(1.07)	(1.47)	(2.66)	(2.13)
	299734	66589	103740	328	220
	297	168	225	18	14

TABLE 10--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Vermont	6.09	5.76	7.58	5.28	9.72
	(2.58)	(2.20)	(3.05)	(0.97)	(3.45)
	7404	22256	28920	889	97
	16	50	36	8	9
Virginia	6.04	5.73	7.24	7.97	7.93
	(1.40)	(1.27)	(1.94)	(3.11)	(1.78)
	38195	468	27424	33	209
	132	46	141	20	30
Wyoming	5.47	5.34	6.83	5.88	6.16
	(1.39)	(1.28)	(1.79)	(1.05)	(1.71)
	15464	3074	7198	462	824
	57	27	28	12	12

First number in cell: Mean charge per record.
Second number in cell: Standard deviation.
Third number in cell: Number of records.
Fourth number in cell: Number of physicians.

TABLE 11

INITIAL OFFICE VISIT

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	11.10	15.89	27.87	14.78	17.22
	(5.20)	(7.86)	(10.26)	(6.68)	(5.75)
	400	284	1692	78	76
	36	46	154	30	17
Arizona	26.35	28.82	38.43	19.97	23.50
	(8.53)	(10.18)	(11.04)	(6.61)	(11.25)
	897	194	3710	57	16
	197	51	184	30	8
Colorado	27.16	28.33	31.37	28.21	26.88
	(4.94)	(7.03)	(5.71)	(10.38)	(1.73)
	754	418	5360	141	81
	65	22	226	8	5
Idaho	26.95	30.59	37.36	36.49	16.00
	(10.62)	(3.11)	(6.57)	(0.0)	(14.14)
	146	42	1431	1	2
	40	11	115	1	2
Illinois	16.62	21.55	23.10	19.54	25.44
	(6.01)	(9.72)	(14.77)	(6.53)	(13.55)
	151	259	3227	54	16
	35	76	159	19	7
Indiana	20.45	14.80	26.38	12.38	15.64
	(7.80)	(6.90)	(9.65)	(3.49)	(3.99)
	2830	350	2094	357	50
	275	119	208	62	34
Louisiana	11.92	12.56	22.75	9.68	16.90
	(5.25)	(4.82)	(13.06)	(3.89)	(5.07)
	336	165	1938	148	73
	47	51	153	30	23
Minnesota	19.38	16.33	32.34	17.33	19.09
	(5.95)	(7.42)	(9.51)	(5.82)	(6.29)
	2723	94	5061	30	22
	90	54	172	29	22

TABLE 11--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthalmology
Mississippi	9.81	11.91	17.12	12.10	13.83
	(3.67)	(5.28)	(6.96)	(3.47)	(3.46)
	569	58	353	36	24
	132	53	152	33	24
Nevada	44.60	60.50	48.46	32.50	37.50
	(6.09)	(26.95)	(7.06)	(17.68)	(0.0)
	15	4	185	2	1
	12	4	32	2	1
New Hampshire	9.27	8.42	9.06	32.24	9.50
	(1.59)	(1.70)	(2.08)	(154.49)	(3.33)
	1905	1420	1750	369	6
	21	8	23	3	2
New Mexico	32.63	23.65	34.96	30.56	23.40
	(6.54)	(10.20)	(6.78)	(1.82)	(5.20)
	47	16	4021	8	4
	8	9	86	2	3
North Carolina	15.61	29.49	50.83	38.75	8.00
	(3.16)	(4.04)	(52.56)	(24.28)	(0.0)
	584	51	1743	4	1
	8	9	152	3	1
Oklahoma	14.96	24.15	35.71	20.37	20.69
	(10.16)	(8.38)	(7.77)	(7.43)	(8.18)
	1093	188	3975	66	103
	250	63	173	38	34
Oregon	33.76	32.76	33.28	27.50	42.17
	(10.44)	(0.84)	(2.69)	(0.0)	(0.0)
	19	43	538	1	3
	15	3	4	1	1
Tennessee	9.92	27.39	28.99	23.64	20.66
	(7.45)	(11.03)	(6.04)	(3.23)	(3.10)
	12	56	1550	11	129
	8	20	152	9	24
Texas	9.52	8.81	25.31	18.77	20.51
	(6.81)	(5.30)	(9.36)	(5.81)	(6.40)
	20091	5347	12094	443	174
	327	152	304	27	27

TABLE 11--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Vermont	8.21	9.05	9.42	0.0	8.31
	(2.13)	(1.60)	(1.99)	(0.0)	(2.32)
	5255	312	2612	0	13
	17	7	26	0	2
Virginia	17.48	14.47	27.88	15.29	0.0
	(5.29)	(5.15)	(8.30)	(5.80)	(0.0)
	873	119	1472	24	0
	119	55	194	24	0
Wyoming	25.00	0.0	30.77	0.0	0.0
	(0.0)	(0.0)	(6.32)	(0.0)	(0.0)
	1	0	117	0	0
	1	0	6	0	0

TABLE 12

ROUTINE HOSPITAL VISIT

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthalmology
Alabama	15.00	0.0	10.28	0.0	0.0
	(2.89)	(0.0)	(1.53)	(0.0)	(0.0)
	4	0	376	0	0
	1	0	7	0	0
Arizona	8.67	8.28	10.81	10.07	9.80
	(1.80)	(2.02)	(1.74)	(1.56)	(1.65)
	132736	25973	135671	905	286
	539	187	220	27	41
Colorado	6.13	6.10	6.87	6.08	7.23
	(1.12)	(0.99)	(1.32)	(1.07)	(1.72)
	42990	11085	38618	1102	94
	449	154	296	18	10
Idaho	5.76	6.64	7.25	6.21	6.81
	(1.59)	(1.70)	(2.26)	(0.89)	(1.98)
	31825	6061	40919	933	77
	187	113	138	13	13
Illinois	9.51	9.74	11.85	8.21	13.50
	(2.74)	(3.60)	(4.66)	(3.75)	(6.88)
	19173	11770	67415	1921	331
	59	53	98	34	23
Indiana	6.62	5.53	7.77	5.07	6.51
	(2.62)	(1.74)	(2.47)	(0.55)	(2.90)
	79509	7596	77812	2001	122
	156	57	127	16	12
Louisiana	7.69	8.53	11.00	11.49	12.68
	(2.85)	(3.05)	(3.26)	(4.45)	(6.42)
	61128	69472	73451	3158	204
	115	242	109	32	23
Minnesota	9.47	9.52	14.86	9.58	12.59
	(6.47)	(5.98)	(10.68)	(3.77)	(7.52)
	40177	3711	42326	131	73
	130	176	169	21	23

TABLE 12--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	10.23	9.51	10.87	9.03	8.25
	(8.49)	(7.38)	(10.03)	(6.87)	(3.89)
	36852	2695	14231	336	99
	240	241	150	21	19
Nevada	9.08	9.28	12.44	10.38	11.07
	(2.07)	(1.89)	(3.07)	(1.57)	(2.70)
	28221	7208	30632	52	86
	119	57	41	7	11
New Hampshire	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
New Mexico	5.97	5.80	5.85	5.74	7.48
	(2.12)	(2.03)	(2.16)	(1.40)	(2.09)
	29811	41928	90897	524	130
	36	78	43	6	7
North Carolina	5.19	7.16	8.03	4.00	8.67
	(2.18)	(4.01)	(2.95)	(0.0)	(5.34)
	471	3023	6201	4	36
	36	152	140	1	8
Oklahoma	7.45	7.76	9.36	8.57	8.33
	(1.48)	(1.45)	(1.86)	(1.52)	(4.04)
	383345	53013	151499	2479	355
	744	202	239	43	40
Oregon	6.70	6.62	9.42	5.29	10.00
	(1.39)	(1.11)	(0.35)	(0.26)	(0.0)
	10467	2369	12688	118	11
	66	10	6	2	1
Tennessee	6.09	6.46	7.85	6.30	8.28
	(3.87)	(3.84)	(4.33)	(3.05)	(1.77)
	45854	49032	70951	1875	218
	101	245	142	15	18
Texas	7.84	8.03	11.06	9.64	8.67
	(10.67)	(22.68)	(22.66)	(13.36)	(4.39)
	62114	18288	59110	1376	166
	199	102	185	18	15

TABLE 12--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Vermont	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
Virginia	7.04	7.70	8.17	6.79	8.07
	(3.53)	(3.94)	(4.76)	(2.73)	(5.27)
	26241	2000	29631	167	156
	221	244	194	28	29
Wyoming	4.50	3.97	4.84	4.12	5.12
	(2.17)	(1.71)	(2.50)	(1.62)	(1.81)
	61268	9965	22723	1444	82
	104	23	24	5	4

TABLE 13

INITIAL HOSPITAL VISIT

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	17.88	22.61	27.37	23.66	16.17
	(8.25)	(11.25)	(10.67)	(3.55)	(8.53)
	1768	731	4184	100	24
	45	67	90	5	10
Arizona	33.21	34.85	37.36	31.75	18.57
	(8.61)	(9.29)	(7.62)	(7.73)	(6.10)
	1363	305	2574	8	7
	140	57	144	4	2
Colorado	35.69	34.37	36.20	34.85	0.0
	(4.97)	(3.77)	(4.85)	(1.71)	(0.0)
	666	364	3058	33	0
	41	15	154	2	0
Idaho	34.47	34.68	35.60	36.05	35.70
	(7.30)	(3.93)	(7.62)	(0.70)	(0.99)
	328	147	1274	4	2
	69	29	87	1	2
Illinois	22.55	41.01	43.52	25.00	0.0
	(6.84)	(13.99)	(15.66)	(0.0)	(0.0)
	53	149	1182	2	0
	11	26	216	2	0
Indiana	19.42	17.29	22.32	23.46	18.39
	(7.31)	(6.18)	(12.24)	(4.70)	(7.79)
	6514	939	3321	67	31
	205	111	294	11	19
Louisiana	26.03	27.81	33.17	29.38	23.33
	(8.45)	(13.51)	(12.50)	(17.41)	(4.08)
	33	64	250	8	6
	16	31	57	3	3
Minnesota	18.37	17.31	29.64	24.61	30.56
	(7.58)	(8.49)	(10.01)	(10.92)	(17.40)
	3609	550	3958	23	9
	93	73	116	19	9

TABLE 13--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	14.62	15.59	19.39	12.66	17.13
	(5.81)	(4.16)	(6.77)	(5.43)	(8.22)
	2463	218	587	32	8
	133	70	97	16	7
Nevada	50.61	55.58	56.14	0.0	50.00
	(8.91)	(9.86)	(6.46)	(0.0)	(0.0)
	90	67	499	0	5
	36	19	33	0	2
New Hampshire	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
New Mexico	34.49	36.21	36.36	28.60	35.50
	(7.43)	(6.38)	(6.93)	(3.00)	(2.20)
	70	295	1847	4	6
	11	20	41	4	4
North Carolina	19.19	39.19	45.81	33.60	50.00
	(8.36)	(13.82)	(16.21)	(14.12)	(4.47)
	62	120	1208	20	7
	12	27	87	8	2
Oklahoma	24.83	28.87	37.94	33.39	35.00
	(8.26)	(10.23)	(8.49)	(10.65)	(0.0)
	1262	360	3840	18	1
	281	82	195	7	1
Oregon	24.41	35.83	34.31	31.67	0.0
	(6.32)	(6.27)	(2.06)	(2.89)	(0.0)
	355	30	495	3	0
	22	7	6	2	0
Tennessee	28.90	35.29	33.91	35.00	35.00
	(4.60)	(6.96)	(8.11)	(0.0)	(0.0)
	123	52	1292	11	1
	7	22	90	2	1

TABLE 13--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Texas	23.71	24.71	35.91	28.05	22.53
	(10.36)	(10.27)	(11.36)	(4.87)	(5.01)
	2265	1698	6261	195	73
	165	105	269	13	10
Vermont	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
Virginia	18.41	22.26	28.05	0.0	0.0
	(6.37)	(5.80)	(8.69)	(0.0)	(0.0)
	2074	246	3596	0	0
	139	72	140	0	0
Wyoming	0.0	0.0	37.19	0.0	0.0
	(0.0)	(0.0)	(6.32)	(0.0)	(0.0)
	0	0	16	0	0
	0	0	5	0	0

TABLE 14

COLECTOMY

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthalmology
Alabama	425.00	505.51	0.0	0.0	0.0
	(101.25)	(156.23)	(0.0)	(0.0)	(0.0)
	48	336	0	0	0
	29	128	0	0	0
Arizona	0.0	720.00	0.0	0.0	0.0
	(0.0)	(113.14)	(0.0)	(0.0)	(0.0)
	0	2	0	0	0
	0	2	0	0	0
Colorado	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
Idaho	0.0	510.00	0.0	0.0	0.0
	(0.0)	(85.44)	(0.0)	(0.0)	(0.0)
	0	3	0	0	0
	0	3	0	0	0
Illinois	549.35	658.15	568.75	0.0	0.0
	(234.26)	(200.51)	(122.29)	(0.0)	(0.0)
	31	390	8	0	0
	27	219	6	0	0
Indiana	388.10	435.16	416.67	0.0	0.0
	(144.57)	(115.81)	(275.38)	(0.0)	(0.0)
	29	639	3	0	0
	24	191	3	0	0
Louisiana	432.07	562.63	0.0	0.0	0.0
	(163.62)	(149.39)	(0.0)	(0.0)	(0.0)
	29	198	0	0	0
	23	99	0	0	0
Minnesota	300.00	446.43	0.0	0.0	0.0
	(0.0)	(92.90)	(0.0)	(0.0)	(0.0)
	1	7	0	0	0
	1	5	0	0	0

TABLE 14--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	438.89	436.10	350.00	0.0	0.0
	(69.72)	(113.62)	(0.0)	(0.0)	(0.0)
	9	112	1	0	0
	8	56	1	0	0
Nevada	825.00	720.00	0.0	0.0	0.0
	(1650.00)	(1440.00)	(0.0)	(0.0)	(0.0)
	2	2	0	0	0
	1	2	0	0	0
New Hampshire	400.00	436.56	0.0	0.0	0.0
	(0.0)	(53.75)	(0.0)	(0.0)	(0.0)
	1	16	0	0	0
	1	12	0	0	0
New Mexico	442.00	364.00	0.0	0.0	0.0
	(0.0)	(110.31)	(0.0)	(0.0)	(0.0)
	1	2	0	0	0
	1	2	0	0	0
North Carolina	0.0	477.18	0.0	0.0	0.0
	(0.0)	(131.11)	(0.0)	(0.0)	(0.0)
	0	141	0	0	0
	0	107	0	0	0
Oklahoma	470.83	518.73	0.0	325.00	0.0
	(152.94)	(71.97)	(0.0)	(0.0)	(0.0)
	12	63	0	1	0
	11	42	0	1	0
Oregon	0.0	502.00	0.0	0.0	0.0
	(0.0)	(150.69)	(0.0)	(0.0)	(0.0)
	0	3	0	0	0
	0	2	0	0	0
Tennessee	500.00	482.46	0.0	0.0	0.0
	(0.0)	(147.55)	(0.0)	(0.0)	(0.0)
	3	107	0	0	0
	3	80	0	0	0

TABLE 14--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Texas	326.83	513.85	337.50	1000.00	0.0
	(184.78)	(178.08)	(165.20)	(0.0)	(0.0)
	42	736	4	1	0
	39	359	4	1	0
Vermont	0.0	410.39	0.0	400.00	0.0
	(0.0)	(100.31)	(0.0)	(141.42)	(0.0)
	0	23	0	2	0
	0	14	0	2	0
Virginia	402.67	460.51	466.67	0.0	450.00
	(138.52)	(111.26)	(28.87)	(0.0)	(70.71)
	9	244	3	0	2
	8	129	3	0	2
Wyoming	0.0	400.00	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	1	0	0	0
	0	1	0	0	0

TABLE 15

CHOLECYSTECTOMY

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	244.19	346.64	350.00	76.00	0.0
	(140.76)	(80.17)	(0.0)	(0.0)	(0.0)
	246	553	1	1	0
	85	157	1	1	0
Arizona	383.34	419.48	0.0	0.0	0.0
	(61.29)	(50.42)	(0.0)	(0.0)	(0.0)
	51	369	0	0	0
	23	121	0	0	0
Colorado	0.0	386.60	0.0	0.0	0.0
	(0.0)	(43.71)	(0.0)	(0.0)	(0.0)
	0	195	0	0	0
	0	27	0	0	0
Idaho	300.00	353.84	332.00	331.25	0.0
	(59.72)	(56.46)	(45.25)	(44.19)	(0.0)
	20	104	2	2	0
	16	46	2	2	0
Illinois	450.49	470.18	440.91	0.0	0.0
	(102.43)	(110.23)	(102.03)	(0.0)	(0.0)
	72	492	11	0	0
	59	249	8	0	0
Indiana	290.73	330.65	278.33	187.50	0.0
	(108.45)	(70.10)	(103.76)	(159.10)	(0.0)
	186	1159	6	2	0
	103	253	5	2	0
Louisiana	334.07	376.64	260.00	537.50	0.0
	(96.87)	(86.17)	(197.99)	(252.86)	(0.0)
	108	493	2	6	0
	59	165	2	4	0
Minnesota	307.47	335.81	376.43	300.00	0.0
	(75.70)	(64.91)	(84.99)	(0.0)	(0.0)
	60	358	7	1	0
	34	105	7	1	0

TABLE 15--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	263.93	317.13	300.00	366.67	0.0
	(103.08)	(53.85)	(0.0)	(76.38)	(0.0)
	131	325	1	3	0
	70	114	1	2	0
Nevada	449.50	516.74	0.0	0.0	0.0
	(120.52)	(54.80)	(0.0)	(0.0)	(0.0)
	10	82	0	0	0
	8	30	0	0	0
New Hampshire	0.0	325.73	0.0	0.0	0.0
	(0.0)	(58.47)	(0.0)	(0.0)	(0.0)
	0	32	0	0	0
	0	23	0	0	0
New Mexico	310.64	357.92	261.25	249.05	0.0
	(95.93)	(71.62)	(0.0)	(191.28)	(0.0)
	54	346	1	4	0
	25	69	1	2	0
North Carolina	248.06	351.67	187.50	350.00	100.00
	(119.56)	(78.87)	(159.10)	(0.0)	(0.0)
	17	1238	2	2	1
	11	338	2	1	1
Oklahoma	336.91	349.10	0.0	365.00	0.0
	(60.93)	(36.79)	(0.0)	(30.41)	(0.0)
	205	379	0	3	0
	118	132	0	3	0
Oregon	283.75	375.65	475.00	0.0	0.0
	(139.25)	(48.54)	(0.0)	(0.0)	(0.0)
	4	46	1	0	0
	4	8	1	0	0
Tennessee	285.06	336.61	0.0	387.50	0.0
	(99.39)	(85.67)	(0.0)	(47.87)	(0.0)
	136	822	0	4	0
	63	250	0	2	0

TABLE 15--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthalmology
Texas	311.31	379.58	335.13	338.54	0.0
	(110.37)	(100.43)	(110.86)	(175.04)	(0.0)
	574	2614	19	24	0
	302	667	10	16	0
Vermont	350.00	317.38	0.0	350.00	0.0
	(0.0)	(43.11)	(0.0)	(70.71)	(0.0)
	1	42	0	2	0
	1	17	0	1	0
Virginia	282.42	315.93	117.73	237.50	0.0
	(111.82)	(69.65)	(156.46)	129.90	(0.0)
	31	500	26	4	0
	18	215	10	3	0
Wyoming	244.14	335.19	0.0	300.00	0.0
	(68.17)	(37.77)	(0.0)	(0.0)	(0.0)
	22	26	0	3	0
	13	11	0	1	0

TABLE 16

INGUINAL HERNIA

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	192.52	214.56	250.00	100.00	0.0
	(52.77)	(50.30)	(0.0)	(0.0)	(0.0)
	303	700	1	1	0
	144	181	1	1	0
Arizona	233.06	255.38	275.00	0.0	0.0
	(33.23)	(31.18)	(0.0)	(0.0)	(0.0)
	100	440	1	0	0
	55	130	1	0	0
Colorado	222.00	192.41	0.0	0.0	0.0
	(0.0)	(25.13)	(0.0)	(0.0)	(0.0)
	5	283	0	0	0
	1	35	0	0	0
Idaho	189.20	223.23	0.0	193.33	0.0
	(28.75)	(49.81)	(0.0)	(29.27)	(0.0)
	56	93	0	6	0
	39	49	0	4	0
Illinois	272.41	292.54	243.75	296.87	0.0
	(75.79)	(75.23)	(76.06)	(57.38)	(0.0)
	148	765	16	8	0
	118	311	12	5	0
Indiana	186.05	203.55	161.25	212.50	0.0
	(56.30)	(42.50)	(29.49)	(17.68)	(0.0)
	185	994	8	2	0
	122	269	7	1	0
Louisiana	209.20	242.98	400.00	247.73	0.0
	(54.92)	(66.88)	(0.0)	(60.68)	(0.0)
	159	439	1	11	0
	82	148	1	8	0
Minnesota	190.05	213.63	213.30	0.0	0.0
	(37.11)	(48.26)	(43.74)	(0.0)	(0.0)
	100	449	10	0	0
	55	125	8	0	0

TABLE 16--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	188.49	193.43	195.83	0.0	0.0
	(45.21)	(50.82)	(29.23)	(0.0)	(0.0)
	194	403	6	0	0
	128	129	5	0	0
Nevada	288.75	315.95	0.0	360.00	0.0
	(46.44)	(27.57)	(0.0)	(0.0)	(0.0)
	12	91	0	1	0
	7	38	0	1	0
New Hampshire	200.00	220.00	0.0	0.0	0.0
	(0.0)	(33.57)	(0.0)	(0.0)	(0.0)
	2	27	0	0	0
	2	15	0	0	0
New Mexico	207.23	229.78	260.00	211.85	0.0
	(48.31)	(39.28)	(0.0)	(73.71)	(0.0)
	71	379	1	8	0
	40	78	1	3	0
North Carolina	186.88	223.62	315.00	209.33	0.0
	(58.82)	(61.33)	(0.0)	(22.86)	(0.0)
	26	1522	1	6	0
	19	375	1	2	0
Oklahoma	190.15	224.49	225.00	225.00	0.0
	(33.88)	(42.41)	(0.0)	(35.36)	(0.0)
	250	424	3	2	0
	140	142	2	2	0
Oregon	212.50	216.60	0.0	250.00	0.0
	(11.18)	(52.32)	(0.0)	(0.0)	(0.0)
	6	26	0	1	0
	3	8	0	1	0
Tennessee	183.88	212.70	0.0	218.75	0.0
	(42.19)	(46.12)	(0.0)	(23.94)	(0.0)
	141	699	0	4	0
	81	256	0	2	0
Texas	196.83	232.91	190.00	251.67	350.00
	(60.89)	(67.14)	(37.91)	(103.44)	(0.0)
	585	1951	5	15	1
	380	705	4	14	1

TABLE 16--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Vermont	150.00	191.38	0.0	175.00	0.0
	(0.0)	(40.22)	(0.0)	(0.0)	(0.0)
	1	34	0	2	0
	1	18	0	1	0
Virginia	159.29	202.83	218.40	270.50	0.0
	(88.07)	(52.27)	(29.56)	(59.98)	(0.0)
	45	811	10	4	0
	27	256	9	4	0
Wyoming	173.38	194.78	0.0	0.0	0.0
	(33.50)	(37.56)	(0.0)	(0.0)	(0.0)
	37	53	0	0	0
	22	20	0	0	0

TABLE 17

T.U.R.

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Alabama	392.00	400.00	0.0	35.00	0.0
	(28.77)	(81.65)	(0.0)	(0.0)	(0.0)
	50	4	0	1	0
	3	3	0	1	0
Arizona	520.00	520.00	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	2	1	0	0	0
	1	1	0	0	0
Colorado	362.34	480.00	0.0	0.0	0.0
	(104.09)	(0.0)	(0.0)	(0.0)	(0.0)
	62	8	0	0	0
	3	1	0	0	0
Idaho	480.00	553.87	0.0	0.0	0.0
	(0.0)	(62.10)	(0.0)	(0.0)	(0.0)
	4	8	0	0	0
	1	1	0	0	0
Illinois	486.36	528.12	506.00	0.0	350.00
	(181.12)	(151.15)	(93.17)	(0.0)	(0.0)
	11	40	5	0	1
	8	8	4	0	1
Indiana	351.67	320.62	0.0	0.0	0.0
	(191.07)	(120.13)	(0.0)	(0.0)	(0.0)
	3	26	0	0	0
	3	6	0	0	0
Louisiana	423.84	466.67	500.00	0.0	450.00
	(57.15)	(38.19)	(31.62)	(0.0)	(0.0)
	99	3	6	0	1
	14	3	2	0	1
Minnesota	391.67	460.00	447.50	0.0	0.0
	(20.41)	(119.37)	(37.20)	(0.0)	(0.0)
	6	5	12	0	0
	4	4	11	0	0

TABLE 17--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Mississippi	328.82	400.36	350.00	0.0	400.00
	(153.40)	(123.11)	(0.0)	(0.0)	(0.0)
	34	14	1	0	1
	8	4	1	0	1
Nevada	570.00	646.67	0.0	0.0	0.0
	(0.0)	(0.71)	(0.0)	(0.0)	(0.0)
	5	9	0	0	0
	1	1	0	0	0
New Hampshire	200.00	142.50	0.0	0.0	0.0
	(70.71)	(10.61)	(0.0)	(0.0)	(0.0)
	2	2	0	0	0
	1	2	0	0	0
New Mexico	305.07	509.89	444.20	499.20	0.0
	(192.14)	(147.73)	(0.0)	(0.0)	(0.0)
	3	13	1	2	0
	3	3	1	1	0
North Carolina	0.0	423.91	375.00	0.0	0.0
	(0.0)	(77.19)	(0.0)	(0.0)	(0.0)
	0	32	1	0	0
	0	6	1	0	0
Oklahoma	335.00	381.25	515.00	0.0	400.00
	(99.37)	(75.30)	(0.0)	(0.0)	(0.0)
	5	8	2	0	1
	5	3	1	0	1
Oregon	0.0	565.67	0.0	0.0	0.0
	(0.0)	(26.21)	(0.0)	(0.0)	(0.0)
	0	6	0	0	0
	0	2	0	0	0
Tennessee	483.64	405.00	0.0	0.0	450.00
	(146.88)	(75.83)	(0.0)	(0.0)	(70.71)
	14	5	0	0	2
	2	5	0	0	2
Texas	144.48	316.28	262.50	0.0	0.0
	(167.26)	(159.67)	(300.52)	(0.0)	(0.0)
	28	109	2	0	0
	18	23	2	0	0

TABLE 17--continued

State	Specialty				
	General Practice	General Surgery	Internal Medicine	OB-GYN	Ophthal-mology
Vermont	0.0	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	0	0	0	0	0
	0	0	0	0	0
Virginia	440.00	288.11	353.57	400.00	400.00
	(56.57)	(119.33)	(145.51)	(0.0)	(0.0)
	2	37	7	1	1
	2	18	6	1	1
Wyoming	400.00	0.0	0.0	0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	13	0	0	0	0
	1	0	0	0	0

	Number of States	
	Routine Office Visit	*Routine Hospital Visit*
GS > GP	11	10
GS > GP	8	7
GS = GP	1	0
Total	20	17*

* Three states, Alabama, New Hampshire, and Vermont, the samples of GP's are too small to be included. In these states, GP's may not have a large hospital practice.

While there are differences in the charges for office visits between GP's and General Surgeons, it is important to examine whether these differences are large or small. We computed the ratio

$$C = \frac{\bar{x}_2 - \bar{x}_1}{\bar{x}_1}$$

where $\bar{x}_2$ = Higher mean charge $\bar{x}_1$ = Lower mean charge.

The results are summarized in the following table. They show the differences in the charges are usually very small. In one half of the states, the difference is less than five percent, while another one quarter of the states have differences in fees between five to 10 percent. Only the remaining one-quarter of the states, the charges by GP's and General Surgeons differed by more than 10 percent from each other. Among those five states where larger differences exist, the surgeons charge the higher fees in four states.

	Number of States	
	Routine Office Visits	*Routine Hospital Visits*
$C \leq 5\%$	10	9
$5\% \leq C \leq 10\%$	5	3
$C > 10\%$	5	5
Total	20	17

2. *General surgeons consistently charge a higher fee than GP's for surgical procedures. The differences in fees are usually greater than 10 percent.* In our sample of 20 states, we had large samples of GP's performing cholecystectomy and inguinal hernia in at least 17 states. In all the states, general surgeons charged more than GP's.

	Number of States	
	Cholecystectomy	*Inguinal Hernia*
GS > GP	17	19
GS > GP	0	0
GS = GP	0	0
Total	17	17

We also examined the magnitude of the differences in charges. In three-fourths of the states, surgeons' charges exceed the GP's charges by more than 10 percent. The results are summarized in the following table.

	Number of States	
	Cholecystectomy	*Inguinal Hernia*
$C \leq 5\%$	2	2
$5\% \leq C \leq 10\%$	2	5
$C > 10\%$	13	12
Total	17	19

3. *There is a different pattern of GP's performing surgical procedures among various states.* While it's the general impression that GP's are still performing surgery in the rural areas, the practice is not uniform throughout the United States. In general, GP's practicing in the South and West are still performing surgery, yet not in the Northeaster rural states of New Hampshire and Vermont.

4. When the mean charges are compared between different states, Mississippi has the lowest mean charges for most of the medical and surgical procedures. Nevada has the highest mean charges, sometimes over twice as high as the mean charges in some of the other states, for each given procedure and specialty. A word of caution is required. New York state is not included in this comparison because it did not have specialty designation in its data. Nevertheless, the mean charges in N.Y. are the highest among all states.

5. For each medical procedure considered, the mean charges made by Internal Medicine, OB-Gynecology and Ophthalmology are much higher than the mean charges for General Practice and General Surgery. Most surgical procedures are performed by either General Practitioners of Surgeons and therefore the information in the last three columns of Tables 10 to 17 can be ignored.

III: *Relative Values - Do Physicians Adhere to Them?*

Various Blue Shield Plans use the California Relative Value Schedule (CRVS) in establishing the payment the Plans would reimburse for the medical and surgical procedures. Some Blue Shield Plans make slight modification of the CRVS and use it. The National Association of Blue Shield Plans modifies the CRVS and promulgates this modified CRVS as a suggested relative value schedule to its member plans. While most Blue Shield Plans may use a relative value schedule in their reimbursement system, the physicians may or may not charge their services according to a relative value schedule.

In recent years, more attention has been paid to whether physicians set their fees in some collective manner. The Federal Trade Commission, among other government agencies, had investigated the promulgation of relative value schedules (RVS) by medical societies and Blue Shield plans. The assertion is that the organized medicine is setting fees through the relative value schedules. The organized medicine is able to enforce the set of prices on the doctors through some unknown mechanism.

We use our micro-data to examine whether doctors are adhering to some RVS in their fees. In order to make this assessment, we used the 1964 California Relative Value Schedule (CRVS). This schedule, which assigns a numerical index of importance to each procedure, was chosen for our analysis since most of the states under consideration have patterned their own relative indices after the CRVS. Furthermore, it is probably the most widely known relative value index, which makes it the most likely candidate for the examination of whether or not physicians follow it in setting their fees. In our evaluation, we use the 1964 CRVS and perform separate analyses for medical and surgical procedures since the relative values were computed using different conversion factor for each of these procedure types. We have chosen six medical and six surgical pro-

cedures for this study.

Before we can determine if physicians follow the CRVS in setting their fees, we have to define what we mean by "following the CRVS." We shall interpret this as meaning that physicians charge a constant multiple of the relative values listed for the procedures being performed. This is equivalent to saying that the ratio of charges for any two procedures is equal to the corresponding ratio of relative values, i.e., their values relative to one another are deemed to be the same as those set by the CRVS. To determine whether physicians follow the CRVS in setting their fees, one possible method would be to regress the mean charges for procedures against the corresponding relative values. This has two obvious drawbacks however, First, only six points would be involved in the regression and other available information such as within and among physician variances would be disregarded. Second, and possibly more important, would be the difficulty in interpreting the fit since closeness to the fitted line does not necessarily mean a good fit to the CRVS. Thus, we developed an alternative method.

If physicians charged a constant multiple of the CRVS, then dividing the mean charges by this constant and plotting them against their relative values would produce a 45° line through the origin. So we know in advance where the scaled-down charges should lie if physician charges conform perfectly to the CRVS. Thus we developed a scaling factor. This factor is calculated in such a way that when the mean charges is divided by this factor, the result will produce the best possible fit to the 45° line. This method also affords greater interpretability to our fit since we know where the points should lie if physicians are following the CRVS. In what follows, we refer to our method of calculating the scaling factor as the "resistant fitting of the CRVS." We defined this term more precisely in a later section but meanwhile it would be instructive to give a

mathematical derivation of a nonresistant fitting procedure.

Consider for the moment that we are dealing with only one fixed surgical procedure. Let y_{ij} represent the i'th physician's charge for the j'th time he performs this procedure in a calendar year. Suppose we model physician charges by

$$y_{ij} = \mu + a_i + e_{ij} \tag{1}$$

where $$E(e_{ij}) = 0 \ , \ E(a_i) = 0 \ , \tag{2}$$

and $$V(e_{ij}) = \sigma^2_W \ , \ V(a_i) = \sigma^2_A \ . \tag{3}$$

Then $V(y_{ij}) = \sigma^2_W + \sigma^2_A$. If we let $\bar{C}_i$ denote the mean charge for the i'th physician and $\bar{X}$ the overall mean, then we may write

$$\bar{C}_i = \mu + a_i + e_{i.} \tag{4}$$

and $$\bar{X} = \mu + a_. + e_{..} \tag{5}$$

where the dot(s) indicate(s) averaging over the replaced subscripts.

Thus we obtain

$$E(\bar{C}_i) = \mu \ , \ E(\bar{X}) = \mu \tag{6}$$

and $$V(\bar{C}_i) = \sigma^2_A + \sigma^2_W/r_i \ , \ V(\bar{X}) = R\sigma^2_A + \sigma^2_W/c \tag{7}$$

where r_i = number of times physician i performed the given procedure,

$d = \sum_{i=1}^{n} r_i$ and $R = \sum_{i=1}^{n} r_i^2/d^2$.

Since $\bar{X} = \dfrac{r_1\bar{C}_1 + \cdots + r_n\bar{C}_n}{d}$, then if $\bar{C}_1, \ldots, \bar{C}_n$ are independent and n (the number

of physicians) is large, $\bar{X} \sim N(\mu, R\sigma^2_A + \sigma^2_W/d)$ asymptotically. We estimate σ^2_W by

$$\hat{\sigma}^2_W = MS_W = \sum_{i,j} \frac{(y_{ij} - \bar{C}_i)^2}{d-n} \tag{8}$$

and σ^2_A by

$$\hat{\sigma}^2_A = \frac{(n-1)(MS_A - MS_W)}{d(1-R)} \tag{9}$$

where

$$MS_A = \frac{\sum r_i(\bar{C}_i - \bar{X})^2}{n-1} \tag{10}$$

So far we have considered only one fixed surgical procedure. Suppose now that we have k different surgical procedures with

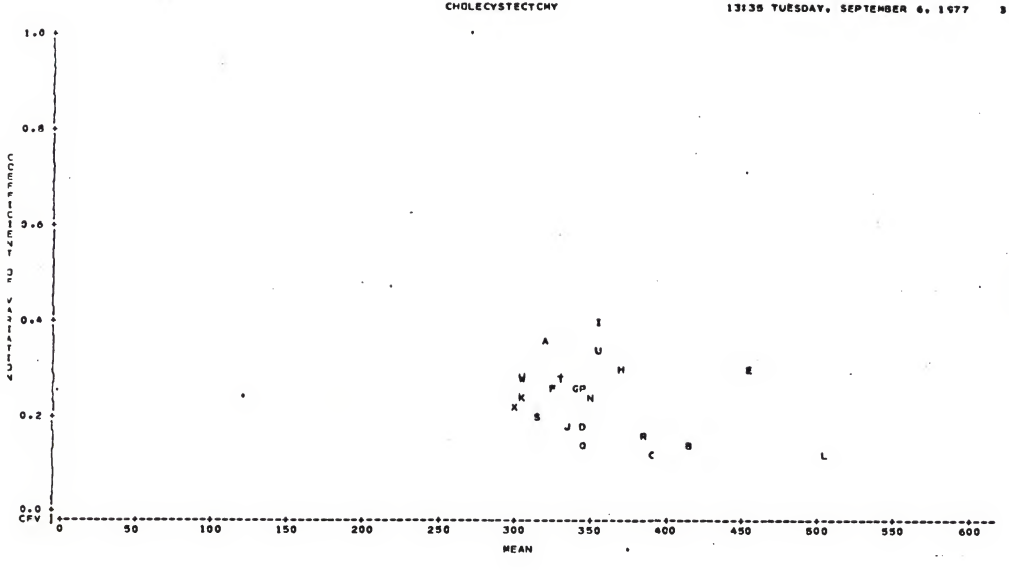
$$\bar{X}_1 \sim N(\mu_1, R_1\sigma^2_{A_1} + \sigma^2_{W_1}/d_1), \ldots, \bar{X}_k \sim N(\mu_k, R_k\sigma^2_{A_k} + \sigma^2_{W_k}/d_k) \tag{11}$$

independently. If we let $Y_i = \bar{X}_i/CRV_i$ and $\sigma^2_i = R_i\sigma^2_{A_i} + \sigma^2_{W_i}/d_i$, $i=1,\ldots,k$, then

$$Y_i \sim N(\mu_i/CRV_i, (\sigma_i/CRV_i)^2) = N(\alpha_i, \tau^2_i) \tag{12}$$

where $\alpha_i = \mu_i/CRV_i$ and $\tau_i = \sigma_i/CRV_i$. Now if physicians follow the CRVS we expect $\alpha_1 = \ldots = \alpha_k$, i.e., we have a common scaling factor. If α represents this scaling factor, then it is well known that the best (minimum variance unbiased) estimate for α is given by

Graph 2


CHOLECYSTECTOMY
13:35 TUESDAY, SEPTEMBER 6, 1977
3
COMPARTMENT VARIATION
1.0
0.8
0.6
0.4
0.2
0.0
CFV
0
50
100
150
200
250
300
350
400
450
500
550
600
MEAN
I
A
U
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GP
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D
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R
C
B
L

$$\hat{\alpha} = \frac{\tau_{1y}^{-2} 1 + \cdots + \tau_{k}^{-2y} k}{\tau_{1}^{-2} + \cdots + \tau_{k}^{-2}}. \tag{13}$$

Note that certain simplifying assumptions were made in the derivation of the scaling factor in order to make the calculations manageable.

By developing a statistical scaling factor, we can then use a resistant estimation procedure to evaluate whether or not physicians adhere to CRVS. The term "resistant" here will mean insensitivity to extreme observations as applied to estimates of location and spread for purposes of calculating the scaling factor. For example, the sample mean $\bar{X}$ is a nonresistant measure of location since increasing one observation by a large amount will also increase the sample mean by a large amount. On the other hand, the sample median is an example of a resistant measure of location. We can now modify the calculations of the scaling factor to incorporate resistant measures of location and spread. The measures used are considered to be about the best currently available. For technical mathematical reasons we shall not discuss the rationale behind their choice.

In the following description of the resistant fitting of the CRVS, we shall refer to the notations used in the original calculations of the scaling factor defined by equation (13). Instead of $\bar{X} = \frac{Eri\ \overline{Ci}}{Eri}$ (the sample mean) we shall use a resistant measure of location, namely,

$$X^{*} = \frac{\sum W_i r_i \overline{C}_i}{\sum W_i r_i} \tag{14}$$

where

$$\begin{aligned} W_i &= (1-V_i^2)^2 \text{ if } |V_i| < 1 \\ &= 0 \text{ if } V_i \geq 1 \end{aligned} \tag{15}$$

and

$$V_i = \frac{C_i - X^*}{65} \tag{16}$$

where S is a resistant measure of scale, say S = median $\{|\overline{C}_i - X^*|\}$ or S = 1/2 interquartile range. It should be noted that either estimate of spread estimates roughly $(2/3)\sigma$ (σ = standard deviation). Note also that X^* must be solved iteratively since the weights depend on the value of X^* which is to be determined. The estimate of location described above is called a *biweight* estimate and is especially useful when the data come from fat-tailed distributions, i.e., distributions with tails fatter than the normal distribution. The biweight weights the middle observations most heavily with a gradual decline in weight up to a distance of 65 or about 45. By using X^* instead of $\overline{X}$ we must also redefine

$$MSA = \frac{n \sum r_i (\overline{C}_i - X^*)^2 (1-V_i^2)^4}{\sum (1-V_i^2)(1-5V_i^2) \cdot [-1 + \sum (1-V_i^2)(1-5V_i^2)]} \tag{17}$$

where

$$V_i = \frac{\overline{C}_i - X^*}{9(MAD)} \tag{18}$$

and MAD = median $\{|\overline{C}_i - X^*|\}$ (MAD stands for median absolute derivation). With this definition for MSA, the calculation of the estimate of σ_A^2 is now much more complicated. The estimate may be written

$$\hat{\sigma}_A^2 = \frac{[\frac{b(b-1)}{n} MSA - (Q_4 - 2Q_5 + Q_1 Q_2) MSW]}{Q_1 - 2Q_3 + R_N Q_1} \tag{19}$$

where

$$Q_1 = \Sigma\, r_i (1-V_i^2)^4 \tag{20}$$

$$Q_2 = \Sigma w_i^2 r_i / d_N^2 \tag{21}$$

$$Q_3 = \Sigma w_i(1-V_i^2)^4 r_i^2/d_N \tag{22}$$

$$Q_4 = \Sigma(1-V_i^2)^4 \tag{23}$$

$$Q_5 = \Sigma w_i(1-V_i^2)^4 r_i/d_N \tag{24}$$

$$b = (1-V_i^2)(1-5V_i^2) \tag{25}$$

And $R_N = \Sigma(w_i r_i)^2/d_N^2$ with $d_N = \Sigma w_i r_i$. Once all the above calculations have been made, the remainder of the analysis proceeds as before.

The above resistant fitting technique was applied to obtain scaling factors for medical and surgical procedures for the 24 states in our study. Table 18 displays these scaling factors which can be taken as rough measures of the relative costs of medical and surgical procedures in these states.

A more detailed display of the fitting procedure, including the above scaling factors, is given in the attached graphs. By plotting the scaled-down charges versus the CRVS, we can easily make visual comparisons of the pricing patterns among different states. The attached graphs show these plots for most of the states under consideration. The missing graphs correspond to states having scaled-down charges which fall off the graph, i.e. those which have very poor fits to the CRVS. From viewing the graphs for medical procedures it appears that only Idaho physicians have a pattern of charges resembling the CRVS. However, other patterns are evident from these graphs. First, in most instances all the initial medical procedures (office visits, hospital visits, and home visits) fall well below the 45° line. On the other hand, the corresponding routine medical procedures seem to fall quite close to this line for most states. This means that physician prices for routine visits fall reasonably in line with how these procedures are valued by

Table 18

Scaling Factors for Medical and Surgical Procedures

STATE	MEDICAL	SURGICAL
* Alabama	3.208	5.344
* Arizona	8.371	6.663
* Colorado	5.606	5.344
* Idaho	5.886	5.553
Illinois	2.014	6.969
Indiana	4.483	5.262
Kansas	5.139	5.602
Louisiana	5.067	5.955
Massachusetts	3.405	6.391
Minnesota	5.464	5.745
Mississippi	3.866	5.021
* Nevada	8.563	8.279
New Hampshire	2.564	5.154
* New Mexico	5,813	5.942
New York	5.353	8.952
* North Carolina	5.791	5.753
* Oklahoma	6.522	5.484
* Oregon	6.561	6.444
* South Dakota	5.065	5.264
* Tennessee	5.390	5.304
Texas	5.328	5.948
Vermont	2.300	5.361
Virginia	5.456	5.294
* Wyoming	5.286	5.173

*States with asterisks (*) to their left should only be compared among each other since they have initial home visits recorded in place of routine nursing home visits (which have a lower relative value).

the CRVS but that charges for initial visits are correspondingly much lower than their relative values. This can be seen from the attached tables (showing the calculations of the scaling factors) as well, where the mean charges for initial and routine visits are generally in a 2 = 1 to 3 = 1 ratio whereas the CRVS puts them in a 6 = 1 ratio.

Turning to the graphs of scaled-down charges for surgical procedures, we see that most states do not have a pattern of charges closely resembling the CRVS. The differences, however, tend not to be as large as those for medical procedures. A procedure which seems to fall well below the line for almost all states is "colectomy." The CRVS gives this procedure a relative value of 100 whereas most scaled-down charges vary between 70 and 90. Two other procedures, TUR's and lens extractions, also tend to fall below the line, but to lesser degrees. The other three surgical procedures considered - cholecystectomy, repair of inguinal hernia, and total hysterectomy - fall into an interesting pattern in that their relative positions remain roughly the same from state to state, i.e. the ratio of charges for these procedures is approximately constant across states.

Nonparametric Test

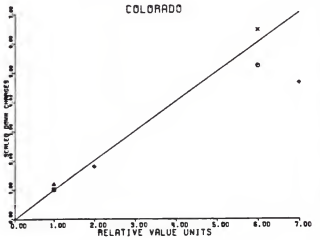
Although it would appear from the graphs that physicians do not follow the CRVS in setting their charges for medical or surgical procedures, we can still formally test this by applying a nonparametric procedure (no assumptions made about the underlying distribution) known as the median test. Nonparametric tests corresponding to analysis of variance techniques exist and are more powerful than the median test under the assumptions of equal variances and identical distribution shapes among procedure groups. However, these important assumptions are generally violated as we have learned by plotting histograms for each procedure within each state. Thus we are forced to use a

nonparametric test which makes no such assumptions - such as the median test.

To apply the median test we first pool all the observations (charge/CRV) from each procedure group together and calculate the median from this single, pooled group. If the null hypothesis of equal procedure medians is true, then the proportion of observations in each procedure group less than or equal to the pooled median should be approximately the same. Thus we can form a 2 x k contingency table with the columns indexed by procedure, (k = number of procedures) rows by $\leq$ median, $>$ median, and cell entries being the number of observations in the corresponding categories. Then a chi-square test (with k-1 degrees of freedom) is performed on this table and the null hypothesis accepted or rejected according as the significance level is less than a greater than 0.05.

This test was applied to medical and surgical procedures for each state with the outcome that the null hypothesis (physicians follow the CRVS) was rejected in each case except for Idaho surgical procedures. It should be noted that the sample sizes were large in most situations and hence any fit to the CRVS would be expected to be rejected unless the fit was quite close. Thus the tests we have performed should not be weighted too heavily in determining if physicians follow the CRVS. One should instead rely on one's own judgment, based partially on the graphs, and bearing in mind the consequences of the decision, to determine where the fits are close enough. In most instances, our conclusion based on these evaluations is that physicians do not follow the CRVS.

RESISTANT FIT OF MEDICAL PROCEDURES TO CRVS



PROCEDURES

- ROUTINE OFFICE VISIT
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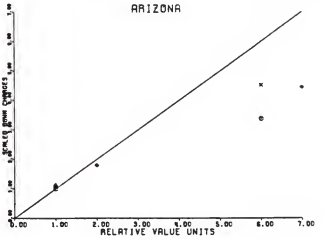
- INITIAL HOSPITAL VISIT
- ROUTINE HOME VISIT
- INITIAL HOME VISIT

RESISTANT FIT OF MEDICAL PROCEDURES TO CRVS



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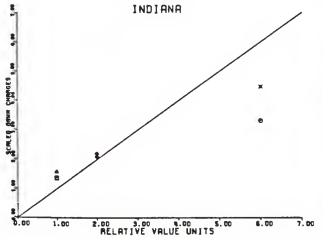

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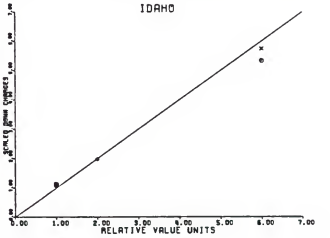

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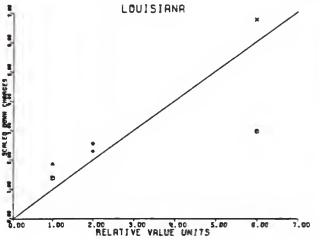

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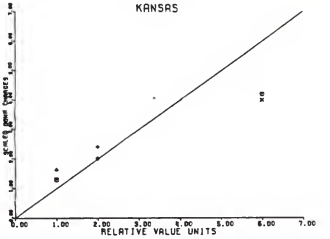

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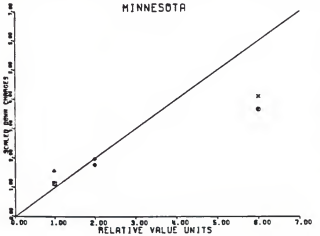

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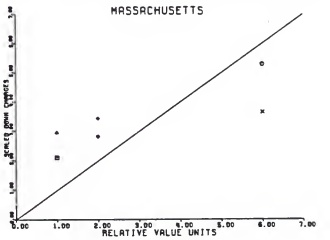

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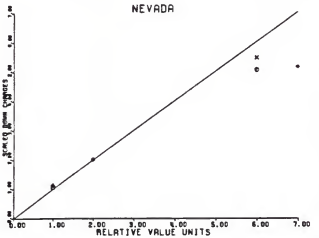

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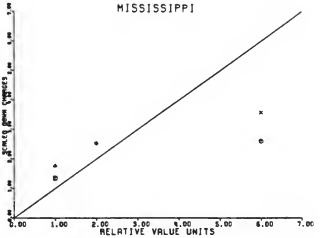

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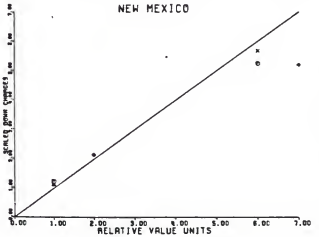

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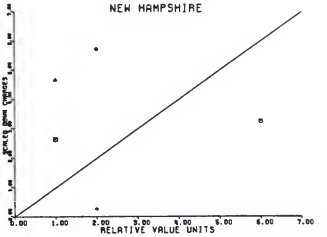

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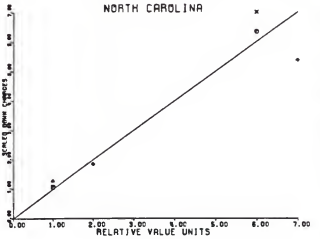

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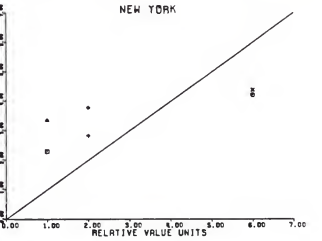

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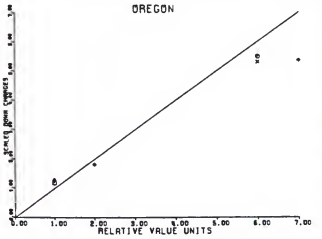

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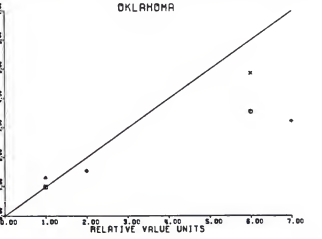

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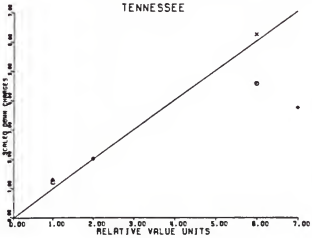

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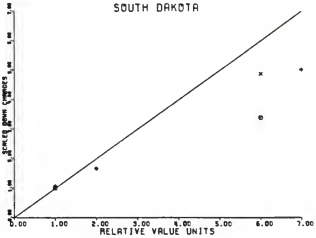
RESISTANT FIT OF MEDICAL PROCEDURES TO CRVS



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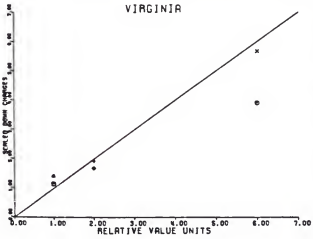

PROCEDURES

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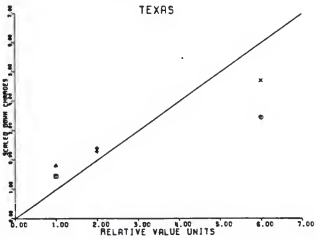
RESISTANT FIT OF MEDICAL PROCEDURES TO CRVS



PROCEDURES

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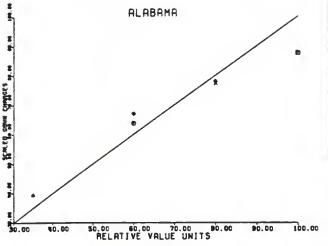
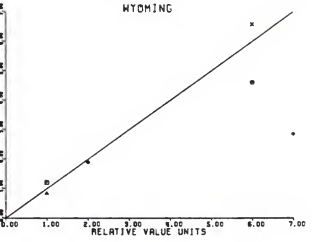
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- COLECTOMY
- CHOLECYSTECTOMY
- REPAIR OF INGUINAL HERNIA
- TRANSURETHRAL RESECTION OF PROSTATE
- TOTAL HYSTERECTOMY
- EXTRACTION OF LENS

RESISTANT FIT OF MEDICAL PROCEDURES TO CRVS



PROCEDURES

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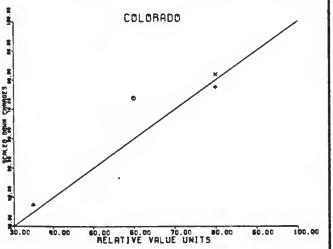
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- COLECTOMY
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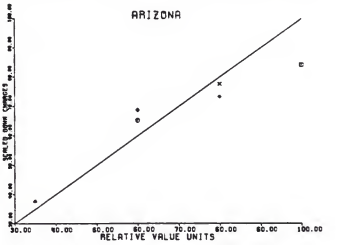

PROCEDURES

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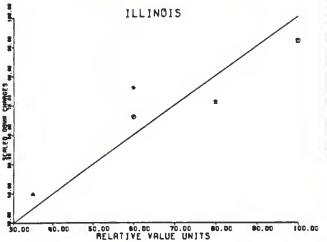

PROCEDURES

- COLECTOMY
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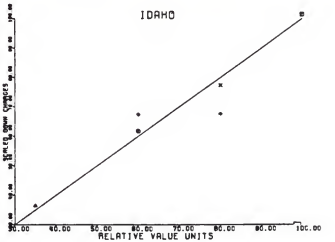

PROCEDURES

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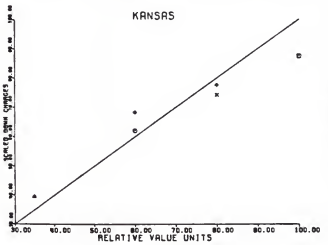

PROCEDURES

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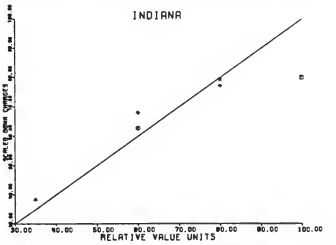
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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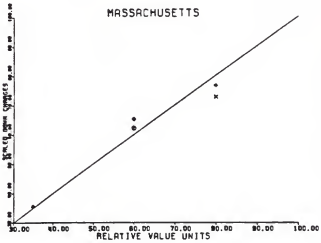
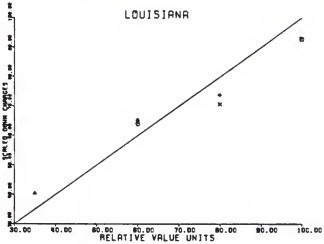
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- ◻ COLECTOMY
- ⊙ CHOLECYSTECTOMY
- ▲ REPAIR OF INGUINAL HERNIA
- × TRANSURETHRAL RESECTION OF PROSTATE
- ◇ TOTAL HYSTERECTOMY
- + EXTRACTION OF LENS

RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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- ▲ REPAIR OF INGUINAL HERNIA
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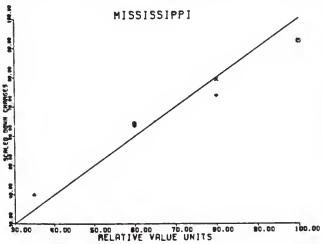
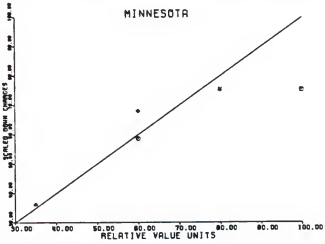
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- ◻ COLECTOMY
- ⊙ CHOLECYSTECTOMY
- ▲ REPAIR OF INGUINAL HERNIA
- × TRANSURETHRAL RESECTION OF PROSTATE
- ◇ TOTAL HYSTERECTOMY
- + EXTRACTION OF LENS

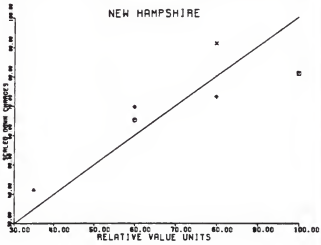
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- ◻ COLECTOMY
- ⊙ CHOLECYSTECTOMY
- ▲ REPAIR OF INGUINAL HERNIA
- × TRANSURETHRAL RESECTION OF PROSTATE
- ◇ TOTAL HYSTERECTOMY
- + EXTRACTION OF LENS

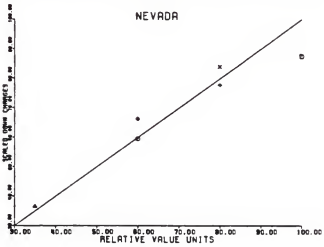
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

- ◻ COLECTOMY
- ⊙ CHOLECYSTECTOMY
- ▲ REPAIR OF INGUINAL HERNIA
- X TRANSURETHRAL RESECTION OF PROSTATE
- ⊕ TOTAL HYSTERECTOMY
- ✦ EXTRACTION OF LENS

RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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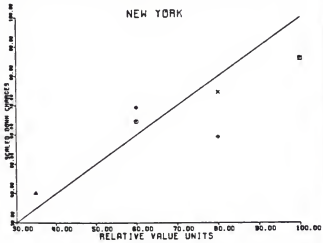
- ▲ REPAIR OF INGUINAL HERNIA
- X TRANSURETHRAL RESECTION OF PROSTATE
- ⊕ TOTAL HYSTERECTOMY
- ✦ EXTRACTION OF LENS

RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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- ▲ REPAIR OF INGUINAL HERNIA
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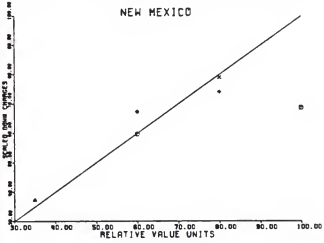
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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- ▲ REPAIR OF INGUINAL HERNIA
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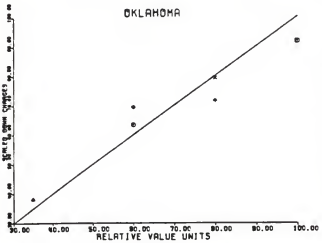
RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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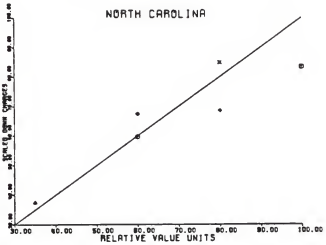
- CHOLECYSTECTOMY
- REPAIR OF INGUINAL HERNIA
- TRANSURETHRAL RESECTION OF PROSTATE
- TOTAL HYSTERECTOMY
- EXTRACTION OF LENS

RESISTANT FIT OF SURGICAL PROCEDURES TO CRVS



PROCEDURES

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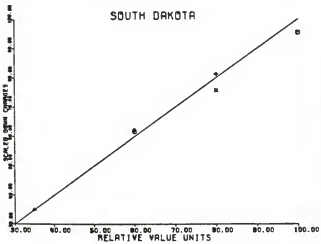

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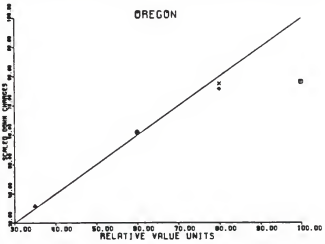

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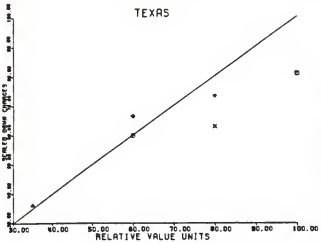

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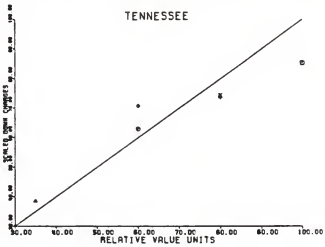

PROCEDURES

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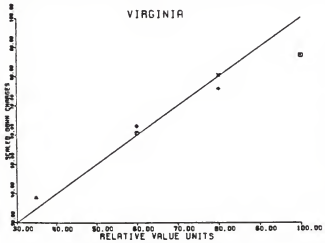

PROCEDURES

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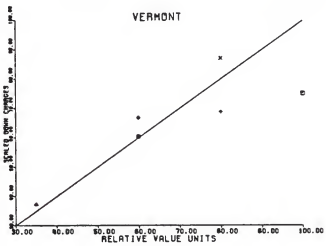

PROCEDURES

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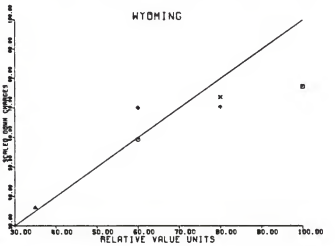

PROCEDURES

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- TOTAL HYSTERECTOMY
- EXTRACTION OF LENS

RESISTANT FIT TO THE CRYS - 4812044

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	4.745	39591	1734
2	24.785	6144	484
3	9.493	35172	1369
4	33.336	5641	400
5	11.075	1041	830
6	31.074	97	34
7	541.600	2	2
8	476.643	473	169
9	251.222	574	207
10	637.194	1296	52
11	494.211	93	79
12	481.723	1596	48

PROCEDURE	SIGSQ4	SIGSQ9	SIGSQ	TAUSQ
1	2.444	0.007	0.882	0.474
2	83.670	0.000	0.644	0.019
3	1.539	0.070	0.802	0.063
4	187.298	0.000	0.976	0.027
5	14.755	0.000	0.874	0.018
6	151.391	0.0	0.811	0.134
7	1197.14.052	0.0	4996.1.285	0.095
8	3485.958	0.0	36.138	0.069
9	925.414	-0.042	8.545	0.007
10	925.924	0.207	33.791	0.001
11	3483.851	0.0	51.358	0.014
12	881.694	0.177	21.931	0.003

SCALING FACTOR(OVERALL)=7.950
SCALING FACTOR(MEDICAL)=4.371
SCALING FACTOR(SURGICAL)=6.487

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12=TONSILLECTOMY OR LTAC

RESISTANT FIT TO THE CRYS - ALABAMA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.433	4689	179
2	31.730	3.7.5	487
3	10.147	396	4
4	24.084	2621	281
5	10.414	8125	315
6	12.520	5441	141
7	488.817	471	171
8	248.140	897	267
9	210.411	1075	351
10	417.567	1592	68
11	357.292	5	5
12	416.615	3534	79

PROCEDURE	SIGSQ4	SIGSQ9	SIGSQ	TAUSQ
1	4.160	1.297	0.891	0.011
2	79.274	26.874	0.892	0.010
3	1.435	0.645	1.377	1.274
4	80.027	31.870	0.880	0.027
5	10.202	4.957	0.337	0.014
6	9.568	2.885	0.532	0.011
7	2230.196	1006.844	52.797	0.007
8	1951.040	4185.840	20.900	0.004
9	1459.757	1259.290	4.231	0.007
10	1341.343	3346.244	47.317	0.007
11	3781.493	0.0	947.822	0.242
12	2385.277	1151.110	13.027	0.020

SCALING FACTOR(OVERALL)=4.849
SCALING FACTOR(MEDICAL)=3.288
SCALING FACTOR(SURGICAL)=5.244

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RESISTANT FIT TO THE CRYS - IOWA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.490	45235	280
2	31.420	1941	311
3	6.267	102162	634
4	31.711	3894	230
5	11.431	24.32	387
6	0.0	0	0
7	543.442	6	5
8	347.647	131	49
9	202.284	171	100
10	429.227	321	31
11	373.716	87	33
12	374.338	341	47

PROCEDURE	SIGSQ4	SIGSQ9	SIGSQ	TAUSQ
1	1.740	0.468	0.820	0.070
2	34.910	18.392	0.861	0.073
3	1.977	1.254	0.812	0.012
4	12.241	17.692	0.284	0.097
5	5.730	5.501	0.104	0.026
6	0.0	0.0	0.0	0.0
7	7421.084	0.0	1813.362	0.182
8	2135.791	724.453	59.780	0.019
9	787.613	592.451	14.884	0.012
10	2723.844	474.270	288.958	0.023
11	0.0	11666.750	452.783	0.137
12	2474.312	276.275	180.782	0.031

SCALING FACTOR(OVERALL)=5.791
SCALING FACTOR(MEDICAL)=5.896
SCALING FACTOR(SURGICAL)=5.552

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RESISTANT FIT TO THE CRYS - COLORADO

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	5.477	47263	711
2	29.189	8731	614
3	6.660	184405	1196
4	35.911	8494	249
5	9.984	19267	531
6	25.881	329	15
7	0.0	0	0
8	296.681	396	25
9	388.321	252	39
10	437.591	1346	67
11	0.0	0	0
12	812.825	2060	81

PROCEDURE	SIGSQ4	SIGSQ9	SIGSQ	TAUSQ
1	1.890	0.0	0.810	0.010
2	35.642	0.000	0.151	0.014
3	1.444	0.007	0.805	0.001
4	19.868	0.000	0.187	0.001
5	4.297	0.000	0.831	0.008
6	21.475	0.001	2.031	0.017
7	0.0	0.0	0.0	0.0
8	2076.817	0.0	44.898	0.024
9	487.774	0.015	14.737	0.017
10	584.154	0.063	19.132	0.007
11	0.0	0.0	0.0	0.0
12	269.898	0.0	7.784	0.001

SCALING FACTOR(OVERALL)=6.449
SCALING FACTOR(MEDICAL)=6.406
SCALING FACTOR(SURGICAL)=6.244

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RESISTANT FIT TO THE CRVS - INDIANA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	1,136	123776	829
2	14.864	8250	534
3	7.066	280316	952
4	20.034	17208	838
5	4.091	9746	653
6	4.304	5294	584
7	671.181	916	270
8	330.043	1837	415
9	262.092	1458	451
10	434.763	2571	180
11	357.729	661	278
12	485.630	3896	147

PROCEDURE	BIGSQA	SIGSQA	BIGSQ	TAUSQ
1	3.414	1.835	0.064	0.064
2	86.401	19.717	1.062	0.051
3	5.445	3.776	0.075	0.075
4	72.871	36.747	1.286	0.036
5	11.676	3.141	0.214	0.054
6	4.738	0.779	0.111	0.028
7	698.474	4001.027	59.989	0.067
8	2746.312	2341.980	18.779	0.005
9	1892.418	647.345	6.961	0.005
10	2416.450	3819.607	50.161	0.009
11	3184.476	6198.160	30.750	0.009
12	978.549	752.864	16.286	0.003

SCALING FACTOR(INDIANA)=3.185
SCALING FACTOR(MEDICAL)=4.463
SCALING FACTOR(SURGICAL)=5.462

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RESISTANT FIT TO THE CRVS - ILLINOIS

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	14.394	4174	356
2	4.149	155794	834
3	18.117	18932	457
4	42.940	3751	380
5	15.069	12901	494
6	13.537	675	140
7	634.536	460	257
8	457.481	993	370
9	274.757	955	460
10	491.747	1344	163
11	576.474	192	117
12	493.180	2946	223

PROCEDURE	BIGSQA	SIGSQA	BIGSQ	TAUSQ
1	57.748	136.304	1.214	0.029
2	3.932	3.844	0.015	0.009
3	6.486	14.231	0.472	0.026
4	144.446	94.413	7.125	0.049
5	23.480	6.142	0.384	0.017
6	19.570	12.847	0.424	0.031
7	31604.219	31963.373	94.211	0.001
8	2118.778	6996.624	34.799	0.017
9	440.468	3966.335	3.738	0.001
10	7634.847	6819.793	118.571	0.015
11	6.0	16384.242	85.410	0.022
12	1206.330	3064.676	18.134	0.003

SCALING FACTOR(INDIANA)=3.057
SCALING FACTOR(MEDICAL)=1.860
SCALING FACTOR(SURGICAL)=6.960

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RESISTANT FIT TO THE CRVS - LOUISIANA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.025	88805	358
2	14.494	4135	436
3	4.630	332745	671
4	34.130	781	196
5	17.054	14864	360
6	11.534	645	114
7	183.027	368	171
8	380.883	845	249
9	240.373	877	317
10	421.894	1725	118
11	365.480	181	117
12	434.974	2795	151

PROCEDURE	BIGSQA	SIGSQA	BIGSQ	TAUSQ
1	4.184	8.863	0.108	0.109
2	43.176	34.199	0.462	0.014
3	6.076	6.181	0.060	0.060
4	141.793	85.551	0.846	0.110
5	3.0	3.861	0.462	0.115
6	3.348	7.875	0.143	0.026
7	1169.718	18847.696	172.782	0.017
8	2562.651	3303.185	26.912	0.009
9	3515.395	3216.803	37.687	0.014
10	2364.423	2896.861	56.735	0.009
11	3713.884	2896.529	57.264	0.016
12	2447.966	1986.751	68.438	0.011

SCALING FACTOR(INDIANA)=6.746
SCALING FACTOR(MEDICAL)=5.967
SCALING FACTOR(SURGICAL)=5.955

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RESISTANT FIT TO THE CRVS - KANSAS

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	5.780	78815	374
2	31.040	2294	304
3	6.437	96115	114
4	25.000	77	10
5	10.765	48622	733
6	12.344	404	23
7	886.797	342	14
8	347.480	355	117
9	221.027	445	157
10	618.641	28	44
11	342.330	67	44
12	431.966	587	63

PROCEDURE	BIGSQA	SIGSQA	BIGSQ	TAUSQ
1	2.652	1.447	0.031	0.031
2	74.403	33.637	0.701	0.019
3	6.779	7.135	0.176	0.176
4	393.474	0.0	65.392	1.291
5	9.537	5.796	0.174	0.016
6	3.673	3.857	0.493	0.123
7	1597.283	13763.694	76.798	0.008
8	846.194	4000.957	37.321	0.010
9	1626.474	1809.731	24.750	0.011
10	3154.815	2624.465	185.844	0.029
11	0.0	3153.827	44.424	0.013
12	872.530	309.486	59.857	0.011

SCALING FACTOR(INDIANA)=3.482
SCALING FACTOR(MEDICAL)=5.139
SCALING FACTOR(SURGICAL)=8.482

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6=ROUTINE NURSING HOME VISIT
7=CIRCUMCISION
8=CHOLECYSTECTOMY
9=REPAIR OF INGUINAL HERNIA
10=TRANSURETHRAL RESECTION OF PROSTATE
11=TOTAL HYSTERECTOMY
12=EXTRACTION OF LENS

RESISTANT FIT TO THE CMVF - DIAMCSTA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.237	8439	257
2	19.470	8527	292
3	6.554	6720	287
4	22.262	8522	363
5	6.784	18500	384
6	10.720	734	152
7	432.819	1	1
8	370.493	842	164
9	269.288	592	293
10	833.484	1507	84
11	390.245	111	67
12	631.215	2168	183

PROCEDURE	SIGSA	SIGSB	SIGSD	TAUSD
1	1.214	1.787	0.017	0.017
2	63.599	15.867	0.067	0.124
3	7.311	61.727	0.143	0.143
4	84.493	29.172	1.870	0.065
5	13.360	0.229	0.075	0.110
6	6.167	2.582	0.086	0.024
7	8542.258	1260.000	1818.281	0.102
8	1151.240	1236.945	21.145	0.006
9	683.001	1063.951	7.335	0.007
10	2988.343	1469.797	82.202	0.015
11	868.484	2195.861	96.965	0.015
12	1731.748	863.253	79.863	0.017

SCALING FACTOR(OVERALL)=5.881
SCALING FACTOR(MEDICAL)=9.466
SCALING FACTOR(SURGICAL)=6.765

PROCEDURE CODES

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6=ROUTINE NURSING HOME VISIT
7=CIRCUMCISION
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RESISTANT FIT TO THE CMVF - MASSACHUSETTS

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.296	19860	464
2	16.045	18217	1071
3	10.077	20176	716
4	17.668	5196	686
5	8.629	16116	518
6	11.784	2407	494
7	0.0	0	0
8	596.833	1486	481
9	271.275	1035	586
10	884.143	893	157
11	416.578	339	232
12	458.943	4486	242

PROCEDURE	SIGSA	SIGSB	SIGSD	TAUSD
1	6.687	9.988	0.136	0.138
2	72.557	48.881	1.281	0.423
3	5.744	5.689	0.034	0.034
4	16.892	0.0	0.147	0.004
5	11.321	0.003	0.297	0.001
6	7.258	0.0	0.112	0.027
7	0.0	0.0	0.0	0.0
8	2980.627	4819.277	16.193	0.006
9	1861.261	2187.060	5.271	0.004
10	8238.424	21427.934	89.231	0.011
11	403.419	3338.068	43.123	0.017
12	1548.287	6969.884	27.384	0.002

SCALING FACTOR(OVERALL)=5.824
SCALING FACTOR(MEDICAL)=3.888
SCALING FACTOR(SURGICAL)=6.581

PROCEDURE CODES

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RESISTANT FIT TO THE CMVF - NEVADA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.883	7578	423
2	42.174	225	63
3	9.737	7536	373
4	64.673	796	126
5	17.163	1977	184
6	43.834	4	3
7	521.243	4	3
8	897.881	95	40
9	557.429	113	50
10	657.219	292	13
11	945.534	25	20
12	643.867	291	27

PROCEDURE	SIGSA	SIGSB	SIGSD	TAUSD
1	1.781	0.000	0.015	0.015
2	38.875	0.801	1.841	0.040
3	7.744	0.000	0.032	0.027
4	24.334	0.253	0.998	0.075
5	15.422	0.000	0.476	0.110
6	86.554	0.0	18.770	0.387
7	1269.695	0.0	8583.786	0.953
8	731.687	0.0	31.681	0.010
9	457.869	0.016	26.811	0.074
10	6073.539	0.138	796.108	0.189
11	2158.791	0.0	650.191	0.137
12	1003.470	0.0	86.814	0.014

SCALING FACTOR(OVERALL)=4.481
SCALING FACTOR(MEDICAL)=8.347
SCALING FACTOR(SURGICAL)=8.278

PROCEDURE CODES

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4=INITIAL HOSPITAL VISIT
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6=INITIAL HOME VISIT
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12=EXTRACTION OF LENS

RESISTANT FIT TO THE CMVF - MISSISSIPPI

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	5.278	61347	358
2	18.682	1253	594
3	6.933	59635	634
4	13.839	3645	383
5	6.746	5194	672
6	8.783	506	185
7	463.281	176	72
8	322.791	564	281
9	290.947	867	290
10	387.647	872	44
11	314.976	73	57
12	564.347	1765	100

PROCEDURE	SIGSA	SIGSB	SIGSD	TAUSD
1	6.536	1.807	0.010	0.011
2	3.110	19.051	0.050	0.007
3	6.177	65.677	0.086	0.007
4	14.236	12.805	0.242	0.007
5	9.486	7.061	0.015	0.006
6	0.0	1.375	0.000	0.001
7	640.128	1921.720	4.720	0.003
8	615.813	1937.739	39.753	0.013
9	701.115	1921.027	0.134	0.001
10	3.0	726.772	2.041	0.000
11	237.207	7267.525	68.694	0.013
12	781.846	863.132	21.138	0.005

SCALING FACTOR(OVERALL)=4.543
SCALING FACTOR(MEDICAL)=3.866
SCALING FACTOR(SURGICAL)=5.021

PROCEDURE CODES

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6=ROUTINE NURSING HOME VISIT
7=CIRCUMCISION
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RESISTANT FIT TO THE CRVS - NEW MEXICO

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.144	32649	78
2	20.436	4483	142
3	4.492	19835.	235
4	37.930	2487	155
5	12.436	8193	198
6	30.189	5	5
7	484.260	3	3
8	334.792	412	180
9	221.428	472	123
10	444.235	847	33
11	294.484	90	85
12	498.990	1936	27

PROCEDURE	SIGMA	SIGMA	SIGMA	TAUSQ
1	1.133	0.706	0.852	0.852
2	37.845	13.240	0.964	0.871
3	1.824	2.441	0.839	0.839
4	32.847	19.863	1.184	0.857
5	9.757	4.480	0.715	0.854
6	46.198	0.0	13.880	0.295
7	417.449	0.0	2187.157	0.219
8	1781.828	2389.254	67.137	0.913
9	1132.557	896.094	28.237	0.821
10	2353.536	1719.652	321.367	0.638
11	1033.298	848.258	88.498	0.816
12	1914.492	2332.291	84.934	0.889

SCALING FACTOR(OVERALL)=5.907
SCALING FACTOR(MEDICAL)=5.913
SCALING FACTOR(SURGICAL)=5.492

PROCEDURE CODES

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6=INITIAL HOME VISIT
7=COLECTOMY
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RESISTANT FIT TO THE CRVS - NEW HAMPSHIRE

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.781	92475	315
2	26.736	9652	97
3	13.000	1	1
4	0.0	0	0
5	14.486	9	3
6	9.667	11	1
7	410.875	23	16
8	335.583	46	27
9	213.532	66	22
10	484.476	93	15
11	285.684	12	7
12	274.960	73	14

PROCEDURE	SIGMA	SIGMA	SIGMA	TAUSQ
1	2.181	35.657	0.986	0.986
2	0.0	1484.284	0.317	0.800-
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.281	0.286	0.230	0.854-
6	0.000	0.000	0.000	0.000
7	1996.837	481.857	194.081	0.070
8	0.0	8118.418	124.912	0.937
9	738.651	298.233	92.214	0.851
10	471.353	2766.445	178.908	0.827
11	319.455	854.080	928.418	0.172
12	1260.959	78.712	347.776	0.034

SCALING FACTOR(OVERALL)=3.970
SCALING FACTOR(MEDICAL)=3.986
SCALING FACTOR(SURGICAL)=5.194

PROCEDURE CODES

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RESISTANT FIT TO THE CRVS - NORTH CAROLINA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	8.287	46067	252
2	36.871	7596	319
3	7.364	11182	421
4	40.501	1805	180
5	16.462	7529	356
6	21.867	91	8
7	478.416	142	188
8	342.659	1274	284
9	234.376	1870	400
10	485.880	2352	120
11	287.141	239	178
12	397.486	3812	137

PROCEDURE	SIGMA	SIGMA	SIGMA	TAUSQ
1	1.787	9.814	0.889	0.889
2	84.384	271.973	3.484	0.878
3	5.471	2.115	0.964	0.964
4	116.493	56.181	3.133	0.826
5	2.113	0.700	0.954	0.814
6	0.433	0.579	1.731	0.879
7	0.0	1986.869	153.214	0.815
8	577.538	2199.168	13.532	0.906
9	946.445	2581.978	5.804	0.905
10	4180.853	4283.215	64.033	0.811
11	2126.501	3273.233	24.594	0.810
12	2604.156	825.000	64.221	0.808

SCALING FACTOR(OVERALL)=5.768
SCALING FACTOR(MEDICAL)=5.791
SCALING FACTOR(SURGICAL)=5.783

PROCEDURE CODES

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RESISTANT FIT TO THE CRVS - NEW YORK

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	12.280	1441	274
2	32.591	1181	480
3	17.925	201	116
4	23.497	11542	779
5	26.296	3450	1142
6	15.956	372	316
7	770.272	1430	964
8	577.067	1573	965
9	334.380	1870	895
10	986.493	1021	387
11	919.992	263	240
12	899.980	11	11

PROCEDURE	SIGMA	SIGMA	SIGMA	TAUSQ
1	0.0	184.721	0.070	0.076
2	0.0	219.978	0.232	0.800
3	0.0	962.941	3.074	3.074
4	77.573	39.278	0.820	0.826
5	0.0	159.705	0.857	0.814
6	0.0	84.139	0.192	0.087
7	0.0	10291.967	124.912	0.812
8	0.0	19969.262	283.747	0.906
9	1438.872	29853.953	38.154	0.815
10	12951.715	54219.239	142.951	0.827
11	0.0	31878.434	136.020	0.834
12	1754.787	0.0	4535.117	0.855

SCALING FACTOR(OVERALL)=5.969
SCALING FACTOR(MEDICAL)=5.263
SCALING FACTOR(SURGICAL)=8.982

PROCEDURE CODES

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6=ROUTINE NURSING HOME VISIT
7=COLECTOMY
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RESISTANT FIT TO THE CRYS - OREGON

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.422	27716	244
2	35.983	2496	85
3	6.493	22193	149
4	34.795	8954	81
5	11.511	2837	131
6	35.031	5	5
7	501.454	9	9
8	391.437	131	37
9	47.036	185	37
10	631.529	343	51
11	394.210	95	1
12	481.052	75	1

PROCEDURE	SISCHR	SISCHP	SISCO	TWUSO
1	1.427	0.000	0.033	0.023
2	14.784	0.051	1.062	0.079
3	1.490	0.0	0.539	0.036
4	16.956	0.000	0.960	0.014
5	0.924	0.000	0.271	0.060
6	53.573	0.0	0.746	0.137
7	1039.817	0.5	1521.394	0.152
8	1711.846	0.5	1885.521	0.033
9	414.482	0.998	81.770	0.018
10	1894.993	0.984	427.216	0.047
11	8840.678	0.0	823.776	0.067
12	2588.494	0.0	1834.785	0.255

SCALING FACTOR(DOWRALL)=6.512
SCALING FACTOR(SICAL)=6.461
SCALING FACTOR(SURGICAL)=6.494

PROCEDURE CODES

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6=INITIAL HOME VISIT
7=CELECTOMY
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11=TOTAL HYSTERECTOMY
12=TONSILLECTOMY

RESISTANT FIT TO THE CRYS - UNLAMOKA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.513	656340	2884
2	23.156	7198	781
3	6.505	66811	1619
4	31.747	7276	757
5	10.824	83201	1114
6	21.020	33	27
7	602.480	96	58
8	345.984	625	261
9	284.868	734	202
10	938.268	1343	84
11	374.740	177	115
12	891.410	2551	71

PROCEDURE	SISCHR	SISCHP	SISCO	TWUSO
1	2.677	0.000	0.004	0.004
2	134.496	0.002	0.971	0.075
3	3.209	0.000	0.906	0.005
4	180.492	0.000	0.004	0.017
5	5.401	0.000	0.042	0.011
6	193.980	0.5	0.172	0.017
7	4624.670	0.0	160.958	0.014
8	8781.571	0.5	194.193	0.005
9	1012.867	0.0	6.781	0.050
10	2947.694	0.180	57.316	0.017
11	2780.954	0.0	79.644	0.014
12	811.178	0.0	854.871	0.004

SCALING FACTOR(DOWRALL)=5.966
SCALING FACTOR(SICAL)=6.822
SCALING FACTOR(SURGICAL)=5.904

PROCEDURE CODES

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RESISTANT FIT TO THE CRYS - IDAHOSSPT

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.894	37871	816
2	24.561	1992	279
3	7.052	195143	995
4	33.539	1670	183
5	10.744	8519	354
6	29.267	8	8
7	537.071	120	67
8	232.774	431	330
9	271.214	1020	320
10	394.019	2435	84
11	315.963	236	191
12	340.035	1020	184

PROCEDURE	SISCHR	SISCHP	SISCO	TWUSO
1	1.917	2.458	0.004	0.024
2	18.193	12.867	0.289	0.087
3	2.462	14.757	0.011	0.011
4	31.753	24.331	1.004	0.030
5	0.0	128611.973	2.250	0.062
6	31.051	0.0	0.992	0.127
7	0.0	14156.188	146.197	0.015
8	8416.587	8755.936	19.480	0.006
9	1945.278	999.886	0.280	0.005
10	1776.257	1812.812	95.294	0.007
11	2281.257	8522.819	24.854	0.012
12	933.816	4876.412	18.981	0.003

SCALING FACTOR(DOWRALL)=5.324
SCALING FACTOR(SICAL)=5.800
SCALING FACTOR(SURGICAL)=5.304

PROCEDURE CODES

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7=CELECTOMY
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12=TONSILLECTOMY

RESISTANT FIT TO THE CRYS - SOUTH DAKOTA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	5.137	76237	279
2	17.211	1812	115
3	5.400	271411	341
4	24.681	8788	151
5	8.476	6395	260
6	21.000	1	1
7	501.481	77	19
8	284.395	365	107
9	194.254	495	131
10	396.211	637	22
11	221.439	62	44
12	487.000	674	12

PROCEDURE	SISCHR	SISCHP	SISCO	TWUSO
1	0.498	0.503	0.007	0.007
2	72.258	0.091	0.917	0.109
3	0.550	0.961	0.004	0.004
4	85.870	14.007	1.734	0.049
5	3.193	2.815	0.051	0.014
6	51.316	0.5	14.071	0.277
7	8681.888	2444.187	892.995	0.004
8	876.732	8780.598	46.725	0.007
9	236.323	2188.487	5.885	0.004
10	854.235	9168.684	56.363	0.009
11	1081.256	388.722	42.941	0.012
12	1213.423	987.027	186.313	0.023

SCALING FACTOR(DOWRALL)=6.193
SCALING FACTOR(SICAL)=6.865
SCALING FACTOR(SURGICAL)=5.254

PROCEDURE CODES

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2=INITIAL OFFICE VISIT
3=ROUTINE HOSPITAL VISIT
4=INITIAL HOSPITAL VISIT
5=ROUTINE HOME VISIT
6=INITIAL HOME VISIT
7=CELECTOMY
8=CHOLECYSTECTOMY
9=REPAIR OF INGUINAL HERNIA
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11=TOTAL HYSTERECTOMY
12=TONSILLECTOMY

RESISTANT FIT TO THE CRYS - VERMONT

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	0.720	7237	164
2	0.941	873	65
3	0.0	0	0
4	0.0	0	0
5	34.539	391	3
6	0.0	0	0
7	402.217	26	17
8	323.441	47	20
9	164.417	38	21
10	444.382	121	4
11	387.765	4	4
12	267.987	45	7

PROCEDURE	BIGSDA	BIGSDM	SIGSD	TAUSD
1	3.955	0.939	0.969	0.898
2	2.323	1.061	0.145	0.864
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	111.480	0.446	0.112
6	0.0	0.0	0.0	0.0
7	0.0	2839.185	1935.813	0.154
8	1572.453	350.333	127.767	0.035
9	81.574	620.941	37.224	0.022
10	877.026	4726.953	881.653	0.861
11	1698.674	0.0	627.500	0.119
12	871.401	990.188	186.546	0.031

SCALING FACTOR(DEVSALL)=3.363
SCALING FACTOR(MEDICAL)=2.305
SCALING FACTOR(SURGICAL)=0.301

PROCEDURE CODES

1=ROUTINE OFFICE VISIT
2=INITIAL OFFICE VISIT
3=ROUTINE HOSPITAL VISIT
4=INITIAL HOSPITAL VISIT
5=ROUTINE HOME VISIT
6=ROUTINE NURSING HOME VISIT
7=CLECTOMY
8=CHOLECYSTECTOMY
9=REPAIR OF INGUINAL HERNIA
10=TRANSURETHRAL RESECTION OF PROSTATE
11=TOTAL HYSTERECTOMY
12=EXTRACTION OF LENS

RESISTANT FIT TO THE CRYS - TEXAS

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	7.863	96160	841
2	18.450	45374	1567
3	9.682	21036	721
4	25.149	1455	737
5	12.811	8563	845
6	17.132	19189	945
7	480.072	1851	457
8	385.814	3954	1198
9	215.382	3595	1234
10	331.187	3945	884
11	394.890	3981	1308
12	436.251	8521	748

PROCEDURE	BIGSDA	BIGSDM	SIGSD	TAUSD
1	0.868	8.664	0.237	0.217
2	73.618	0.953	0.221	0.831
3	0.150	2665.517	0.184	0.124
4	164.873	83.561	0.580	0.367
5	16.873	0.507	0.137	0.637
6	17.133	1.964	0.232	0.067
7	9677.752	17291.551	71.232	0.007
8	8496.869	6885.152	14.481	0.002
9	3949.336	3885.505	4.618	0.004
10	23525.062	3995.223	398.665	0.847
11	6985.373	3982.732	16.801	0.004
12	8225.060	1871.045	206.027	0.041

SCALING FACTOR(DEVSALL)=8.84
SCALING FACTOR(MEDICAL)=8.329
SCALING FACTOR(SURGICAL)=5.948

PROCEDURE CODES

1=ROUTINE OFFICE VISIT
2=INITIAL OFFICE VISIT
3=ROUTINE HOSPITAL VISIT
4=INITIAL HOSPITAL VISIT
5=ROUTINE HOME VISIT
6=ROUTINE NURSING HOME VISIT
7=CLECTOMY
8=CHOLECYSTECTOMY
9=REPAIR OF INGUINAL HERNIA
10=TRANSURETHRAL RESECTION OF PROSTATE
11=TOTAL HYSTERECTOMY
12=EXTRACTION OF LENS

RESISTANT FIT TO THE CRYS - WYOMING

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	8.411	43081	196
2	24.175	218	19
3	4.401	136373	686
4	34.744	22	5
5	10.836	2673	137
6	15.000	1	1
7	450.000	1	1
8	396.875	49	31
9	187.825	170	87
10	381.100	137	5
11	267.302	15	12
12	353.730	240	11

PROCEDURE	BIGSDA	BIGSDM	SIGSD	TAUSD
1	2.741	1.158	0.841	0.841
2	172.371	3.127	84.228	0.784
3	1.028	3.985	0.021	0.071
4	0.0	17.175	0.953	0.022
5	7.141	2.968	0.156	0.039
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	1593.740	813.486	99.694	0.025
9	15.475	1829.885	19.287	0.868
10	472.258	1319.594	187.476	0.017
11	1807.484	387.153	217.938	0.059
12	878.148	1394.420	490.731	0.017

SCALING FACTOR(DEVSALL)=8.214
SCALING FACTOR(MEDICAL)=5.786
SCALING FACTOR(SURGICAL)=5.172

PROCEDURE CODES

1=ROUTINE OFFICE VISIT
2=INITIAL OFFICE VISIT
3=ROUTINE HOSPITAL VISIT
4=INITIAL HOSPITAL VISIT
5=ROUTINE HOME VISIT
6=INITIAL HOME VISIT
7=CLECTOMY
8=CHOLECYSTECTOMY
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RESISTANT FIT TO THE CRYS - VIRGINIA

PROCEDURE	MEAN CHARGE	NUMBER OF RECORDS	NUMBER OF PHYSICIANS
1	6.221	88647	827
2	21.298	2779	844
3	7.783	67841	686
4	30.174	4364	457
5	10.408	16578	813
6	15.187	822	180
7	441.192	847	148
8	320.874	594	258
9	186.559	507	319
10	378.294	1365	157
11	333.717	185	58
12	406.307	2945	286

PROCEDURE	BIGSDA	BIGSDM	SIGSD	TAUSD
1	2.087	8.781	0.257	0.858
2	152.823	16.201	3.234	0.097
3	0.565	11.792	0.204	0.094
4	117.983	19.136	2.837	0.108
5	6.478	2.769	0.231	0.058
6	5.885	0.496	0.257	0.051
7	0.0	8709.711	40.935	0.004
8	867.285	8352.752	15.437	0.003
9	178.742	1797.375	3.741	0.003
10	272.558	9364.610	5.474	0.002
11	0.0	5283.732	57.658	0.015
12	1718.748	4483.147	16.930	0.003

SCALING FACTOR(DEVSALL)=5.300
SCALING FACTOR(MEDICAL)=5.486
SCALING FACTOR(SURGICAL)=5.274

PROCEDURE CODES

1=ROUTINE OFFICE VISIT
2=INITIAL OFFICE VISIT
3=ROUTINE HOSPITAL VISIT
4=INITIAL HOSPITAL VISIT
5=ROUTINE HOME VISIT
6=ROUTINE NURSING HOME VISIT
7=CLECTOMY
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Chapter 3

Toward Developing a Relative Value Scale for Medical and Surgical Services

by William C. Hsiao and William B. Stason

A methodology has been developed to determine the relative values of surgical procedures and medical office visits on the basis of resource costs. The time taken to perform the service and the complexity of that service are the most critical variables. Inter-specialty differences in the opportunity costs of training and overhead expenses are also considered.

Results indicate some important differences between the relative values based on resource costs and existing standards, prevailing Medicare charges, and California Relative Value Study values. Most dramatic are discrepancies between existing reimbursement levels and resource cost values for office visits compared to surgical procedures. These vary from procedure to procedure and specialty to specialty but indicate that, on the average, office visits are undervalued (or surgical procedures overvalued) by four- to five-fold. After standardizing the variations in the complexity of different procedures, the hourly reimbursement rate in 1978 ranged from $40 for a general practitioner to $200 for surgical specialists.

The dramatic escalation of health care costs has brought physicians' fees under increasing scrutiny. Concern exists not only with regard to high fees, but also with the equivalency of fees between different types of services and between different specialties. At the present time charges for physician services are, in large measure, determined by the individual physician.

If the market for physician services were reasonably competitive, determination of price by the physician would be reasonable. Under these circumstances the informed consumer could accept or reject the service depending on its price and on the perceived value of that service. Such is not the case, however. The consumer's imperfect knowledge of the benefits s/he can expect from a given medical or surgical service, the physician/patient relationship in which the patient relies upon the physician to determine the appropriate course of therapy, and present medical insurance reimbursement policies all distort the market place for medical services. Furthermore, the unpredictable and acute nature of many health problems often precludes "shopping" for health services. A person afflicted by disconcerting or life-threatening symptoms is hardly in a position to search the market for the "best deal."

It is highly unlikely, given existing circumstances in the medical care market and the increasing pressures toward regulation of medical practice, that conditions for a competitive market will ever exist. If the fee-for-service option is to be retained, therefore, it is essential that a systematic and equitable means be devised for pricing each medical and surgical service relative to one another.

The California Relative Value Study (CRVS), first published in 1956, is the most comprehensive effort to date in this direction. In the CRVS, relative values were initially based upon existing median charges of California physicians. In periodic revisions that have been made since 1956, it is not clear what criteria have been applied, although in some cases revisions are known to be the results of bargaining and negotiations among specialties. The intent of the CRVS has been to provide a guide to assist physicians in establishing fees but not to constrain physicians from charging what they deem appropriate.

Other relative value scales that have appeared since the CRVS bear close resemblance to it. This is true for Medicaid schedules and schedules adopted independently by Blue Shield plans and by some commercial insurance companies. Hence, through the CRVS, all current relative scales can be traced more or less directly to prices that existed at a past point in time. Any distortions at that time are likely to have been perpetuated.

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Alternatives to relying upon market mechanisms to determine the relative values of medical services include estimating the resource costs required to produce different services or establishing values based on the consensus of a group of medical and/or non-medical experts.

We have focused on the former approach. The wide acceptance of resource costs as the basis for establishing the value of goods in society; their use in the pricing of public utilities; the susceptability of resource costs to relatively objective measurement; and the feasibility of monitoring and updating such a value scale to reflect changes in medical skills and technology all contributed to this decision.

The objectives of this study were to develop a methodology for computing these resource costs and for melding them into a relative value scale; to apply this methodology to a limited number of medical and surgical services; and to compare the resulting relative values to those of the California Relative Value Study and to prevailing prices.

Methods and Data Sources

The major inputs into the production of medical services are the professional time expended, the intensity of effort and degree of skills represented by this time, the physicians' level of training, and the overhead expenses incurred in providing the service.

Time

The time spent by a physician in performing a surgical procedure or office visit should unquestionably be an important determinant of its value. Professional time for surgical procedures includes the "skin to skin" time (the time from the initial incision until the final suture is in place) and time spent in preoperative evaluation and postoperative care. For office visits, time spent reviewing past medical records or laboratory results and preparing records of the present visit and relevant correspondence need to be considered in addition to time actually spent with the patient.

"Skin to skin" time for a variety of surgical procedures was obtained from the Study of Surgical Services in the United States (SOSSUS) (1975). In this study, time estimates were obtained from operating room logs on 285,160 principal operations performed in four defined geographic areas in the U.S. during 1970. Procedures were coded according to the Commission on Professional and Hospital Activities (1968). Consideration in this paper is limited to procedures:

(1) which are characteristically performed by general surgeons, obstetricians and gynecologists, opthalmologists, orthopedic surgeons, and urologists;
(2) which are relatively well-defined in terms of the usual extent of the procedure;
(3) for which the coding systems employed by SOSSUS and those of the California Relative Value Scale (California Medical Association, 1969) are similar; and
(4) for which at least 30 observations were available in the SOSSUS data.

Mean "skin to skin" time in minutes for selected procedures is presented in Table 1. A one-third random subset of these data was examined in greater depth to evaluate the distribution of "skin to skin" time for each procedure. A few procedures, such as diagnostic D&C and inguinal hernia repair have a high degree of skewness in their distributions of time (skewness > 1.0); in each instance the "long tail" of the distribution is "to the right" in the direction of increased length of operation. These findings could be due to a subset of patients who had particularly complicated procedures or, alternatively, (but less likely) to a group of particularly slow surgeons. Despite these non-normal distributions, "mean time" was chosen for use in this analysis.

Empirical data on the time a surgeon spends in the pre- and post-operative care of patients undergoing different surgical procedures are not available. In their absence the following assumptions were made:

(1) Pre-operative evaluation occurs following an office visit and, for elective procedures, takes *15 minutes*. (This estimate, obviously, applies to elective procedures only. The prolonged periods of pre-operative evaluation that may be required in the case of trauma or other acute illnesses, including appendicitis, are not adequately acknowledged by this figure.)
(2) Time spent in surgery over and beyond "skin to skin" time (dressing, scrubbing, waiting, preparing the patient, etc.) takes *20 minutes*.
(3) Time spent in the immediate post-operative period dictating an operative note, writing orders, and checking the patient in the recovery room takes *15 minutes*.
(4) Time spent in post-operative follow-up takes *10 minutes* on the day of surgery and an average of *five minutes* per day thereafter.

These assumptions, therefore, divide the time spent in pre- and post-operative care into a fixed portion, 60 minutes in duration, that applies uniformly to all surgical procedures and a variable portion that is determined by the length of hospital stay (Commission on Professional & Hospital Activities, 1976). Although these assumptions undoubtedly overestimate the time required for some procedures and underestimate it for others, they can be considered first approximations until better data become available.

Finally, for office visits it was esitmated that an initial visit takes an average of 30 minutes and that a follow-up visit takes 15 minutes (National Ambulatory Medical Care Survey, 1978).

Complexity of Services

The time required to perform a surgical procedure or medical service does not fully describe the professional effort involved. Not all time is equal; rather, the degree of skill and intensity of effort required per unit of time vary widely from one service to another. Presumably, the value of a service should reflect these differences. Complexity here is defined to include:
(1) the intensity of physical and mental effort involved including the risk of intraoperative complications;
(2) the diagnostic skills and clinical judgments required

TABLE 1

"Skin to Skin" Time by Procedure

Specialty	Procedure	Number of Observations	Mean Time (in minutes)
General Surgery	Excision and ligation of varicose veins	139	125.8
	Hemorrhoidectomy	166	50.6
	Inguinal hernia repair	552	65.7
	Excision biopsy of breast	145	44.6
	Appendectomy	269	52.2
	Cholecystectomy	340	94.5
	Cholecystectomy with common duct exploration	54	145.8
Obstetrics and Gynecology	Diagnostic D & C	737	23.5
	Excision biopsy of breast	145	44.6
	Oophorectomy, unilateral	50	75.0
	Caesarian section	93	59.3
	Abdominal hysterectomy, total	502	112.3
	Vaginal hysterectomy, with A-P repair	156	101.8
Ophthalmology	Chalazion	32	33.2
	Strabismus correction	46	67.9
	Lens extraction, intracapsular	299	51.6
Orthopedics	Bunionectomy	56	71.7
	Menisectomy	62	64.4
	Intertrochanteric fracture of hip with internal fixation	63	93.7
	Bankhart procedure	30	125.3
	Lumbar laminectomy	149	119.3
Urology	Cystoscopy, diagnostic	539	29.0
	Vasectomy	34	30.7
	Transurethral bladder surgery-tumors 0.5cm to 2.0 cm	102	50.5
	Suprapubic prostatectomy	35	84.3
	Transurethal prostate resection	202	68.3

to choose the appropriate therapeutic procedure; and (3) the technical skills required to perform the procedure. Although the expression of each of these measures varies not only from one procedure to another but also from one patient to another for a given procedure, the focus in this analysis is on the average overall complexity of one procedure relative to another.

To assess the complexity of different surgical and medical services personal interviews were conducted with 25 board-certified physcians, five each from General Surgery, Obstetrics and Gynecology, Ophthalmology, Orthopedics, and Urology. Physicians were selected non-randomly to represent various practice modes (fulltime fee-for-service practice, salaried practice, fulltime academic); different institutions (teaching hospitals, community hospitals); and a broad spectrum of ages and lengths of experience. All were located in the Boston area.

Each physician was asked, first, to rank on a 10 point scale the complexity of procedures he performed reasonably frequently; hence, procedures that might appear complex to a given surgeon because they were not a regular part of his practice were excluded. Having done this he then was asked to choose a procedure falling near the middle of his scale and, assigning a value of 100 units to this procedure, to estimate the complexity per unit time of:

(1) the least complex procedure listed;
(2) the most complex procedure;
(3) an initial diagnostic office visit.

The initial 10 point scale was then converted to a cardinal scale by anchoring ends of the scale by the value estimates for the most complex and least complex procedures and by calculating proportional values for procedures above and below the reference procedure (100 units/unit time). The values obtained were averaged within specialties and then expressed as relative complexities by dividing all values by that of the least complex procedure.

To allow physicians to reassess their estimates, a modified Delphi technique was carried out in which each physician was provided with his own relative complexity values and those representing the average of physicians in his specialty. Changes were then incorporated into the final calculations.

Two findings were of particular interest. First, rank orders by complexity of procedures within a specialty varied very little from one physician to another despite the diverse characteristics of the practices surveyed. Second, the range of relative complexities varied widely from one specialty to another; from 1.0 to 2.6 for orthopedics to 1.0 to 10.2 for ophthalmology. There is a widespread consensus among physicians that the most complex procedure in one specialty is

comparable to that in another, given an equal length of residency training. Consequently it was assumed that wide differences in the scale of complexity values did not represent true differences between specialties. All scales, therefore, were standardized to the range for general surgery (1.0 to 4.0). Results of complexity value determinations are presented in Table 2. Note that the spectrum of procedures for which complexity estimates were obtained is much broader than that for which "skin to skin" times were available and for which relative values were subsequently calculated.

A methodologic issue here is whether or not physicians were able to hold time constant when they provided estimates of the complexity of procedures. Figure 1 shows that with a few exceptions there was a close correlation between "skin to skin" time and complexity per unit of time. When asked directly about this relationship, most surgeons indicated that the high degree of correlation between these two variables reflects the true nature of surgical practice; procedures that require more complexity per unit of time also take longer. Others pointed to fatigue as an element contributing to the correlation between time and complexity; as operating time increases, the intensity of effort or concentration required also increases. Pre- and post-operative care, on the average, represents the same complexity per unit of time as routine office visits, which equal 1.0.

Investment in Professional Training

The length of time a physician spends in training varies widely from one specialty to another, ranging from one year of postdoctoral training for a general practitioner to seven years for a neurosurgeon or thoracic surgeon (Wechsler, 1976). Earnings foregone during the training period are estimated by applying the principles of human capital theory in which the opportunity cost of a training [1] is calculated and amortized over the working lifetime of a physician. The assumption is that each specialty should earn the same rate of return on its investment in training.

Physicians who undertake residency training programs beyond a single year of internship incur yearly positive opportunity costs equal to the difference in salaries between that of a practicing general practitioner and a resident. The sum of opportunity costs taken over the duration of residency programs can be expressed by:

$$Y=\sum_{t=1}^{a} X_t\,(1+r)^{a-t},\ (t=1,\ldots,a)$$

where X_t = (GP net earnings$_t$ − resident salary$_t$) for a given year

r=interest rate

a= number of years of residency program

t=counter for number of years from the beginning of residency.

The opportunity cost amortized over the working lifetime can be expressed as:

$$a=\left[\frac{(1+r)^{n-a}-1}{r(1+r)^{n-a}}\right]^{-1}\left[\sum_{t=1}^{a} X_t(1+r)^{a-t}\right]$$

For an explanation of how this equation was derived, see Technical Note A at the end of this article.

To perform these calculations, data are needed on the lengths of residency training programs for different specialties, career lifetimes in medicine, resident salaries, and net income by specialty including the relationship of incomes to the length of time in practice.

Lengths of residency training requirements by specialty are based on the actual specialty Board requirements (Wechsler, 1976). The mean working career for physicians from the end of the first year of post-graduate education (internship) was estimated from two sources to be 41 years (Goodman, 1975; Li, 1968). Important differences may exist, however, between the peak earning periods of different specialties. Using, as a criterion, the period during which a physician is expected to earn at least 75 percent of the average of all physicians in his specialty, a Canadian report indicates the peak working career for a general practitioner to be 38 years, an ophthalmologist 37 years, a general surgeon 32 years, a urologist 28 years, and a cardiovascular surgeon 27 years (Korcok, 1975). It is not known whether these differences result from the greater physical and mental demands of some specialties or from the greater ability of some specialists to achieve financial security at an earlier age. Given this uncertainty, we assumed in this analysis that the working careers of different specialists are of equal length.

Salaries for first year residents in 1975 averaged $11,914 (Directory of Approved Residencies, 1975-76). For later years of residency, it was asumed that salaries of residents increased at the rate of 15 percent per year (Salary$_t$ = 11,914 × $(1.15)^t$). Medical salaries by specialty and increases in salary by length of practice were available from surveys performed by *Medical Economics* (Owens, 1976; Jeffers, 1967). Earnings of general practitioners (GP) were used to calculate residents' opportunity costs. Earnings estimates for GPs by the length of time in practice were obtained for 1975 by assuming linearity for step functions with time between 1965 and 1975.

Estimates of the annual differential amount due specialists based on opportunity costs incurred during years of training following internship are presented in Table 3, assuming that the average working career following internship is 41 years. Results, by the number of years of training, are presented for 7 percent and 10 percent rates of interest. These figures imply that, for full-time practitioners, an internist who has two additional years of training beyond internship should receive an annual increment in income of $4,000 over a GP, if the rate of return is seven percent; a general surgeon, who spends four additional years in training, should receive $8,300 more per year. These increments, obviously, could be used to adjust hourly reimbursement rates as well as annual income. Because the number of hours worked per week and number of weeks worked per year varies little, at least

[1] The opportunity cost of a training refers to the direct expenses involved in getting the training (tuition, books, etc.) plus the earnings lost during the time the physician was in school.

TABLE 2

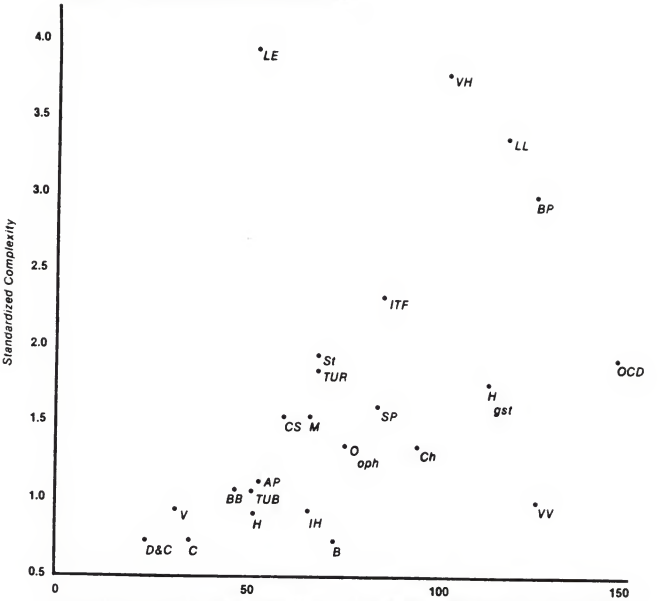
Relative Complexity of Surgical Procedures and Initial Office Visits By Specialty

Specialty	Procedure	Complexity/ Unit Time	Relative Complexity	Standardized Relative Complexity [1]
General Surgery	Excision and ligation of varicose veins	47	1.0	1.0
	Hemorrhoidectomy	56	1.2	1.2
	Inguinal hernia repair, except recurrent	58	1.2	1.2
	Initial office visit	62	1.3	1.3
	Excision biopsy of breast	62	1.3	1.3
	Appendectomy	65	1.4	1.4
	Cholecystectomy	78	1.6	1.6
	Modified radical mastectomy	102	2.2	2.2
	Cholecystectomy with common duct exploration	103	2.2	2.2
	Pyloroplasty and vagotomy	120	2.5	2.5
	Total gastrectomy	149	3.1	3.1
	Left colectomy with coloproctostomy	172	3.6	3.6
	Complete colectomy with combined abdomino-perineal resection	190	4.0	4.0
	Parathyroid exploration, initial	191	4.0	4.0
Obstetrics and Gynecology	Initial office visit—obstetrics	40	1.0	1.0
	Diagnostic D & C	41	1.0	1.0
	I & D Bartholin cyst	44	1.1	1.0
	Excision biopsy of breast	70	1.7	1.3
	Normal delivery	70.8	1.7	1.3
	Initial office visit—gynecology	76	2.1	1.3
	Laporoscopy and tubal ligation	83	2.0	1.4
	Oophorectomy, unilateral	100	2.5	1.6
	Caesarian section	124	3.1	1.8
	Marshall-Marchetti operation	131	3.2	1.8
	Abdominal hysterectomy, total	146	3.6	2.0
	Modified radical mastectomy	262	6.4	3.1
	Vaginal hysterectomy, total	333	8.2	3.8
	Abdominal hysterectomy, radical	360	8.9	4.0
Ophthalmology	Chalazion	18	1.0	1.0
	Initial office visit	20	1.1	1.0
	Enucleation	55	3.1	1.7
	Peripheral iridectomy	79	4.5	2.1
	Strabismus correction	85	4.8	2.2
	Filtering procedure	147	8.3	3.4
	Lens extraction, intracapsular	180	10.2	4.0
Orthopedics	Bunionectomy	63	1.0	1.0
	Initial office visit	78	1.2	1.4
	Meniscectomy	91	1.4	1.8
	B/K amputation	102	1.6	2.2
	Triple arthrodesis	108	1.7	2.4
	Intertrochonteric fracture of femur with internal fixation	116	1.8	2.6
	Bankhart procedure	128	2.0	3.0
	Lumbar laminectomy	141	2.2	3.4
	Total hip replacement	164	2.6	4.0
Urology	Initial office visit	39	1.0	1.0
	Vasectomy	52	1.3	1.2
	Transurethral bladder surgery—tumors 0.5cm—2.0cm	56	1.4	1.3
	Ureterolithotomy	89	2.3	1.9
	Suprapubic prostatectomy	92	2.3	1.9
	TURP	104	2.7	2.1
	Pyelolithotomy	110	2.8	2.2
	Pyeloplasty	118	3.0	2.3
	Complete nephrectomy	120	3.1	2.4
	Radical nephrectomy	159	4.1	3.1
	Nephrotomy for staghorn calculus	199	5.1	3.7
	Radical cystectomy with ileal loop	212	5.4	4.0

[1] Standardized relative complexity is computed by standardizing the range of complexity to 1.0 to 4.0

Figure 1
"Skin to Skin" Time

Complexity Per Unit Time vs. "Skin to Skin" Time



Note: "Skin to Skin" time is compared to estimates of complexity per unit of time for selected surgical procedures. Abbreviations. D&C = diagnostic dilation and curretage, V = vasectomy, C = chalazion, BB = breast biopsy, Ap = appendectomy, TUB = transurethral bladder surgery, H = hemorrhoidectomy; LE = lens extraction; CS = Caesarian section, M = meniscectomy, IH = inguinal hernia repair; TUR = transurethral resection of the prostate; St = strabismus correction, B = bunionectomy; Ooph = unilateral oophorectomy; SP = suprapubic prostatectomy; ITF = intertrochanteric fracture of the femur, Chol = cholecystectomy, VH = vaginal hysterectomy; Hyst = abdominal hysterectomy, LL = lumbar laminectomy; BP = Bankhart Procedure; VV = varicose vein stripping; CCD = cholecystectomy with common duct exploration.

Table 3

Annual Differential In Income Due to the Opportunity Costs of Additional Years of Residency Training Based on 1975 Median Incomes

a	$GP	$Resident	GP_i$-$Res$_i$	$Y @ 7%	$Y @ 10%	(n−a)	d @7%	d @ 10%	Factor for differential years of training @ 7%	Factor for differential years of training @ 10%
1	37912	11914	25998	25998	25998	40	1950	2660	1.05	1.07
2	38944	13701	25243	53061	53841	39	4001	5519	1.10	1.14
3	39976	15756	24220	80995	83445	38	6139	8570	1.15	1.21
4	41008	18120	22888	109553	114677	37	8348	11812	1.20	1.29
5	42040	20838	21202	138423	147347	36	10617	15221	1.25	1.36
6	43072	23963	19109	167222	181190	35	12910	18789	1.30	1.44

a=years of training after internship.
n=years of active career lifetime after internship.
$GP=expected income after "a" years of practice (1975 figures)
$Resident=expected resident income after "a" years of residency (1975 figures)
$Y=total opportunity costs over the duration of residency at 7% and 10% discount rates
d=differential annual income after "a" years of training at 7% and 10% discount rates

between internists, general surgeons, and GPs (NCHSR and AMA, 1973), no correction to standardize for number of hours worked was considered necessary.

Overhead Expenses of Practices

Variations from specialty to specialty in the legitimate expenses of running a practice also need to be reflected in the prices of services rendered. These expenses include office payroll, office space costs, malpractice premiums, drugs and medical supplies, and depreciation on medical equipment. We assumed that overhead expenses are spread equally over all services performed.

Overhead expenses in dollars and as a percent of gross receipts, by specialty, were obtained from *Medical Economics* (Owens, 1977). Of surgical specialties, figures were available only for general surgery and obstetrics and gynecology. The assumption was made that expenses for other specialties under consideration—ophthalmology, orthopedics and urology—were the average of those for general surgery and OBG. To adjust for differences in overhead between general practitioners and other specialties, a standardized factor calculated as $\frac{1-P_{GP}}{1-P_{spec}}$ where P_{GP} and P_{spec} represent overhead expenses as a proportion of gross receipts for a GP and a given specialist, respectively. The resulting overhead expense factors are shown in Table 4.

Construction of a Relative Value Scale—Two Methods

Multiplicative Model

The value of each procedure or service is the multiplicative function of time, complexity per unit of time, and factors representing differences between specialties in the opportunity costs of training and differences in overhead expenses between a general practitioner and a given specialty.

The value of a given procedure, then, equals (T) × (C) × (OC) × (O) where:

T is the mean "skin to skin" time or office visit time in minutes;
C is the standardized relative complexity of the procedure per unit time;
OC is the amortized opportunity cost of years of training in a specialty beyond internship expressed as a percent of the expected income for a GP who has been in practice for a number of years equal to the duration of the specialty residency training program:

$$OC = \frac{\text{GP income + total opportunity costs}}{\text{GP income}}$$

O is a standardized factor that adjusts for differences in overhead expenses between general practitioners and given specialties.

Principal Component Analysis

An alternative way to compute relative values is to weight the resource cost variables before combining them. To accomplish this, principal component analysis was applied to the time and complexity variables. The resulting factor scores were then adjusted for interspecialty differences in the opportunity costs of training and overhead expenses by multiplying by the appropriate standardized factors.

Because we are interested in the ratios, rather than the differences between procedures, a multiplicative model was chosen.

The factors derived from the principal component analysis are:

$$Y_K{}^M = \left[\frac{X_{1k}}{S_{x1}}\right]^{W1}\left[\frac{X_{2k}}{S_{x2}}\right]^{W2}$$

The deviation of the $Y_K{}^M$ is explained in Technical Note B. The value, $Y_K{}^M$, was multiplied by the correction factors for opportunity costs (OC) and over-

Table 4

Relative Values of Selected Surgical Procedures Based on Resource Costs Using 'Skin to Skin' Time as the Measure of Professional Time Commitment and the Multiplicative Model for Combining Components

Specialty	Procedure	Mean Time (T)	Complexity Factor (C)	Opportunity Cost Factor (OC)	Overhead Expenses Factor (O)	(T)×(C)×(OC×(O)	Relative Value (with Inguinal Hernia Repair Standardized =1.0)
General Surgery	Excision and ligation of varicose veins	125.8	1.0	1.20	.90	135.9	1.6
	Hemorrhoidectomy	50.6	1.2	1.20	.90	65.5	0.8
	Inguinal hernia repair	65.7	1.2	1.20	.90	85.2	1.0
	Excision biopsy of breast	44.6	1.3	1.20	.90	62.6	0.7
	Appendectomy	52.2	1.4	1.20	.90	78.9	0.9
	Cholecystectomy	94.5	1.6	1.20	.90	163.3	1.9
	Cholecystectomy with common duct exploration	145.8	2.2	1.20	.90	346.5	4.1
Obstetrics/ Gynecology	Diagnostic D&C	23.5	1.0	1.15	.94	25.5	0.3
	Excision biopsy of breast	44.6	1.3	1.15	.94	63.0	0.8
	Oophorectomy, unilateral	75.0	1.6	1.15	.94	130.2	1.5
	Caesarian section	59.3	1.8	1.15	.94	115.8	1.4
	Abdominal hysterectomy, total	112.3	2.0	1.15	.94	243.8	2.9
	Vaginal hysterectomy with A&P repair	101.8	3.8	1.15	.94	419.6	4.9
Ophthalmology	Chalazion	33.2	1.0	1.15	.92	35.1	0.4
	Strabismus correction	67.9	2.2	1.15	.92	158.4	1.9
	Lens extraction, intracapsular	51.6	4.0	1.15	.92	218.4	2.6
Orthopedics	Bunionectomy	71.7	1.0	1.15	.92	76.1	0.9
	Menisectomy	64.4	1.8	1.15	.92	123.0	1.4
	Intertrochanteric fracture of hip with internal fixation	93.7	2.6	1.15	.92	258.4	3.0
	Bankhart procedure	125.3	3.0	1.15	.92	398.8	4.7
	Lumbar laminectomy	119.3	3.4	1.15	.92	430.2	5.0
Urology	Cystoscopy, diagnostic	29.0	1.0	1.20	.92	32.1	0.4
	Vasectomy	30.7	1.2	1.20	.92	40.8	0.5
	Transurethral bladder surgery	50.5	1.3	1.20	.92	72.6	0.9
	Suprapubic prostatectomy	84.3	1.9	1.20	.92	177.3	2.1
	Transurethral resection of prostate	68.3	2.1	1.20	.92	158.7	1.9

head expenses (O) to obtain the relative value index of surgical procedures:

$$RV = (Y_K^M) \times (OC \times (O).$$

Results

Resource Cost Relative Values (RCRV)

The relative values of selected surgical procedures based on resource costs were first calculated using "skin to skin" time as the measure of professional time commitment ($RCRV_s$), and then calculated again after estimates of time spent in pre- and post-operative care were incorporated ($RCRV_T$). Results derived from "skin to skin" time using the multiplicative model are presented in Table 4, and equivalent results derived from total time are presented in Table 5. All values are standardized to inguinal hernia repair, which is assigned a value of 1.0. Comparison of results from the multiplicative model and principal component analysis are shown in Table 6.

Comparison of Resource Cost Relative Values to the California Relative Value Study (CRVS) Values

As can be seen in Table 5, there is only approximate agreement between RCRV and CRVS values which have been standardized to inguinal hernia repair; agreement is within 33 percent (ratio between 0.70 and 1.30) for 17 of 20 or 85 percent of the procedures. Procedures outside this range, in general, are at the extremes of the scale (RCRV≤0.4 or ≥2.9).

Table 5

Resource Costs Relative Values Compared to California Relative Value Study (CVRS) Values: Valuation of Time Spent in Pre- and Post-Operative Care Included

Procedure	(A) CRVS (1969) Unit Value	(A) CRVS (1969) Relative Value[1]	(B) Resource Cost[1] Relative Value ($RCRV_T$)	A/B	Rank Order CRVS (1969)	Rank Order Resource Costs
Chalazion	1.2	0.1	0.6	0.17	1	1
Vaginal hysterectomy with A-P repair	18.0	2.0	3.0	0.67	16	19
Bankhart procedure	19.0	2.1	..	...	..	..
Cholecystectomy with common duct exploration	17.0	1.9	2.7	0.70	15	18
Cystoscopy, diagnostic	2.0	0.2	..	...	..	..
Lumbar laminectomy	26.0	2.9	3.2	0.91	20	20
Abdominal hysterectomy, total	16.0	1.8	2.0	0.90	14	17
Hemorrhoidectomy	4.8	0.5	0.9	0.56	3	3
Intertrochanteric fracture of femur with internal fixation	20.0	2.2	..	...	..	..
(OBG) Excision biopsy of breast	5.0	0.6	..	...	..	..
Transurethral bladder surgery	6.0	0.7	1.0	0.70	4	4
Caesarian section	10.0	1.1	1.2	0.92	7	8
Vasectomy	3.6	0.4	..	...	..	..
Lens extraction, intracapsular	20.0	2.2	1.7	1.29	17	15
Oophorectomy, unilateral	12.0	1.3	1.2	1.08	9	8
Excision and ligation of varicose veins	12.0	1.3	1.3	1.00	9	11
Cholecystectomy	14.5	1.6	1.6	1.00	11	13
Strabismus correction	14.0	1.6	1.3	1.23	11	11
(GS) Excision biopsy of breast	5.0	0.6	..	...	..	..
Bunionectomy	7.0	0.8	1.0	0.80	5	4
Suprapubic prostatectomy	20.0	2.2	1.8	1.22	17	16
Inguinal hernia repair	9.0	1.0	1.0	1.0	6	4
Menisectomy	14.0	1.6	1.2	1.33	11	8
Transurethral resection of prostate	20.0	2.2	1.6	1.38	17	13
Appendectomy	9.5	1.1	1.0	1.10	7	4
Diagnostic D&C	4.0	0.4	0.6	0.67	2	1

[1] All values standardized to inguinal hernia repair=1.0.

Table 6

Relative Values Based on Resource Costs: Multiplicative Model Compared to Principal Component Analysis Model (skin to skin time only)

Specialty	Procedure	(A) Principal Components Analysis Relative Value of Inguinal Hernia Repair =1.0	(B) Multiplicative Model Relative Value of Inguinal Hernia Repair =1.0	A/B
General Surgery	Excision and ligation of varicose veins	1.2	1.6	0.8
	Hemorrhoidectomy	0.9	0.8	1.1
	Inguinal hernia repair	1.0	1.0	1.0
	Excision biopsy of breast	0.9	0.7	1.3
	Appendectomy	1.0	0.9	1.1
	Cholecystectomy	1.4	1.9	0.7
	Cholecystectomy with common duct exploration	2.0	4.1	0.5
Obstetrics/Gynecology	Diagnostic D&C	0.6	0.3	2.0
	Excision biopsy of breast	0.9	0.8	1.1
	Oophorectomy, unilateral	1.2	1.5	0.9
	Caesarian section	1.2	1.4	0.9
	Abdominal hysterectomy, total	1.7	2.9	0.6
	Vaginal hysterectomy with A&P repair	2.3	4.9	0.5
Ophthalmology	Chalazion	0.7	0.4	1.8
	Strabismus correction	1.3	1.9	0.7
	Lens extraction, intracapsular	1.6	2.6	0.6
Orthopedics	Bunionectomy	1.0	0.9	1.1
	Menisectomy	1.2	1.4	0.9
	Intertrochanteric fracture of hip with internal fixation	1.7	3.0	0.6
	Bankhart procedure	2.1	4.7	0.5
	Lumbar laminectomy	2.3	5.0	0.5
Urology	Cystoscopy, diagnostic	0.7	0.4	1.8
	Vasectomy	0.7	0.5	1.4
	Transurethral bladder surgery	1.0	0.9	1.1
	Suprapubic prostatectomy	1.4	2.1	0.7
	Transurethral resection of prostate	1.4	1.9	0.8

Possible explanations for the observed differences between RCRV and CRVS values are many. Differences in the definitions of surgical procedures between the SOSSUS and CRVS; difficulties in obtaining reliable estimates of complexity of surgical procedures per unit of time; and the lack of empirical data on time spent by surgeons in pre- and post-operative care all are clear limitations of our resource cost methodology. On the other hand, there is no reason to believe that CRVS values, based as they are on market prices, would necessarily reflect more accurately the resource costs. In particular, it appears that the CRVS does not recognize differences in the complexity of procedures over and beyond that reflected in operative time.

Comparison of Resource Cost Relative Values to Prevailing Medicare Charges and to California Relative Value Scale Values

Table 7 compares resource cost relative values to prevailing Medicare charges and CRVS values for those commonly performed surgical procedures for which charge data were available. The prevailing charges are for Massachusetts in 1978 and apply to specialists located in urban areas (HCFA, 1978). To facilitate comparisons, charges were converted to relative values standardized to inguinal hernia repair. In general, agreement between all three scales is extremely close for these selected procedures. The higher relative values for several procedures when "skin to skin" time alone is used ($RCRV_s$) disappear when estimates of pre- and post-operative time are incuded ($RCRV_T$).

Table 7

Resource Cost Relative Values Compared to Prevailing Medicare Charges And the Relative Value Study Values [1]

Surgical Procedure	Prevailing Medicare Charges (1978)[2]				
	$	Relative Value	$RCRV_R$[3]	$RCRV_T$[4]	CRVS[5]
Hemorrhoidectomy	271	0.8	0.8	0.9	0.5
Inguinal hernia repair	339	1.0	1.0	1.0	1.0
Appendectomy	339	1.0	0.9	1.0	1.1
Cholecystectomy	570	1.7	1.9	1.6	1.6
Hysterectomy	640	1.9	2.9	1.9	1.8
Lens extraction	678	2.0	2.6	1.7	2.2
Cystoscopy, diagnostic	68	0.2	0.4	. . .[6]	0.2
Suprapubic prostatectomy	720	2.1	2.1	1.8	2.2
Transurethral prostatic resection	678	2.0	1.9	1.6	2.2

[1] All values standardized to inguinal hernia repair at 1.0.
[2] Data on prevailing charges were available only for the procedures listed. Figures are for Massachusetts in 1978 and apply to specialists located in urban areas.
[3] Uses "skin to skin" time as the measure of physician time commitment.
[4] Incorporates both "skin to skin" time and estimates of time spent in pre- and post-operative care.
[5] California Relative Value Study (1969) values.
[6] Not calculated because no length of stay data available. Often done on an ambulatory basis.

Relative Values of Office Visits Based on Resource Costs

Interspecialty comparisons of the values of initial complete office visits are presented in Table 8. It was assumed that, regardless of specialty, an initial visit requires 30 minutes of a physician's time. Complexity factors for the surgical specialties were provided by the physicians interviewed; complexity for the medical specialties was assumed to be the average of those for surgical specialties. Relative to a general practitioner, values for initial office visits range from 0.9 for obstetrics and urology to 1.2 for an internal medicine subspecialty, general surgery, gynecology, and orthopedics. On this basis, values for follow-up visits, assuming a 15-minute duration and a complexity of 1.0, would range from 0.4 for a general practitioner to 0.6 for an internist with a subspecialty.

Table 9 presents values of initial and routine office visits relative to surgical procedures.

For comparisons between office visits and surgical procedures to be valid, account must be taken of the surgeon's effort in providing pre- and post-operative care as well as that in actually performing the operation. Hence, resource cost relative values represent the estimated total time commitment by surgeons. On this basis, values of initial office visits relative to inguinal hernia repair range from 0.17 for ophthalmology to 0.24 for orthopedics with a mean of 0.21. The relative value of a routine office visit for a general practitioner is 0.08; for all specialists it is 0.09.

Table 8

Interspecialty Comparisons of the Values of Initial Office Visits Based on Resource Costs

Specialty	Time (T)	Complexity Factor (C)	Opportunity Cost Factor (OC)	Overhead Factor (O)	(T)×(O)×(OC)×(O)	Values Relative To GP=1.0
General Practice	30[1]	1.2[2]	1.0	1.0	36	1.0
Internal Medicine	30	1.2[2]	1.1	0.97	38.4	1.1
Internal Medicine (sub-speciality)	30	1.2[2]	1.2	0.97	41.9	1.2
General Surgery	30	1.3	1.2	0.90	42.1	1.2
Obstetrics	30	1.0	1.15	0.94	32.4	0.9
Gynecology	30	1.3	1.15	0.94	42.4	1.2
Ophthalmology	30	1.0	1.15	0.92	31.7	0.9
Orthopedics	30	1.4	1.15	0.92	44.5	1.2
Urology	30	1.0	1.2	0.92	33.1	0.9

[1] Assumed time required for an average initial office visit.
[2] The average of estimates for surgical specialties was taken as the complexity factor for medical specialties.

Table 9

Values of Initial Office Visits Based on Resource Costs Relative To Surgical Procedures; By Specialty

Specialty	Initial Office Visit (T)×(C)×(OC)×(O)	Initial Office Visit Relative Value With Inguinal Hernia Repair =1.0	Routine Brief Office Visit (T)×(C)×(OC)×(O)	Routine Brief Office Visit Relative Value With Inguinal Hernia Repair =1.0
General Practice	36	0.19	15.0	0.08
Internal Medicine	38.4	0.21	16.0	0.09
Internal Medicine (sub-specialty)	41.9	0.23	17.5	0.09
General Surgery	42.1	0.23	16.2	0.09
Obstetrics	32.4	0.18	16.2	0.09
Gynecology	42.4	0.23	16.2	0.09
Ophthalmology	31.7	0.17	15.9	0.09
Orthopedics	44.5	0.24	15.9	0.09
Urology	33.1	0.18	16.6	0.09
Average for Specialists		0.21		0.09

Table 10

Relative Value of Office Visits Based On Resource Costs Compared to Prevailing Medicare Charges

Type of Visit	Prevailing Medicare Charges [1] $	Prevailing Medicare Charges [1] Relative Value [2]	Resource Cost Relative Value [2]	Projected $ Reimbursement If Prevailing Surgical Rates Applied [3]
Initial Complete Office Visit				
General Practitioner	$20	0.6	0.19	$64
Specialist	34	.10	0.21	71
Routine Brief Office Visit				
General Practitioner	10	.03	0.08	27
Specialist	15	.04	0.09	31

[1] Medicare charges are for Massachusetts in 1978 and apply to physicians located in urban areas.

[2] All relative values are standardized to inguinal hernia repair=1.0.

[3] Assumes the prevailing Medicare rate for an inguinal hernia repair ($339) is applied to office visits Figures rounded to nearest dollar

Comparison Between the Resource Cost Relative Values of Office Visits and Prevailing Medicare Charges

Comparison of resource cost relative values of office visits to prevailing Medicare charges (Table 10) reveals two important findings. First, it appears that general practitioners are being under-remunerated relative to specialists. On the basis of prevailing charges there is a 30-40 percent differential while resource cost estimates indicate that a 10 percent differential would be more appropriate. Second, resource cost relative values suggest that office visits are undervalued relative to surgical procedures. When the reimbursement rate for inguinal hernia repair is applied to resource cost relative values, the charge for an initial office visit to a specialist rises from the prevailing rate of $34 to $71 and a routine visit from $15 to $31, more than two-fold increases. Alternatively, it may be that surgical rates are inflated by a factor of two.

Hourly Rates of Remuneration Implied by Prevailing Medicare Charges

Table 11 presents implied hourly rates of remuneration under three sets of assumptions: (1) "skin to skin" time only is valued; (2) estimates of time spent in pre- and post-operative care is valued at $60/hour; and (3) 40 percent of the value of a surgical procedure is ascribed to pre- and post-operative care.

For office visits in 1978, the general practitioner and specialist grossed $40 and $60-68 per hour, respectively. Corresponding rates for time spent in surgery depend on which assumption is accepted with regard to the value of pre- and post-operative care. When no adjustment is made for pre- and post-operative care, the hourly rate of remuneration ranges from $310 per hour for an inguinal hernia repair to $788 per hour for a lens extraction. When pre- and post-operative care is valued at $60 per hour, the range is from $193 per hour for a hemorrhoidectomy to $679 per hour for a lens extraction. Finally, when 40 percent of the value of a surgical procedure is ascribed to pre- and post-operative care, the hourly rate is $186 for an inguinal hernia repair and $473 for a lens extraction. Even under the most conservative assumption the time in surgery is remunerated at between three and seven times that in office practice, with wide variations between specialties. Likewise, marked differences exist between specialties and between procedures within a specialty.

Table 11

Hourly Rates of Remuneration Implied by Prevailing Medicare Charges

Surgical Procedures	Prevailing Medicare Charges [1] (dollars)	Time in Minutes [2]	Dollars per hour in surgery [3]		
			No Adjustment	Estimated Time [4]	40% of value
Hemorrhoidectomy	271	50.6	322	193	193
Inguinal hernia repair, unilateral	339	65.7	310	218	186
Appendectomy	339	52.2	390	272	234
Cholecystectomy	570	94.5	362	275	217
Hysterectomy	640	112.3	342	279	205
Lens extraction	678	51.6	788	679	473
Suprapubic prostatectomy	720	84.3	512	399	307
TURP	678	68.3	596	475	358
Office Visits					
General Practitioner					
Initial	20	30	40		
Routine Brief	10	15	40		
Specialist					
Initial	34	30	68		
Routine Brief	15	15	60		

[1] Massachusetts, (1978).
[2] Study of Surgical Specialties in the U.S
[3] Adjusted for the proportion of total charge ascribed to pre- and post-operative care
[4] Adjusted by valuing the estimated time in pre- and post-operative care at $60/hour
[5] Estimates which appear to be reasonable in light of data from the National Ambulatory Medical Care Survey: 1975 Summary

Discussion

In the absence of a competitive market, alternatives to market mechanisms must be explored for setting the prices of medical services relative to one another. This need is particularly critical in the face of national health insurance proposals that aim to further reduce competition by centralizing decisions both with regard to the scope of coverage and the levels of reimbursements to be provided. This study demonstrates that analyzing the resource costs of medical services is feasible and could provide the basis for determining the values of medical and surgical services. The goal of such a relative value scale would be to ensure equitable reimbursement both for different services rendered by a given specialty and for services rendered by different specialties. An agency such as HCFA could then convert these relative values to dollar reimbursements by applying conversion factors tailored to geographical differences in the cost of living or to other policy considerations.

Methodologic Considerations

This study has emphasized the average time it takes a physician to provide a given service and the intensity or complexity of effort involved. Adjustments for interspecialty differences in the opportunity costs of training and overheard expenses were then made.

Time

Time is a universal measure of the value of human services and has the advantage of being subject to objective measurement. There can be little question of its importance as a resource cost. The time estimates we have used for intraoperative or "skin to skin" time and for initial and routine office visits were derived empirically in a large, well-organized study of surgical services in the United States, and these estimates appear to be reliable. Pre- and post-operative care is also critical to the successful outcome of surgery, however. Here the paucity of empirical data is striking, and our estimates of pre- and post-operative time involvement by the surgeon could be too high for some procedures and too low for others. Clearly, systematic studies of pre- and post-operative periods of care should be performed.

It can be argued that our decision to use the *average* time required to perform a given operation or to provide a certain type of office visit has the potential disadvantage of inducing physicians to avoid or to refer the difficult patient whose operation or diagnostic evaluation might take longer than average. Conversely, services provided in the tertiary care referral center, which routinely accepts such patients, would be undervalued. A flexible policy toward supplementing reimbursement for the well-documented and unusually complex case would help to answer this objection.

Complexity Per Unit of Time

The complexity of a service, though much more subjective in its estimation than time, is no less important in determining its relative value. There can be little argument that the skills or intensity of effort required by different medical and surgical services vary, and though complex procedures usually take longer, exceptions exist. For example, extraction of a lens requires less than an hour to perform but requires a high degree of manual dexterity and intense concentration. Conversely, varicose vein stripping is a relatively simple though lengthy procedure. Most would argue, and certainly current reimbursement schedules indicate, that lens extraction should be accorded a higher value despite its brevity.

Adjustment of the value of time for differences in its complexity would seem, therefore, to be essential. The challenge is to assess this parameter reliably. The direct scaling techniques used in this study have been widely applied in other utility assessments [2] (Johnson and Huber, 1977). The uniformity of the rank orders of procedures by complexity obtained from different surgeons within individual specialties was remarkable. This suggests that complexity can be reliably evaluated.

However, our estimates pose at least two problems: First, the sample of physicians from which they were obtained was both small and non-random. There is no reason to think, however, that responses were systematically biased unless physicians in Massachusetts see the world differently from their peers elsewhere.

Second, there is the possibility that estimates of complexity per unit of time are confounded by the inability of physicians to dissociate this measure from total operative time. Certainly, the indication is that "skin to skin" time and complexity are closely correlated (Figure 1). In an effort to mitigate this potential problem, time and complexity were combined by principal component analysis before opportunity cost and overhead factors were applied. These results are shown in Table 5.

Therefore, the major issues to be explored in future research are: (1) to validate our results in a more representative group of physicians, (2) to explore the question of whether different surgical specialties, as we assumed, really perform procedures with like spectrums of complexity and (3) to better define the extent to which the value of time should be adjusted for complexity. Is 4 to 1, 2 to 1, or some other number the appropriate range?

Opportunity Costs

The opportunity costs of training and overhead expenses of practice were incorporated into the determination of relative values to reflect systematic differences that exist between specialties. The thesis that the rate of return on investment in training should be the same between specialties seems undeniable.

Selection of the appropriate discount rate is hotly debated by economists. A change in the discount rate used to calculate the opportunity costs for investment in training from 7 percent to 10 percent would increase the differential in relative values between specialties by approximately two percent per additional year of training, but the relationship between procedures within a specialty would not be affected.

Major Findings

Among one-half of the surgical procedures studied, relative values for surgical procedures determined from resource costs are not greatly different from those of the California Relative Value Study or from current Medicare charges. There are significant differences in the other half of the surgical procedures studied, however dramatic differences are also demonstrated when surgical procedures are compared to office visits. On the basis of resource costs, the value of an initial diagnostic office visit to a specialist should be 21 percent that of an inguinal hernia repair; on the basis of prevailing charges it is only 10 percent, a more than two-fold discrepancy. After standardizing the variations in complexity among different procedures, the prevailing Medicare charges, expressed in terms of standardized hourly rates of reimbursement, range from $40 per hour for a general practitioner to more than $180 per hour for an ophthalmologist performing a lens extraction, even after making conservative adjustments for time spent in pre- and post-operative care. General surgeons, by comparison, tend to average between $150 and $200 per operating room hour for the surgical procedures examined. The question has to be raised as to whether these differences are justified and, if so, on what basis.

Policy Implications of a Relative Value System Based on Resource Costs

Resource cost relative values have the advantage over market prices in that they can be derived by an explicit process that is open to examination. Inequities within specialties and between specialties, therefore, can be readily identified and corrected. As changes in technology or the efficiency of medical providers occur, values can be adjusted, and when new procedures are developed, then can be equitably valued. Because relative values are converted into dollar reimbursements only after application of a conversion factor, the process of relative value determination, fundamentally a professional issue, can be separated from various policy issues. The appliction of financial incentives to induce redistribution of physicians among specialties or to encourage physicians to move to relatively under-served geographic areas of the country could operate primarily through control of the conversion factor. If, for example, it was felt that there were too many surgeons in one subspecialty and too few primary physicians, the appropriate federal agency could adjust the fees charged by each as a financial incentive until such time as the desired distribution between the specialties was achieved.

[2] Utility is a measurement of the level of satisfaction people obtain by consuming certain commodities or services

Policy decisions to control increases in the costs of physician services, likewise, could be achieved through the combination of utilization review and adjustment of the conversion factor used for relative values.

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Technical Note A

The sum of opportunity costs taken over the duration of residency programs can be expressed by:

$$Y=\sum_{t=1}^{a} X_t\,(1+r)^{a-t},\ (t=1,\ldots,a) \qquad (1)$$

where X_t = (GP salary$_t$ − resident salary$_t$) for a given year

r=interest rate or discount rate

a=number of years of residency program

t=counter for number of years from the beginning of residency.

Amortization of (Y) over the career lifetime provides an estimate of how much more a specialist should be paid per year than a GP to compensate him for his foregone earnings. Assuming that the differential to be paid is constant over time, the following equation can be solved for an estimate of its magnitude:

$$Y=\sum_{b=1}^{n-a} \frac{\delta}{(1+r)^b},\ (b=1,\ldots,(n-a)) \qquad (2)$$

where n = career lifetime from the beginning of residency

δ=the differential amount to be paid to specialists per year

b=counter for number of years from the completion of residency.

Rearranging (2) leads to:

$$\delta=\left[\sum_{b=1}^{n-a}\frac{1}{(1+r)^b}\right]^{-1} Y,\ (b=1,\ldots,(n-a)) \qquad (3)$$

An expression for the series sum in the brackets is:

$$\sum_{b=1}^{n-a}\frac{1}{(1+r)^b}=\frac{(1+r)^{n-a}-1}{r(1+r)^{n-a}} \qquad (4)$$

Equation (3) can be rewritten:

$$\delta=\left[\frac{(1+r)^{n-a}-1}{r(1+r)^{n-a}}\right]^{-1}\left[\sum_{t=1}^{a} X_t(1+r)^{a-t}\right] \qquad (5)$$

Technical Note B

Principal Component Analysis

First, a log transformation of data was performed:

$$m_{jk}=\log\left(\frac{x_{jk}}{s_{xj}}\right) \text{ where: } \begin{matrix} j=1,2 \\ k=1,\ldots,n \end{matrix} \qquad (1)$$

The resultant values were standardized and the factor score, f_{ik}, was obtained as:

$$f_{1k}=b_{11}\left(\frac{m_{1k}-m_1}{s_{m1}}\right)+b_{21}\left(\frac{m_{2k}-m_2}{s_{m2}}\right)$$
$$=\left(\frac{b_{11}}{s_{m1}}\right)m_{1k}+\left(\frac{b_{21}}{s_{m2}}\right)m_{2k}-\underbrace{\left(\frac{b_{11}m_1}{s_{m1}}+\frac{b_{21}m_2}{s_{m2}}\right)}_{c} \qquad (2)$$

$$f_{ik}=v_1m_{1k}+v_2m_{2k}-c \qquad (3)$$

(where v_j, the weight, $=\frac{b_{j1}}{s_{mj}}$) and k=1 . . . . n)

If we divide both sides of the equation by (v_1+v_2) and denote $v_j/(v_1+v_2)=w_j$ and $C/(C_1+C_2)=-c'$, we then have:

$$\frac{f_{1k}}{v_1+v_2}=w_1m_{1k}+w_2m_{2k}+c'$$
$$=w_1\log\frac{x_{1k}}{s_{x1}}+w_2\log\frac{x_{2k}}{s_{x2}}+\log c'' \text{ (where } c'=\log c''. \qquad (4)$$

By taking exponentials we obtain:

$$\exp\left(\frac{f_{1k}}{v_1+v_2}\right)=c''\left(\frac{x_{1k}}{s_{x1}}\right)^{w_1}\left(\frac{x_{2k}}{s_{x2}}\right)^{w_2} \qquad (5)$$

where c'' is a constant for all k=1, . . . , n. Both sides of the equation are divided by c''. The relative value, Y_k^M, thus becomes:

$$Y_k^M=\left(\frac{x_{1k}}{s_{x1}}\right)^{w_1}\left(\frac{x_{2k}}{s_{x2}}\right)^{w_2} \qquad (6)$$

where $w_1+w_2=1$ and k=1, . . . n. The constraint $w_1+w_2=1$ has been imposed so that if both time and complexity for a certain procedure are multiplied by a constant, the relative value of that procedure will be also multiplied by the same constant.

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Chapter 4

Health Insurance Market

I. Introduction

Health insurance experienced a rapid rate of growth since the 1940's. Most Americans now have some insurance protection against the high cost of medical care. Virtually all families with one or more persons in the household employed, have purchased insurance from private companies. People age 65 and over and non-employed people are covered by public insurance programs. Widespread insurance protection has built up a large health insurance industry that consists of two types of firms, commercial companies and non-profit Blue Shield plans. Commercial insurers are organized on either a for-profit or non-profit basis. In 1979, the health insurance industry received $64.9 billion in premium income and paid out $58.1 billion in claims.[1] 63.4% of the cost of physician services were paid by health insurance.[2] As a consequence, the behavior of health insurance firms have profound effects on consumer behavior in demanding medical care and on physician income.

A typical surgeon receives more than three-fourths of his professional income from health insurers. A typical internist receives 60% of his professional income from insurance payments. The economic well-being of physicians are directly related to what type of services are covered by insurance, how much would insurance pay and how the claims for reimbursement are controlled and processed. These decisions of health insurers, in a major part, were results of insurance market structures.

In the past few years, insurance industry has also developed and supported alternative organizational form of medical services to compete with the fee-for-service sector. Besides the closed panel HMO's, the emergence of preferred provider organizations (PPO), independent practitioners associations (IPA), physician network, etc. have altered the competition for physician services. But our study is focused on the roles of traditional insurers and their relationship with the fee-for-service doctors. The increasing market competition due to alternative provider organizations and rising supply of physicians is beyond the scope of this research project.

This chapter presents the findings from a study of the health insurance industry and its market behavior. The phenomenal growth of health insurance and its important impact on the supply and demand for medical services is analyzed first. Then we discuss in some detail the structure of the health insurance market and the regulatory constraints in which it operates. Next the two types of firms in this industry - commercial and Blue Cross/Blue Shield plans - are analyzed. We develop an economic model of the insurance firms and use it to study the extent to which market structure affects the price and quantity decision of the firms. This analysis sheds light on some peculiar economic behaviors of health insurers, which, in the past, had perplexed economists and policymakers.

II. Spurt of Health Insurance and its Effects

Private health insurance has enjoyed spectacular growth in recent decades. Since 1950 the number of people covered rapidly rose from 82 million (53% of the population) to 168 million in 1977 (78% of the population).[3] The statistics of the aggregate growth rate does not tell the whole story, however.

Health insurance coverage varies. Some plans cover only inpatient hospital expenses, others may cover only surgeons' charges, while a comprehensive plan may cover all medical expenses including drugs, dental care and eye glasses. In addition to these variations in coverage, health insurance products differ in their scope of coverage. Service contracts insure the payment for specified medical services regardless of what the providers charge. Indemnity contracts pay only a pre-scheduled amount for each specific service. Methods of reimbursement also vary. Blue Shield plans pay participating physicians directly. Commercial insurers make their payments to the patients and leave it to the patients to meet their financial obligations.

The growth rate varies for private insurance coverage of different types of medical services. The average annual growth rate in the number of people covered for hospital care was 4.0% between 1950-74, while the growth rate for coverage of physicians' services was 5.3% during the same period.[4] While more people purchased insurance for physician services, the scope and depth of this insurance grew at an even more rapid pace. Figure 4.1 shows that in 1950, the percent of expenditures for hospital care and physician services paid by third party payors were 66.6% and 16.5% respectively. By 1960, 77.7% of hospital expenditures were paid by third party payors while physicians received 34.4% of their gross income from insurance. By 1970, insurance paid 88.5% of the hospital expenditures while it reimbursed 55.8% of expenditures for physician care. By 1979, 90.8% of hospital and 63.4% of physician expenditures were paid by third party.[5]

The expansion of health insurance coverage has a decided influence on the demand and supply of medical services. Increase in coverage reduces

the out-of-pocket cost of medical services to patients. With the decline of the net price to the patient, the demand for services will rise. Many econometric studies have estimated the price elasticity of demand. Also a large social experiment financed by the federal government, conducted by the Rand Corporation, has been collecting more reliable experimental data to measure the elasticity of demand. The general results from numerous econometric studies and from the Rand study show the price elasticity for all medical services is around -0.25 and it varies among different kinds of medical services. The variation in the price elasticity between hospital admission to ambulatory care ranges from -.15 to -0.6.[6]

Health insurance affects economic efficiency in another way. Consumers usually purchase insurance while they are healthy. But their demand for medical services occur when they are sick. If a healthy consumer has perfect knowledge of his own risk aversion and his state-of-preference while he is sick, then he would purchase the correct insurance and thus is no distortion of economic efficiency. However, myopic vision seems to be more prevalent than perfect foresight among human beings.

A healthy person frequently underestimates his likelihood of becoming seriously ill. Both psychologists and economists have studied and confirmed this problem. A healthy person also may not be able to correctly assess his state-of-preference when he is sick. He tends to underestimate his demand. These myopic visions, combined with a less than full knowledge of health insurance coverage results in distortion of economic efficiency.

A consumer may decide to buy an insurance with limited coverage. But when he becomes ill, he demands any service that has a marginal medical benefit to him. When the cost of the service is not covered under his

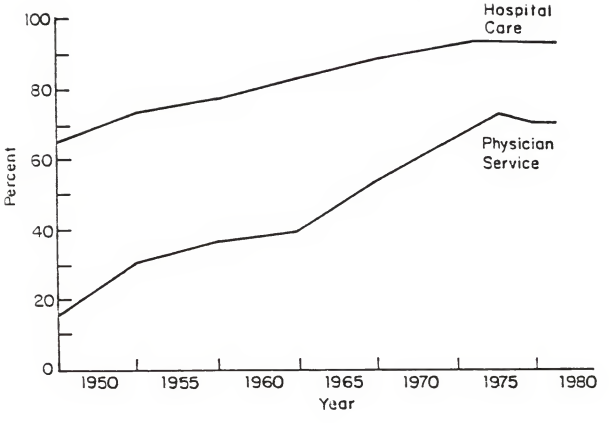

Hospital Care
Physician Service
Percent
100
80
60
40
20
0
1950
1955
1960
1965
1970
1975
1980
Year

Figure 4.1

insurance, he, nevertheless, exerts pressure on the insurance firm to pay for it. If the insurance is purchased through his place of employment, the pressure is applied to the employer. The employer feels most vulnerable to this pressure because it wants to maintain good labor relations. Frequently an employer finds it necessary to pressure the insurer to pay the claim as well as expand its insurance coverage to its employees. We found in our field study that insurance firms and employers constantly cited this behavior pattern as a serious problem. They acknowledge their inability to withstand the pressure from the small group of employees whose ex-post demands for payment by insurance differ significantly from their ex-ante demands. A recent study conducted by Harvey Sopolsky also confirmed our findings.[7]

With an increasing proportion of physicians' income paid by insurance, the reimbursement policy and product design of health insurers have a striking effect on decisions made by physicians. When a patient becomes ill, he does not demand a specific medical procedure. That decision is largely made by the doctor. Professional judgment unquestionably plays a major role in the physician's selection of the best diagnostic or therapeutic procedure. The marginal effects of economic incentives can be especially strong when two procedures are about equally effective to treat an illness, or when a procedure can be performed either on an ambulatory or an inpatient basis.

The decision to cover a medical procedure under insurance and the price level for its reimbursement have significant effects on physician behavior. Selecting particular medical technology to treat a patient depends in part on whether that modality of treatment will be paid by

insurance. Not only does the quantity of service offered by physicians vary with insurance coverage, but quality of services as well. A routine office visit could take five minutes to fifteen minutes. A physician has significant control over the time he spends with a patient. This was well documented under the Medicaid Program. When Medicaid reduced its payment for routine office visits, the length of time the doctor spent with the patient was reduced proportionally. Breast cancer could be treated with partial or radical mastectomy. When a Blue Shield plan increased its relative reimbursement for partial mastectomy over the radical procedure, there was a corresponding change in the two surgical rates.

Health insurance, therefore, not only influences patients' demand for medical care, it also affects the physician's choice of medical technology and modality of treatment.

III. Market Structure and Regulation of Health Insurance

Approximately 153 million people under 65, 80% of the population, purchased insurance to cover the cost of services rendered by physicians in 1977. About 98% of the population over age 65 were covered through government programs.[8] Most health insurance is purchased by the employer as fringe benefits for employees. The buyer's market is atomistic. In 1980, there were 2,105,000 active corporations in the United States, most of which offered health insurance to their employees, especially firms that employ more than five persons. In addition to the corporations, there were 11,358,000 proprietorships, a majority of which offered insurance to their employees.[9]

Most health insurance is purchased by the consumer on a group basis. Group insurance is bought through a person's place of employment, professional association, or labor union. There are two principal competitive advantages to group insurance. First, it reduces adverse selection - the probability that only persons with significant health risks will choose to be insured. Group insurance contracts normally require 75% of the employees of a firm (or any group) to be enrolled in the insurance plan. Thus, the risks to be covered are likely to be similar to the health conditions of the general population. In most cases, employers contribute a significant portion of the premium to encourage employees to enroll. This not only reduces the direct payment by the employees but there is a tax incentive for the employees to have this arrangement because the employer's contribution is not taxable to the employees as income.

Another advantage of group health insurance is low sales and administrative cost. A product is sold to the employer or a union whose members are in thousands. The marketing efforts only have to be directed to one central agent, not to thousands of individual employees. The choice of benefit plans is usually limited. Enrollment and premium collection are performed through the employers as a small incremental step in its personnel and salary administration. As a result, the expenses related to selling and administration becomes greatly reduced due to the economies of scale.

Individual insurance is sold directly to individuals. The selling expense becomes extremely high, usually about 20-25% of the premium. These increased sale costs are caused by the time and effort required to contact each individual prospective buyer. More important, the risk for individual

health insurance is much greater due to the adverse selection by the prospective buyer. Those who are in poor health with greater need for medical services have stronger incentive to purchase health insurance. Yet, the underwriting procedure used by insurance organizations can only give crude and approximate assessment of the risk being insured. The collection and evaluation of underwriting can be very costly. There is a question of cost and effectiveness related to how much information can be obtained and used. Moreover, a buyer always has more complete knowledge of his own medical history, his own expected utilization of medical services and his own preferences of medical care. No underwriting procedure can be established to obtain complete information about these variables.

As of 1977, 73.5% of Americans under age 65, 159.1 million people, were covered by group insurance with payment of 36.8 billion dollars of premium. Another 10.4% of Americans, 22.6 million people are covered by individual insurance, with payment of 5.7 billion dollars.[10] People who are over age 65 and eligible for Medicare are insured by the federal government. However, the government contracts Blue Shield plans and commercial insurance companies as intermediaries to pay the claims. Although the policies for reimbursement are set by the federal government, the insurance organizations play a large role in the government's decisions by advising the government agency on its administrative feasibility. Insurers tell the government what levels of fees are being paid now, what fees are acceptable to physicians, what medical procedures are being excluded from insurance contracts now, the feasibility of monitoring the unacceptably high fees and reviewing the medical necessity of a procedure. Therefore, it is not surprising then that the reimbursement policies adopted for the Medicare

program are quite similar to those of private health insurance contracts, such as physicians would be paid on a reasonable and customary basis.[11]

The producer's side of the health insurance market consists of two types of firms, Blue Shield plans and commercial companies. The Blue Shield organization, "was born out of the depression and the need of doctors to protect their incomes."[12] Each Blue Shield plan is a regional organization and only one such plan available in each geographical area. The Blue Shield plans are non-profit, usually with close ties to physicians. Now there are 69 plans in the United States.

Blue Shield plans are autonomous corporations usually organized under special state "enabling acts" intended primarily to treat this type of insurance as special non-profit firms and to exempt them from the regular insurance laws. A separate body, National Association Blue Shield Plans, was set up to certify and coordinate the local plan. In each region, there is only one Blue Shield plan as compared to dozens of commercial insurers who compete with each other in one region. The plans enjoy a certain degree of monopolistic power, by differentiating their product as a community service offered by a non-profit organization rather as a product offered by a commercial firm. Also, Blue Shield plans offer service benefits rather than cash indemnities. Service benefits are contracts in which an insurance firm assures the buyer a certain quantity of necessary medical services such as a day in the hospital or a visit to the physician's office, regardless how much each unit of service costs. These are usually provided through contractual agreements between the insurer, the participating doctor, and the hospital.

The other type of health insurers are the commercial firms, most of them have been in business for more than 100 years. Commercial insurers usually offer products besides health insurance. Most of these companies began by offering insurance against financial loss due to death or disability. Later their products expanded into offering retirement annuities and pensions. Health insurance was a more recent product, developed in the 1920's. Initially, health insurance was an employee benefit plan offered by commercial firms as part of total insurance protection along with life insurance and pensions.

About one-half of the commercial companies are for-profit organizations, owned by stockholders. The remainder are non-profit organizations, owned by their policyholders. The non-profit commercial insurers are called mutual companies. The primary objective of the commercial stock insurers is earning a profit. While profit is a lesser concern to the mutual companies, they are, nevertheless, interested in maintaining a yearly surplus between earned income and claim payments. The surplus provides the basic financial stability for the mutual companies. This is explained more fully in the next section of this chapter.

The product differentiation between Blue Shield plans and commercial firms is significant; most commercial firms offer a wide range of products that reimburse patients for their financial loss ranging from indemnity plans to full payment without any deductible or coinsurance. But they cannot offer a coverage which provides a medical service by participating doctors; Blue Shield plans have monopoly over this product. At the same time, Blue Shield competes with commercial firms by offering indemnity insurance and products with cost sharing.

Among commercial firms, it is often difficult to distinguish one company's product from another because most firms would tailor their insurance provisions to the buyer's demand. Commercial firms can only differentiate their products by better administrative service for claim processing.

Blue Shield plans comprise 38% of the insurance market for physician services.[13] Market share varies greatly among regions; it ranges from 5% in Northern California to 60% in Massachusetts.[14]

Commercial insurance firms have 53% of the market. (The other 9% are independent plans). There are more than six hundred corporations selling medical insurance, with only the larger ones operating on a nationwide basis. The share of the commercial market by the top twenty-five firms are shown on Table 4.1. The top four firms have 24% of the commercial market and that is 13.3% of the total health insurance market.

Table 4.1 - Market Share of the Top Twenty-Five Commercial Firms

	Share of the Commercial Market	Share of the Total Health Insurance Market
Top 4 firms	23.52%	13.31%
Top 10 firms	40.39%	22.87%
Top 15 firms	47.85%	27.09%
Top 20 firms	53.67%	30.37%
Top 25 firms	57.95%	32.79%

Source: National Underwriter, Life/Health Edition, "Health Insurance Review, Rankings for 1979" pp. 26-30, June 21, 1980.

The commercial insurance market is segregated into national and regional markets for several reasons. First, in order for a firm to operate in all states, it must be licensed in all states. Since insurance is regulated at the state level, each political jurisdiction has its own laws and regulations governing licensing, insurance policy forms, and reporting requirements. The fixed cost can be quite high for satisfying each state's regulatory demands. Second, the insurance firm must invest manpower and capital for sales, service, and claim operations in each region that it wants to conduct business. These investments can be substantial. Third, the group insurance buyers are divided between national firms and regional companies. The large industrial companies operate on a nationwide basis. When an insurance sale is made to a national company, the insurer must be able to service the employees of the company wherever they live. On the other hand there are many companies which only operate in one region, their employees live in the community where the plant or the store is located. The insurer can sale to and service these regional companies with a license in that particular state without being a national insurer.

The competitiveness of the health insurance market can be deduced by the net profit earned by both commercial firms and Blue Shield plans. From 1974-1977, the top twenty (of the top thirty) commercial firms earned average annual profits, after taxes, of 84 million dollars (in current dollars). The profit is the sum of underwriting gains plus investment income. The average sales per year, represented by the total income from premium collections and investments, amount to 12.9 billion dollars per year. Average annual profit then was less than 0.7% of sales or about 6% net

return on the equity invested by insurers on this product.[15]

Blue Shield plans fared better. They earned a higher surplus. In the three years 1974-1977, all plans earned an average net income after taxes of 89 million dollars per year which equals approximately 1.2% of sales. The explanation for Blue Shield plans' better financial performance is given in the next section of this chapter.[16]

Regulation of health insurance is delegated to the states by the McCarran-Ferguson Act, passed by the Congress in 1945. This Act holds that relevant federal laws could apply to insurance only "to the extent that such business is not regulated by state law."[17] With the passage of the McCarran Act, every state has passed laws to regulate insurance in order to avoid federal legislation.

All state regulations concentrate on a few commercial aspects of the insurance business and assure its financial soundness. The laws establish standards that maintain financial solvency of the firms, protect the public against fraud and deception, and assure fairness in business practices. Accordingly, states have established minimum requirements for the initial capitalization for incorporation, setting minimum and maximum standards on reserves, requiring the filing of insurance policy forms and premium rates, and regulating investments.

Regulation of initial minimum capital for incorporation could create a barrier to entry. However, the required amounts set by states are modest; they range from a low of $150,000 for Arizona and New York to a high of $1,500,000 for Michigan. Most states require somewhere between $400,000 and $1,000,000 of initial capital to incorporate a firm that sells health insurance.[18] With these modest standards, the capital requirements have not

impeded entry in any significant way, as is evidenced by the many firms which sell commercial health insurance.

Insurance regulation is mainly concerned in protecting the solvency of the insurance firm so it has the funds to meet its future obligations. Insurance coverage is a long term contract where the buyer pays a premium in advance in exchange for the insurer to indemnify him if a specified financial loss occurs in the future. The difference in time between the payment of premium and claim liability vary by type of insurance. Life insurance purchased at age 30, covering a person over his whole life time can expect the claim to be paid out 40 years later. Retirement insurance has similar time lag. Health insurance, a yearly term product, has a much shorter time differential between payment of premium and claim. It averages between 4-6 months. Nevertheless, insurance regulations were developed during a period when life insurance and pension were almost the total product portfolio of insurers. Even now, only one-third of the premium incomes of commercial insurers are derived from health insurance products. As a result, insurance regulations are mainly focused on protecting the long term solvency of insurers.

Both stock and mutual companies are required by law to accumulate surplus to protect themselves against uncertain contingencies. Some states set a maximum limit on the surplus, expressed as a percent of the company's claim liability. But these limits were usually set very high, they have limited effects on the behavior of mutual companies. Only the old established mutual firms which have accumulated a large surplus are affected. The ability for most mutual firms to earn and to keep its surplus is more limited by price competition from stock companies.

The premium rates of commercial group health insurance products are not truly regulated. Firms must file their rates in advance, before the product is marketed. Rates are subject to on-going review rather than prior approval. The filing is for information only. However, rates for individual health insurance products are treated differently. Most states require the expected claims loss to be at least 60% of the premium. In other words, the sum of selling expenses, administrative costs, risk premium and profit margin cannot exceed 40% of the premium.[19]

Most Blue Shield plans are not regulated by insurance laws. Forty-two states have placed Blue Shield plans under some form of special regulation. The several reasons for this are firstly, the non-profit plans would be subject to premium tax and corporation income taxes unless special treatment is given. And secondly, the legal codes for commercial insurers are usually brief, direct and simply worded. They are not appropriate for regulating the financial transactions for services performed by a profession which is already regulated by personal licensure. Thirdly, corporate laws mainly regulate financial standards and commercial deception, and do not directly address the basic nature of a non-profit organization offering pre-paid medical services. Consequently, most states enacted special legislation to regulate Blue Shield plans.[20]

The initial capital requirement to incorporate a Blue Shield plan is much lower than for commercial companies, ranging from a low of $23,000 in Alabama to the highest of $500,000 in Minnesota.[21] Entry has not been impeded as evidenced by the fact that every region in the United States has a plan. The premium rates of Blue Shield plans are more tightly controlled by regulation. In most states, the rates have to be approved in advance by

a regulatory agency in order to assure the financial surplus of the plan to be kept at a reasonable level. This is done by keeping the premium rates at such a level that excessive surplus cannot accrue.

IV. Insurance Firms and Market Performance

Commercial Firms

With very few exceptions, commercial companies offer other insurance products besides health protection. On the whole, premium income from health insurance comprises about one-third of the company's total income.[22] The other two-thirds come from life, pension and disability. However, commercial companies derive no underwriting gain (i.e., profit from operations, excluding profits from investment income) recently from health insurance. Instead, they lost 836 million dollars in 1977 and this has been the case for the past several years.[23] But the insurers did offset most of the financial losses with investment income earned from reserve funds they held for claims not filed yet, but expected to be paid later. In the same year, profits earned from life, pension, and disability insurance totaled to approximately 5 billion dollars.[24]

commercial insurers had experienced that consumers are much more aware of the need for insurance to protect against high medical cost than insuring against other kinds of risks. The stronger preference for health insurance may have risen from the relatively high frequency of illness. Most Americans see their physicians at least once a year. One out of seven Americans are hospitalized each year.[25] The frequent need for some kind of medical service may have led the consumers to become aware of the possibilities of becoming seriously ill, requiring expensive treatment. As a result, consumers' preference for health insurance may be greater than for other types of insurance. This situation makes it much easier for health insurance sales personnel to gain access to buyers of insurance. But once a face-to-face contact has been made, the salesman has an opportunity to

sell other types of insurance. Often, Commercial insurers are willing to take a loss or just break even financially on health insurance products in order to increase their chances of selling other more profitable insurance products to the buyer. Other insurance products are more profitable because they insure long term risks such as life or retirement benefits where consumers are less certain about the risk they face. The joint marketing and administration between health insurance and other insurance make it difficult to ascertain accurately the true profitability or loss of health insurance as a separate product.

Between the two types of commercial insurance firms, stock and mutual, the former behaves like the typical competitive firm, maximizes its profit. Every stock company must earn a competitive rate of return on its stockholder's equity, otherwise its stock price will fall. In that case, the Board of Directors become dissatisfied and also the firm faces greater probability of being taken over by another company. A number of commercial firms were taken over by industrial corporations during the past two decades when the profits of the insurance firms fell below the competitive level.

But corporate managers are concerned about the profit not only in the short run, they are also concerned about the profit for the long run. This is especially true in the insurance business. Insurance is a long-term business where the liabilities may not be paid out until decades later. The profit from life insurance, disability insurance, and pension is not realized until years and perhaps decades after the insurance is sold to clients.

Mutual companies were consumer cooperatives organized by various sponsoring groups, including fraternal organizations, artisan guilds, and religious groups. An assessment may be charged against each member of a mutual company to provide the initial capital needed. The original motives for organizing the mutuals were clear. First, members wanted to obtain insurance at minimum cost. Second, the companies were organized during a period when insurance was under-developed because reliable statistics on risks were scarce. This deficiency had deterred entrepreneurs from going into the insurance business.

The present corporate objective function of mutual companies can best be analyzed by examining the evolution of these companies. A mutual company begins as an open-ended consumer cooperative where the organizing members elect a board of directors which selects the management. Let p denote the premium rate, I represents insurance quantity. E(LOSS) denotes the expected loss per unit of insurance, CRXi represents the legal contingency reserve required per unit of insurance, AS denotes the initial assessment per unit of insurance, C is the administrative cost of insurance.

We assume an assessment is initially made against every member. The profit function of the mutual company can be written as:

$$\Pi = pI - \left(\sum_{i=1}^{n} E(LOSS)_i + \sum_{i=1}^{n} CRX_i \right) - C$$

$$p = MLOSS + MCRX + MC$$

where MLOS, MCRX, MC denote marginal expected loss, marginal contingency reserve and marginal administrative cost respectively. The price equals

marginal cost. We assume the member has been assessed an amount which equals MCRX, to satisfy the legal requirements for capitalization of an insurance firm and to provide adequate reserve for unusual contingencies. Then premium equals:

$$p = MLOSS + MC$$

At the end of a period when all the initial members had either cancelled their insurance or died, and if the actual claim loss = E(LOSS), then the company's management would have retained the $\sum_{i=1}^{n} CRX_i$. The original assessment has been kept by the company rather than returned to the members because of two reasons: (1) U.S. courts have ruled that members' interest is limited to the insurance benefits specified in the insurance contract. One of these benefits may be the right to share in divisible surplus, but this is limited to dividends as determined by the company as a going concern;[26] Since the company needs a minimum initial capital contingency reserve to stay in business, it can retain a large portion of the assessment. (2) It takes considerable effort to form a strong coalition of members in order to obtain a refund of a large portion of the assessment. Each member paid a small assessment, and therefore, he lacks strong incentive to invest a substantial amount of effort in getting back the assessment. Also, a member can let other members press for a refund, and he can be a free rider. Since the original members' ownership can't be sold or bought, there are no tradeable equity shares for a mutual company. Therefore, their equity claim over the company is weak. Members' ownership of the company ceases when their insurance policies end. In addition, the members' claims over the company is further weakened when they can't capture any long term profit of the company through tradeable shares.

When the original members of a mutual company have all terminated, there is no residual claimant over the retained assessment and thus no equity holder representative control over the management. As a result, the management may pursue their own objectives without the constraints from stockholders.

We observed in our field study that management of mutual companies nominate their own boards and attempt to maximize a utility function which has two major attributes: profit and amenities for employees. Accumulated profits provide the company with a buffer against any financial adversity and thus maintain the long term viability and stability of the firm. Increased amenities enhance the management's own non-monetary income and promote congeniality and harmony within the company. The increased satisfaction among its employees reduces the chance of any insider who might organize the employees to challenge the existing management.

Over a long period of years, the old mutual insurance companies were able to accumulate a substantial sum of surplus since they did not have to pay out their earnings to members. As a result, many long established mutuals have surplus approaching the legal limits. The manner by which they react to this situation determines the partial market equilibrium between stock and mutual firms.

We assume the commercial health insurance market is competitive. The stock companies try to maximize their profits. The mutual companies try to maximize their utility function constrained by competition from the stock companies. Before the mutual firm's surplus reaches the maximum limit set by the regulatory authority, the market equilibrium condition would be the same as one under pure competition where the mutual firm with lower cost

functions earn a quasi-rent. But the equilibrium condition would be altered when the mutual firm has accumulated surplus equal to the legal limit.

Since the regulations address the surplus level and not the premium rate, the mutual firm can reduce its premium and/or increase the amenities to its employees when the firm's surplus is at the legal maximum. If the premium is lowered, the quantity sold will increase until the marginal cost equals marginal revenue. The lesser efficient stock firms will be forced out of the market.

On the other hand, the mutual firm may decide to increase its fringe benefits and amenities to its employees to maintain a better labor relations. This action will elevate the cost functions and reduce its earned surplus. There are indications that the mutual firm's reaction to surplus regulation embraces both price reduction and increase in administrative costs. Studies done by Life Office Management Association show consistently that the average cost for administration in mutual firms are 3-5% higher than stock companies.[27] At the same time, the premium rates of mutual insurers are slightly lower than those of stock companies.

One question remains. Would there be new entries of mutual firms which might alter the equilibrium condition in the commercial insurance market? The answer has to be divided into two parts: first, the formation of new mutual firms, and second, new entries into a regional or national market.

The likelihood of a new mutual insurer being formed is slight. The conditions which fostered the formation of mutual companies are largely gone. Health insurance is readily available to consumers who demand it.

Now hundreds of insurers are selling insurance. The supply side of the market is well organized. There is no need for a group or a person to make the entrepreneurial efforts and contribute some of the initial capital to organize a new mutual insurance firm. More importantly, the established mutual companies can produce insurance at a cost less than the rate a new mutual company can offer because the old firms have retained assessments from their terminated members.

On the other hand, currently there are numerous mutual companies which operate only in a given region. If the national market condition becomes such that mutual firms can earn an excess profit, then some existing regional firms may enter into the national market, provided the excess profit is sufficient to cover the initial cost of obtaining licenses in all states, and establishing necessary sales and claim centers to service the consumers. The same reasoning can be extended to each regional market. Whenever its market condition provides a long term excess profit, other regional insurers would try to enter.

However, before the equilibrium condition of the health insurance market can be examined, we must first turn our attention to another major type of firm, Blue Shield plans which compete with commercial health insurers. We would have to analyze their operations to determine how they affect the market conditions.

Blue Shield Plans

Blue Shield plans were organized as producer cooperatives. Physicians sponsored the Blue Shield plans to make health insurance available and reduced their loss to bad debts and to reduce the financial hardship of

illness on their patients. The initial capital of many plans was paid by "participating" physicians through assessments. Plans were formed as non-profit community service organizations. The enabling legislations forbade any issuance of equity shares by which physicians could directly share in the profits of the plans.[28] The original membership could not be bought or sold, their ownership ceases when a physician terminates his membership voluntarily or by death.

As the initial group of participating doctors passed out of existence, the equity claim of physicians over the Blue Shield plans weakened. In addition, as greater numbers of Blue Shield plans merge with Blue Cross plans, the control of doctors over the plans is further reduced because now the Board of Directors is composed of other medical providers besides physicians. Currently, thirty-five percent of the plans are merged.[29] As the control by physicians diminishes, the management of Blue Shield plans have become more independent and able to establish their own objective functions.

We assume that Blue Shield plans maximize their total surplus. In our field study, the board members and the management of Blue Shield plans repeatedly and consistently emphasized that their corporate mission is to provide continuous community services in prepaying medical services, not an ordinary insurance operation. But in order to achieve its goal, they must maintain the long term viability of the organization by assuring its financial condition is sound. Their desire to accumulate a large financial surplus to give the plan both stability and security is exceedingly strong. In addition to the initial small contribution of capital when the Blue Shield plan was formed, the firm must rely on the profit it can earn to

strengthen its surplus position. That depends on the market price and the cost of production.

Blue Shield's cost function is less than those of commercial companies. In many states, the Blue Shield plan is exempt from premium tax which typically range from 2-3% of the premium. More significantly, participating physicians of the Blue Shield plan usually give the firm a discount on its charges. For example, in Massachusetts almost all physicians sign an agreement with the Blue Shield plan to be participating doctors. The Blue Shield plan pays only 95% of what physicians charge as the full payment. The reasons for physicians to give such a financial advantage to Blue Shield is explained in Chapter 4. The Blue Shield plan pays hospitals for outpatient services and laboratory tests based on their actual cost, while commercial firms pay charges. The charges usually exceed the cost by 10% in 1980. In sum, the claim cost and tax liability of Blue Shield totals approximately 5% - 8% less than what the commercial firms have to pay.

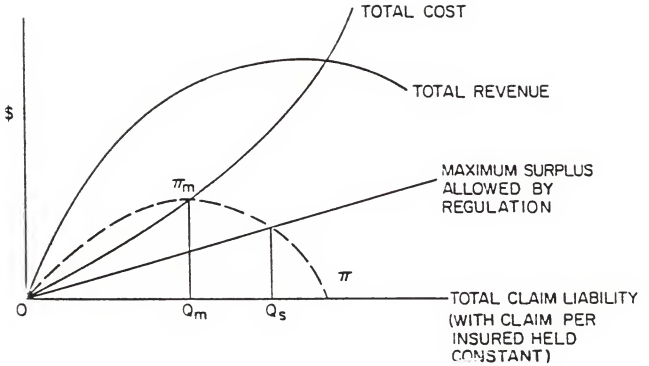
Every Blue Shield plan enjoys some monopolistic power. In each region the National Blue Shield Association only certifies one Blue Shield plan. While commercial firms compete with Blue Shield firms, they can't offer one important product, the service insurance. Physicians who initially organized the Blue Shield plans, have traditionally entered into a contractual agreement with Blue Shield to supply whatever medical services that a patient needs and accept the payment sent by Blue Shield as the payment in full. Commercial firms have not been able to offer the same product. They can only indemnify the insured for any financial losses resulted from illness. The amount of indemnity may not necessarily cover the charges made

by the physician. Therefore, the Blue Shield plan has a monopoly on service insurance.

The regulatory agencies recognize the potential problem that Blue Shield plans could accumulate a very large surplus because of their monopolistic power and their cost advantages over commercial firms. As a result, most states regulate the premium rates of insurance offered by plans and set maximum limits on their surplus. Each time a Blue Shield plan wants to change its rates, it must receive prior approval from a state agency. In the majority of states, Insurance Commissioners were given this responsibility. They review the estimated claim costs, the level of administrative expenses and then set the reasonable level of surplus the plan allows to maintain. Regulatory agencies usually set the surplus level as a percent of expected claim cost.

A Model of Health Insurance Industry

We assume that the Blue Shield plan has monopolistic power in the market because it has lower cost and is able to differentiate its product, thus has captured a large share of the market. Therefore, the Blue Shield plan can set prices. The firm faces a downward demand curve and maximizes surplus (S) subject to the regulatory constraint. The surplus is regulated as a percent of claim liability [$S = f(CL)$] which is the expected loss calculated from a known probability density function of a risk. The surplus is evaluated at the end of each year which enters into the determination of next year's premium rates. Claim liability can be viewed as analogous to the input factor cost, excluding the administrative and sales expenses. Figure 4.2 illustrates the relationship between total costs, total revenue, and profit of a regulated Blue Shield firm.


TOTAL COST
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ALLOWED BY
REGULATION
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O
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Q_s
TOTAL CLAIM LIABILITY
(WITH CLAIM PER
INSURED HELD
CONSTANT)

Figure 4.2

This simple geometry aids us in analyzing the behavior of the Blue Shield plan. If Blue Shield is a typical monopolist which maximizes profits, then its output level would be Q_m. But because its profit is regulated, the output and price decision could be shifted from Q_m. When the maximum profit level is regulated below Q_m, the firm will lower its price until Q_s is reached. Figure 4.2 shows the output will be larger under regulation and price lower than the price that the plan would have set if it's an unregulated monopoly. When the regulatory agency sets the limit in surplus that exceeds the slope of a line between QW_m, then regulation would have no effect on the firm's behavior. The firm would set price and quantity as a monopolist.

Regulation has another major impact on Blue Shield's output decision. Since it is the common practice for regulatory agencies to set the surplus level as a percent of claim liability, whenever the firm has a choice of offering two different insurance products, one has high claim cost and another has low claim cost, it would choose the one with high claim cost to maximize the firm's surplus.

Blue Shield plans have long favored the comprehensive, first dollar coverages while having very limited offering of insurance for catastrophic illness. Our model would have predicted this outcome. The incidence rates of minor illness are high, and their associated medical costs are modest. Thus their expected claim cost is large. Meanwhile, the incidence rates of major illnesses are very small, but carry high cost. Their expected claim cost is low.

If consumers' risk adverse function is monotonically increasing with the amount of financial loss, then they would prefer insurance covering

catastrophic illness rather than coverage for minor sickness. However, Blue Shield plans have always tried to influence consumer's choice through advertising and education to buy first dollar insurance coverage. Meanwhile, the commercial firms have not adopted this posture. Instead, they try to influence the consumers to buy insurance with deductible and coinsurance with coverage for catastrophic events. Their differences in organizational behavior can be explained by our model. In order to maximize its surplus allowed under law, the Blue Shield plan would push for an insurance product which has a high claim cost per insured.

From our earlier discussion of the insurance market, the market can be best described as one where one large firm dominates with many smaller firms competing on the fringe. Blue Shield plan is the dominant firm because it lowers cost and also restricts the entry of other Blue Shield plan into the same market area. The commercial companies accept the price set by Blue Shield and decide what quantity to produce at that price. Because each commercial firm accepts the price established by Blue Shield, we can determine a short-run supply curve of the commercial firms which is the sum of their marginal cost curves. This is shown as MC_{comm} on Figure 4.3. The horizontal difference between DD' and MC_{comm}, given as dd' in the diagram, represents the quantity Blue Shield can sell at various prices. Then a marginal revenue curve can be constructed from dd'. If a Blue Shield plan maximizes profit without any regulatory constraint, the plan would set the price at P_o where $MC_{BS} = MR_{BS}$. In a static equilibrium condition, commercial firms will sell Q^m_{comm} and Blue Shield sells Q^m_{BS} with the total quantity sold shown as Q_o and price set P_o. Under this condition, the Blue Shield plan can make a pure profit of $Q^m_{BS}(P_o-P_1)$. This

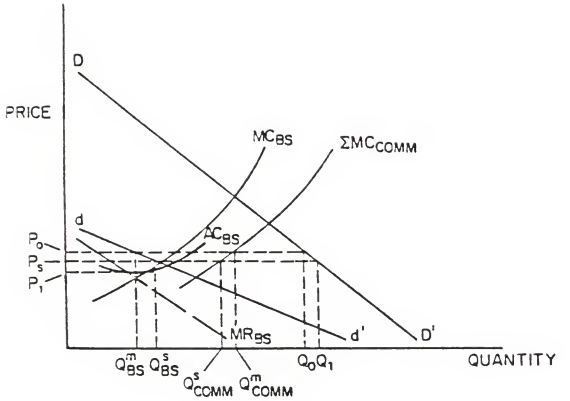
D
PRICE
MC_{BS}
ΣMC_{COMM}
d
AC_{BS}
P_o
P_s
P_1
MR_{BS}
d'
D'
Q^m_{BS} Q^s_{BS}
Q^s_{COMM} Q^m_{COMM}
$Q_o Q_1$
QUANTITY

Figure 4.3

is the market equilibrium position when the surplus allowed under law equals or exceed the percentage of claim liability as measured by the slope of the line between O m shown in Figure 4.2. The Blue Shield plan would behave as a monopolist with a demand curve given by dd'.

On the other hand, if the regulated surplus is something less than the slope of Om_m, then the Blue Shield plan would set the price (P_s) which is determined by quantity Q_s from Figure 4.2. P_s would be lower than P_o and Q_{BS} would be greater than Q^m_{BS} which is the quantity that the Blue Shield would supply at the unregulated profit maximizing equilibrium point. The total quantity supplied in the market would be Q_1, which is greater than Q_o. The market share of all commercial firms would be smaller by the difference between Q^m_{comm} and Q^s_{comm}.

Conclusion

The supply side of the health insurance market is composed of two types of firms: Blue Shield plans and commercial companies. Blue Shield plans are non-profit organizations, frequently originated with the support and sponsorship of local medical societies who also provided the initial capital. Blue Shield plans enjoy certain monopolistic power since its national association only certifies one plan for each region. Therefore, no two plans can compete in the same market area. Currently there are 69 Blue Shield plans, blanketing every community in the United States.

Blue Shield plans are described as community services rather than as insurance organizations. Their major product consists of services coverages, not indemnity insurance. Service plans promise their policyholders certain quantity of medical service when they need it rather than indemni-

fying the insured for the cost of services. Providers of medical services (i.e., hospitals, doctors, visiting nurses, etc.) contract with Blue Shield and promise to make the services available to its insured. Also the providers agree to accept the Blue Shield payment as the full payment for that portion of the cost covered by insurance. In turn, the Blue Shield plans promise to pay the providers for the cost of producing these services. Physicians and hospitals only contract with Blue Shield plans, therefore they have a monopoly over the product, service insurance.

Because of its special nature, most states do not regulate Blue Shield plans under their insurance laws. Instead, special legislation was passed to regulate Blue Shield plans as a non-profit community organization. Regulators review and approve the premium rates charged by Blue Shield plans. The premium rates are set to ensure that the surplus of the plans are maintained at an adequate but not excessive level.

The other major type of insurers is commercial companies. There are more than 600 of them. They are comprised of stock and mutual firms. Stock companies are profit making commercial enterprises while the mutual companies are non-profit, legally owned by the policyholders. Every state imposes some requirement on the initial level of capitalization of commercial insurers. The levels are relatively low. It doesn't seem to have created a barrier to entry. Insurance regulations concentrate on protecting the solvency of commercial firms, preventing fraud and deceptive business practices. Regulations of reserve calculations and maximum level of surplus have significant impact on the behavior and performance of commercial firms.

The demand side of the health insurance market consists of numerous employers and individuals. Most of the health insurance is sold to the employer groups. Large group buyers are extremely well informed and rational in selecting the product they buy. Most larger employers employ insurance specialists to manage their insurance program for their employees. As a result, consumers exert a strong competitive pressure on the health insurers.

The health insurance market can be best characterized as one dominated by one large firm with many competitors competing on the fringe. Blue Shield plans gained the dominating position because of its monopolistic power, control over a major product, and its lower cost of production. The plans set prices to maximize their surplus, up to the limit permitted by the regulatory authorities. Commercial firms take the price set by Blue Shield plans and supply as much as they can as under pure competition.

The non-profit nature of Blue Shield plans and mutual insurers has some important effects on the performance of the health insurance industry. First, the cost of production for the non-profit firms is less because there is no stockholders' equity invested in the enterprises. Hence, they do not have to earn a return on its surplus. Second, the insurance laws regulate the surplus of mutual companies but not their premium rates. Therefore, when mutual firms have accumulated surplus approaching the legal limit, they would reduce premium rates as well as tolerate greater administrative slack in their insurance operations.

Blue Shield plans are regulated both on their surplus level and premium rates. This induces the plans to increase its quantity produced beyond the quantity that would have been produced at the profit maximizing level

for a monopoly. Also, the prices set by the Blue Shield plans are less than the monopolistic prices due to regulatory measures. Moreover, because the regulation on surplus is stated as a percentage of claim liability, then under a behavior of surplus maximization, Blue Shield plans would design and market insurance products that have high claim costs such as comprehensive, first dollar coverage. The insurance effect from this type of product increases demand for routine medical care and reduces economic efficiency of the medical services.

In sum, health insurance market has many unique characteristics. The health insurance industry is composed of a mixture of for-profit and non-profit organizations. They offer different products and have different cost functions. The regulations and laws governing Blue Shield plans and mutual companies affect the market conduct and performance.

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Chapter 5

Uncertainty and Health Insurance

I. Introduction

In his landmark paper, Uncertainty and Medical Care, Kenneth Arrow puts it succinctly "that risk and uncertainty are, in fact, significant elements in medical care hardly needs argument. I will hold that all the special features of this industry, in fact, stem from the prevalence of uncertainty."[1] Since health insurance is a future contract involving medical costs, a product designed to protect the insured from the risk of large financial losses resulting from medical care, then the uncertainty inherent in medical services would impact on both the buyers and sellers of health insurance.

The provision of health insurance involves economic transaction of three principal players: consumers, insurers and physicians. Many studies have examined the impacts of insurance on consumers' demand for medical services. But the impact of uncertainty on insurers has not received sufficient attention.

Insurance provides a vehicle for the insured to pool their risk. In an ideal situation, the individuals can reduce their risk through insurance by transferring the risk to the insurer. The insurance firm can assume the risk when the probability of the loss is known. Then it can pool the risk together and determine the likely outcome by the Law of Large Numbers. However, health insurance firms are confronted with two complex problems: uncertainty in the incidence of illness and impacted information. Uncertainty differs from risk in that the probability of uncertain outcomes is obscure. Incidence of illness is a random variable, but it changes over time because

of alterations in environmental conditions, lifestyle and consumers' knowledge of health, etc. Also, there are exogenous shocks such as Asian flu epidemics which make the incidence of illness difficult to ascertain with reasonable degree of confidence. Second, asymmetry of information between the insured and insurer results in anti-selection against insurance firms.

More importantly, the aforementioned market distortions are exacerbated by physicians' discretionary power over medical cost by their ability to choose the services to supply for a given condition and setting the fees for their services. This market power was accrued to physicians risen from three major factors. First, medical science is limited. There is considerable uncertainty in the diagnosis and treatment of disease. Physicians have to exercise a great deal of judgment. Second, the quantity of medical services is not well defined. A surgical operation could be classified as simple or complex, depending largely on the physician's discretion. Third, the prices charged by physicians, which determine the medical cost, show striking differences.

However, it has been demonstrated that physicians as a group control the discretionary decisions of individual doctors. For some illnesses, they can reduce the uncertainty in the modality of treatment by establishing protocols by which all the physicians should follow. For uncertain definition of medical quantity, organized medicine can ordain a classification system which physicians should use and then monitor the behavior of practicing physicians through peer review. In the case where there is wide price dispersion, the medical community can reduce the variance by professional review and economic sanction. Because of their capabilities to affect the uncertainty of medical costs, physicians exert strong economic power over health insurance firms. In other words, they have to respond to physicians who control the major

input factor cost of insurance.

This chapter is organized into six sections. First, we explicated the difference between risk and uncertainty. For the insurance firm, the two are not synonymous. Next, we examine the nature of insurance to ascertain how risk and uncertainty would impact on insurers. Following that, the uncertainty of medical services is analyzed in some detail, statistical data were collected to ascertain the magnitude of the variation in medical practices. Then we studied the extent to which physician groups can control the variation in both the quantity and price of medical services. Next, we examined how would insurance firms react to this situation where their major input cost is controlled by an external group. A model is developed to study the reaction function of the insurers to the physician's control over the average and variance of medical cost.

II. Uncertainty and Risk

The idea of probability, risk and uncertainty appeared in many forms in economic literature. The manner in which they were employed suggests there is no common understanding of the nature and limitation of these concepts. There is widespread failure to clarify the distinction between risk and uncertainty. They are used interchangeably by many economists. The oversimplification of equating risk with uncertainty has permitted one to dismiss the complex problem of uncertainty in health care, which is a basic problem to insurer of health hazards.

In the insurance world, a sharp distinction has been made between risk and uncertainty. A few economists had also recognized their significant difference. According to Frank Knight, there are two distinct kinds of probability, risk and uncertainty. Risk refers to a situation where the outcome

is not certain, but it can be calculated based on empirical evidences. The expected value and variance can be objectively determined. Uncertainty, on the other hand, refers to a situation where the probability of outcome is largely unknown. There is little objective basis to estimate the probability density function. If there were any prior statistics on the outcome, they are not valid or reliable predictors of future outcome. Any guess of the probability would be based on intuition or hunches; the results are likely to err. Estimates of the expected value and variance of an uncertain outcome could vary widely among persons doing the estimation.[2]

Pfeffer explained the diversity between risk and uncertainty in a different way. First he defined probability as "an objective relationship between classes of evidence, which may be measured in terms of the limits of frequencies in some instances and in terms of the weight of the evidence in others. The probability of the occurrence of an event is the same for everyone, given that the state of knowledge is the same." Then he explained that risk is a state of the world; uncertainty is a state of the mind. Risk is a combination of hazards whose relative frequency of occurrence is measured by a probability density function. Uncertainty is measured by a subjective degree of belief. The belief reflects the state of a person's knowledge, his feelings, and his strength of conviction about the specific situation.[3]

Thus, both Knight and Pfeffer characterized risk as some outcome that is not certain, but the probability of an event to occur can be estimated based on objective statistical evidence. On the other hand, uncertainty is a situation where there is an inadequate amount of statistics upon which the probability of an outcome can be estimated. Under uncertain conditions, people may act from their intuition of what the probability might be. But their subjective guess may deviate greatly from the true objectively measured

probability. Pfeffer went further by characterizing uncertainty as a belief that may have little empirical foundation, but formed by each person's own values, psychological factors, and prior experience. Therefore, under uncertainty one could not expect agreement among many people on the probability of an outcome.

Therefore, one chief distinction between risk and uncertainty lies in the nature of the probability assigned to outcomes. One is objective while the other is subjective. The consumer, in forming his preference function for risky situations, may base his decision on either objective or subjective probability. As long as this is the best information he has on hand, he still can optimalize his choice across goods. It would not necessarily impair his rational choice nor diminish economic welfare. However, the insurance firm finds a striking difference between the nature of risk and uncertainty in its ability to offer insurance products. This will be examined in the next section.

III. Nature of Insurance

The fundamental nature of insurance is quite complicated. Most economists study insurance from the consumer's side, analyze the reasons from which people purchase insurance. Actuaries usually focus their attention on the supply side, examine when and why insurers would offer insurance for sale. The courts, compelled to defining insurance for legal disputes, have adopted comprehensive definitions which describe the interest of both the buyer and seller of insurance.

For consumers, many economic writers define insurance as a device whereby one exchanges the certainty of a small but definite loss for the uncertainty of a large but indefinite one. For example, Friedman and Savage

put it this way:[3]

> An individual who buys fire insurance on a house he owns is accepting the certain loss of a small sum (the insurance premium) in preference to the combination of a small chance of a much larger loss (the value of this house) and a large chance of no loss. That is, he is choosing certainty in preference to uncertainty.

This statement implicitly assumes that the individual who purchases insurance has an expectation for a loss and he is risk averse. He has a diminishing marginal utility of wealth. Moreover, the illustration used in the statement shows the insured has an insurable interest in the property and the owner transfers the risk of loss to some insurers.

Kenneth Boulding provided a more exact explanation for the insured's expectation for a loss. He stated that the insured is presumed to know subjectively the odds, or at least the general magnitude of the odds. Insurance would be purchased up to the point where the mathematical expectation of the insured equals the premium rate.[5]

Thus, consumers, by paying a small premium, can decrease the risk of a larger loss. The calculus of trading off a small certain loss for an uncertain larger hazard is based upon what the individual perceived as the probability of loss, derived either from objective evidence or subjective belief. Thereby the introduction of insurance increases the economic welfare of the individual.

In the field of medical care, there are many incidences of low probability events which have high cost associated with them. Typical examples are the failure of renal functions which require dialysis, an anginal condition which requires coronary artery bypass surgery, malignant tumor in the lung

which needs prolonged medical and surgical treatments. A small payment from each individual exposed to these hazards could pool the risks and thus protect himself from the small chance of a large loss.

However, besides insuring potential loss which has a small probability, would consumers want to buy insurance to cover an uncertain event which has a high probability of occurrence? The answers lies in how many ways are open to consumers for making provisions for financial risks. There are three principal methods for an individual to meeting financial hazards: reserving by savings, transferring the risk, and pooling. When faced with a loss that has a high degree of certainty, consumers could save to pay for the anticipated potential loss or purchase insurance. Theory suggests that most people would prefer to save rather than pay the administrative and transactional cost of insurance. Yet, we observe that most consumers choose low deductible automobile insurance rather than high deductible. Perhaps this reveals people are highly risk averse. But many people also purchase legal insurance to cover the cost of preparing wills, closing on real estate transactions and divorce proceedings. In the health insurance arena, consumers purchase individual insurance (not subsidized by tax exemption) to cover the cost of child birth, routine office visits to physicians, vaccination, etc. These revealed preferences show consumers may be irrational in some of their purchases of insurance for uncertainties.

Now we turn to the nature of insurance for the sellers. Kulp adheres to the actuarial principle when he writes that insurance is a formal social device for making accumulations to meet uncertain losses of wealth which is carried out through the transfer of the risks of many individuals to an organization. It combines a sufficient number of exposure units to make the loss predictable. The predictable loss is then shared proportionately by all

those in that risk class.[6]

In order for an insurance firm to be able to assume the risk transferred from individual insured, not only the nature of an insurable risk but its probable occurrence and resulting loss must be determined. The actuaries must have adequate objective statistics to make reasonable estimates of the expected loss. Otherwise, there is no economic sound basis to offer the insurance. Kenneth Boulding writes that the insured may use subjective odds, whereas the insurers must have reasonably good statistical evidence to determine the probability of loss.[7] For a risk to be well adapted to insurance, two conditions are necessary. The probability of the occurrence of the event insured against must be known with fair accuracy, and the contingence of the event is beyond the effective control of either party: the insured and the insurer. If the first condition is absent, it is impossible to determine a fair rate. Also, it is impossible for the insurer to ascertain what risk the firm is assuming. If the second condition is absent, the contingence can be manipulated by the interested parties and the insurance becomes speculative.

The quantification of risk is a necessary condition for insurance offerings, but not a sufficient condition. While statistical data enable actuaries to calculate the premium rates with some degree of confidence, it does not address the difficult problem of matching the insured into the proper risk pools conceived by the actuaries. Economic literature has stressed the market failures created by asymmetry of information and moral hazard. The insured possesses more complete knowledge of his medical cost risks (i.e., his medical condition, preference for medical care, and his anxiety toward illness, etc.). He can use this information to select against the insurance plan. Consequently, a risk is insurable only when underwriting rules can be established to differentiate the underlying risk condition of

each insured by which the insurer then can place the insured into the appropriate risk pool. The process of assessing each applicant's risk condition and assign him to a pool is called underwriting. Again, the second condition requires reasonably accurate statistical data that can identify and measure the risk factors so differentiation can be made.

In the absence of objective statistical data, someone might suggest that an insurance firm can still offer insurance with premium rates based on the actuary's subjective probability. This scheme would not work because of asymmetrical information and moral hazard. Take the simple case where a person is risk neutral. He will purchase insurance when the pure premium is equal or less than his expected medical cost, calculated using his subjective beliefs. When the premium rate is high, only those people who believe their expected loss will equal or exceed the premium rate, will purchase insurance. Since the insured usually has superior knowledge of his risk, the insurance firm can't use their own subjective probability to calculate the premium rates nor establish underwriting rules. When it's done that way, the insurer is likely to face bankruptcy because of anti-selection. The insurance firm must have objective statistics to calculate premium rates and to underwrite each applicant.

In sum, insurers can only insure risks, not uncertainty. Ordinary insurance principles could not provide insurance for uncertain contingencies due to the reasons stated above. Insurance firms need to know the probability of the occurrence of the insured event with reasonable accuracy. This usually requires the availability of objective statistical data. This requirement explains why the private insurance market has failed to offer insurance for many uncertain events.

In addition to the aforementioned aspects of insurance, its legal

definition prescribes several more conditions. When courts were compelled to define insurance, they had most frequently adopted the definition framed by Vance.[8] He writes that insurance is a contract between the insured and insurer, distinguished by the presence of five elements: (a) the insured possess an interest of some kind of susceptible pecuniary estimation, known as an insurable interest; (b) the insured is subject to a risk of loss through the destruction or impairment by a designated hazard; (c) the insurer assumes that risk of loss; (d) such assumption is part of a general scheme to distribute actual losses among a large group of persons bearing similar risks; (e) as consideration for the insurer's promise, the insured makes a payment to a general insurance fund, called the premium.

The legal description includes the insurable interest as an element for insurance to control the moral hazard by making certain the insured has a pecuniary interest in the event to be insured. The second and third element discuss risk transfer as an essential function of insurance. But the fourth element specifies that the risk must be pooled and distributed as a condition for insurance. Lastly, the legal definition describes insurance as an economic transaction where the insured pays a premium in exchange for the protection against uncertain loss.

In the next section, we turn our attention to the uncertainties that are present in medical care and their possible magnitudes.

IV. Uncertainty and Cost of Medical Services

While the insurance firms are already faced with the problems of uncertainties in the incidence of illness, impacted information and moral hazard, their difficulties are compounded by the uncertainties over the medical cost of treating a given condition (i.e., the type and quantity of services to be

utilized and prices charged). The uncertainty in medical science gives discretionary power to physicians who can control a large portion of medical costs.

Modern medicine grew out of life sciences. But human knowledge of biological sciences is incomplete, requiring the practice of medicine to be a combination of science and art. Kenneth Arrow wrote that "the special economic problem of medical care can be explained as adaptations to the existence of uncertainty in the incidence of disease and in the efficacy of treatment."[9] This uncertainty is inherent in both the diagnosis and treatment of diseases. According to Alain Enthoven, doctors are confronted with patients who have symptoms and syndromes, not labels with their diseases. A set of symptoms can be associated with any of several diseases. Diagnostic tests are not 100% reliable. For many medical conditions, there are several possible treatments, each of which is legitimate. As a result of these uncertainties there is wide variation among doctors in ordering tests and in prescribing treatment for similar cases.

While medicine is based upon scientific knowledge, the application of this knowledge is a matter of judgment. "In fact, medicine remains more of an art than science." observed Enthoven.[10] In addition, there are significant differences of opinion among doctors regarding the proper use of many procedures and their relative effectiveness. Also for some diseases there is disagreement whether medical or surgical management would be best.[11]

One empirical measure of the uncertainty of medical services is to examine the variation in surgical rates. Most people believe the medical conditions for surgical procedures are especially well established. When a disease is properly diagnosed, the indication for surgery would be well defined. The uncertainty of using a particular surgical procedure as the

"best" mode of treatment is less than the uncertainty of selecting the proper medical treatment.[12]

Accurate surgical rates have been collected for a long time. Because of the precise definition and ease of measurement of surgical procedures, comparative studies between regions have been done by many researchers. The wide variations in the frequency of surgery being performed among similar population groups have been well documented. Lichtner and Pflang found age-adjusted appendectomy rates in West Germany that were nearly three times the rates in this country.[13] Lewis has shown the incidence of common procedures vary about two-fold among Kansas counties.[14] Vayda and Anderson found similar variation across Canadian provinces.[15] Bunker found the incidence of common surgical procedures in the United States to be twice that of the United Kingdom.[16]

The most careful and revealing study is one conducted by Wennberg and Gittlesohn.[17] They analyzed the variation of age-adjusted surgical rates between communities in Vermont. A largely rural area with a population of 440,000 in 1970, Vermont has nineteen hospitals. Residents of towns tend to use nearby hospitals. This pattern of usage allowed Wennberg and Gittelsohn to divide the state into thirteen service areas and trace the patients' origin back to each area. Complete data on the age, sex, income, diagnoses, procedures performed, length of hospital stay, morbidity and mortality were available for each area. The age-adjusted rates of seven frequently performed surgical procedures are exhibited in Table 5.1. Their rates are strikingly different. Tonsillectomy shows the largest variations: a 12-fold difference between service areas; it varied from a low of 13 to a high of 151 cases per 10,000 people. Surgical rates for what are commonly accepted as nondiscretionary procedures vary three-fold. Primary appendectomy rates

ranged from 10 to 32 per 10,000 people; mastectomy ranged from 12 to 33. For each of the procedures, the difference in rates was statistically significant as measured by chi-square tests.

Other statistical evidence documenting the large uncertainty in medical services is the length of stay in hospitals for normal delivery. Data has been systematically collected for two decades. The large variation in the length of stay in hospitals for normal delivery without any complications has puzzled physicians and laymen alike. Table 5.2 shows the average length of stay for mothers between age 20 to 34 varies from 2-4 days in the West to 3-6 days in the Northeast and Northcentral regions. The variance is large. The difference exhibited for the 20 to 34 year-old age group is consistent with the experience of mothers in other age groups.

Heasman and Carstairs also found striking differences in median length of hospitalization for patients treated by different British medical specialists. For patients with myocardial infarction, the median stay varied from ten to thirty-six days; for peptic ulcer, six to twenty-six days; for tonsillectomy, one to five days; and for hysterectomy, three to eighteen days. Doctors differ as to how long they will keep their patients in the hospital for the same disease.[18]

Table 5.1 - Variation in Age-Adjusted Surgical Rates (per 10,000 persons) for the Thirteen Service Areas in Vermont, 1969

Surgical Procedure	Lowest Area	Average for Entire State	Highest Area
Tonsillectomy	13	43	151
Appendectomy	10	18	32
Hemorrhoidectomy	2	6	10
Males			
Prostatectomy	11	20	38
Females			
Cholecystectomy	17	27	57
Hysterectomy	20	30	60
Mastectomy	12	18	33

Source: Wennberg, John and Alan Gittelsohn. Small Area Variations in Health Care Delivery. Science 182 (December 14, 1973):1102-1108.

The evidence for the uncertainty of medical services is not limited to surgical rates and hospital length of stay. Schroeder et al.,[19] studied the use of laboratory tests and procedures. They conducted three studies of physician variation in the use of laboratory tests at the George Washington University Medical Center. One study compared charges for laboratory use among thirty-three faculty internists caring for a homogeneous patient population at the general medical clinic. The study found a seventeen-fold difference in the mean annual lab cost per patient among the physicians. For example, a marked difference existed for lab tests ordered for serum electrolytes on patients who receive diuretic therapy. Some physicians ordered a potassium test alone while others ordered an entire series of sodium, potassium, chloride and bicarbonate tests.

Another study conducted by Schroeder compared the cost of lab use among twenty-one medical interns for patients in the coronary care unit. Attempts were also made to control case-mix. Considerable variation was found in this study also.

A third study done by Schroeder et al., analyzed the costs of lab tests among thirteen faculty internists who cared for hypertensive patients on an ambulatory basis. Once again the variation among physicians was large. The difference was twenty-fold.

Table 5.2 - Length of Hospital Stay for
Normal Delivery Without Complication - 1976

Geographic Region	Total Patients	Average Stay	Variance
14-19 years old			
All regions	96519	3.2	3
Northeast	15046	3.7	3
Northcentral	35659	3.5	2
South	32055	3.0	2
West	13159	2.5	2
20-34 years old			
All regions	414930	3.3	3
Northeast	87177	3.6	3
Northcentral	157369	3.6	2
South	102839	3.2	2
West	67545	2.4	3
35-49 years old			
All regions	16655	3.4	3
Northeast	4172	3.7	5
Northcentral	5972	3.7	3
South	3807	3.1	2
West	2704	2.5	1

Source: Commission on Professional and Hospital Activities. Length of Stay in PAS Hospitals, by Diagnosis, United States: Northeastern Region; Northcentral Region; Southern Region; Western Region. Ann Arbor, Michigan: Commission on Professional and Hospital Activities, 1977.

Schroeder concluded from all his studies that "great variation in the use of lab tests by comparable physicians exists even when controlling for case-mix. The variations are not obviously related to specific physician characteristics."[20]

In addition to the uncertainty inherent in medical care, the probability of illness also changes due to environmental causes such as air and water pollution, occupational hazards, artificial food additives, toxic materials from newly developed chemicals and drugs, etc. Often these environmental factors do not have an immediate impact on the incidence of illness, but their accumulative effects over time may eventually alter people's health conditions.

People's habits, lifestyle, and diet also determine the incidence of disease. The reduction in infant mortality from 180 per 1000 children to 20 per 1000 was largely due to better nutrition and cleaner water rather than improved medical care. Smokers have high rates of cardiovascular diseases and carcinoma of the lung. The decrease in adult smokers in the U.S. has already affected the morbidity rates. Heavy drinkers suffer from a high rate of cirrhosis. Use of illegal drugs causes numerous medical problems. Recently a study of 7120 Californians, over a ten year period, found 57% of their health problems were related to their habits and style of living.[21] Fortunately for the insurers, such changes occur gradually over time.

Moreover, the inflation rate, the change in the real price of input factors, as well as the advancement in medical technology, have had an impact on the cost of medical care. The rapid development and diffusion of new technology in both the diagnosis and treatment of diseases have caused significant increases in medical care prices. Since insurance is sold to cover the future cost of medical services, fluctuations in the rate of inflation and in

the rate of advancement in medical technology have further exacerbated the risk and uncertainty for insurers.

The uncertainty of medical care is not confined to variation in the quantity of medical services and overall changes in price. Fees charged by physicians also vary markedly. Hsiao studied the fees charged for specific procedures in several market areas in Northern California. He found that for normal delivery without any complication the fee in the same market area ranged from $200 to $375; for hemorrhoidectomy the fee ranged from $210 to $350.[22]

V. Physician Control Over Medical Cost

Medicine is not a set of prescribed routines but the exercise of complex judgments. As such it cannot be completely objectified, for it is at least, in part, a matter of opinion. The power to exercise judgment is given to doctors which gives them discretion and control over medical costs. Victor Fuchs observed "the physician is the captain of the team" who controls the allocation of resources.[23] One researcher concluded that at least 80% of each medical dollar spent is decided by physicians.[24]

The training required to become a doctor is arduous indeed. The scientific base of medicine requires a medical student to master subjects such as biology, chemistry, genetics, physiology, anatomy, pathology and biochemistry. After four years of college, the average physician has to go through another seven years of graduate medical education. The competence required and the long years of investment of human capital place physicians in a preeminent role. His authoritative position to make diagnostic and therapeutic decisions is rarely challenged. Eliot Friedson observed that medicine's position today is akin to that of state religion yesterday - it has an offi-

cially approved monopoly over the right to define health and to treat illness.[25]

According to Friedson, medicine is a profession. By its structure and by the legal status accorded to it, doctors have the special privilege of freedom from control by outsiders. This privilege is derived from three conditions. First, medicine requires an unusual degree of skill, training and knowledge. Non-professionals are incapable to evaluate or regulate it. Second, the profession is the only body able to competently recognize deviant performance. Third, the profession maintains high ethical standards and is capable of controlling and regulating itself.

The distinction between the medical profession and other occupations lies in its legitimate organized autonomy. It has been given the right to control its own work. Unlike other occupations, medicine is deliberately granted autonomy, including the exclusive right to determine who can legitimately do its work and how the work should be performed. More important, it has the recognized right to declare outsiders as incapable, incompetent and unqualified to evaluate its work and activities. Thus, outside evaluations are illegitimate and intolerable.[26]

The professional autonomy enjoyed by medicine is widespread. It encompasses every facet of medicine--its organization and economic activities, licensure boards, disciplinary committees, and hospital boards and committees. The power of the profession extends to such important issues as the appropriate quantity of service for a given patient symptom, the reasonable fee for the service. It is in this environment that insurance must operate.

The preeminence of doctors and their professional autonomy do not necessarily mean that the preferences of patients do not matter. Consumers do choose the physician and initiate the first office visit with a medical

complaint. Patients can decide whether or not to return for a second visit. Sometimes the physician may give the patient a choice of treatment if two procedures are equally efficacious. More important, doctors may take the preferences of the patient into account when they make decisions. Yet, control over the uncertainty of medical services rests with the medical profession.

Empirical studies show that doctors can control the variations in both the quantity of services rendered for any disease and the fees charged for each service. The ordering of laboratory tests is typically one decision that doctors make alone. Most patients do not know what laboratory tests are appropriate for their conditions and the specific quantity they should demand. One study found that the number of laboratory tests per case were reduced by 29% when the medical staff of a hospital installed an audit reporting system on laboratory tests. In the auditing process, laboratory tests ordered by each physician for comparable ambulatory patients were summarized on a weekly basis. A copy of the report was sent to the chief of service where the doctor was employed while another copy was given to the doctor. This reporting, coupled with casual review by the chief of service, prompted a drastic drop in the average number of tests ordered while there was no discernable negative effect on patient health.[27]

In 1970, a committee appointed by the College of Physicians and Surgeons in the province of Saskatchewan compiled a list of symptoms for a hysterectomy. Then the College instituted a review process for this surgical procedure. The overall number of hysterectomies decreased by 33% and in one Saskatchewan City, a 50% reduction was achieved.[28]

Lembcke reported the impact of peer review on the rates for pelvic surgery in a community. Following the initiation of a review process by peers

which provided feedback to surgeons, the pelvic surgical rates declined by 27%.[29]

A careful study of the impact of peer review was conducted by Wennberg et al. They evaluated the effects of review on the overall rate of tonsillectomy and on the variation of surgical rates between geographic areas that existed before and after the initiation of peer review. In a five year period following the inauguration of monitoring tonsillectomy by the Vermont State Medical Society, the age-specific rate for this procedure dropped by 46%. An equally important result was the narrowing of variation among areas. Wennberg observed: "In 1969...More than a 13-fold difference distinguishes the rates between the highest area from those in the lowest area and the coefficient of variation is 0.67. By 1973, the variation (although still large) has diminished: the range of variation is 4.5,...and the coefficient variation is 0.40."[30]

The ability of physicians to monitor and control the variation of medical decisions among their peers is undisputed. Effects of peer review are enormous. They range from a reduction of 29% in laboratory tests when an informal review system was adopted - to a 46% drop in tonsillectomy rate when the state medical society installed a formal review mechanism. While the effectiveness of professional control by physicians over their peers is documented, no layman initiated control program has ever been tried.

The discretionary economic power of physicians is not limited to the quantity of services. It extends to specifying the content of a service as well.

A common misconception is that medical care consists of standard products that can be described precisely and measured in well defined output units. Yet, in fact, medical services are anything but a standard product.

A physical examination can be a simple medical history along with a cursory examination or it can be a head-to-toe examination with EKG, blood tests and urine analysis. A surgical procedure can be the operation itself or it can also include the pre-operative and post-operative services. A hospital room can vary from one in which normal hotel services are provided to one equipped with costly machines to monitor vital signs requiring a doctor or a nurse in constant attendance.

Studies have shown that whether physicians bill patients or insurance firms, they have wide discretion in claiming for the services they have rendered. William Sobaski investigated the economic impact of revising the medical procedure code (i.e., the California Relative Value Schedule) from a four digit system to a give digit system which attempts to make the quantity definitions more precise. He compared the billing by physicians for different periods under the two systems. His evaluation found that the reported intensity of medical services has increased. The change in the reported pattern of services boosted doctor's gross revenues by 7% for hospital visits.[31]

Holahan and Hadley analyzed the billings by physicians under the Medicare and Medicaid programs in California. They found the indefinitiveness of medical products permitted many doctors to fragment their bills. Physicians charged separately for procedures that were commonly considered to be part of a comprehensive service. For example, during an office visit, if the doctor gave the patient an injection, he charged for the office visit and then billed for the injection as a separate service. Their study led Holahan and Hadley to conclude: "...Many believe (that medical services) can be manipulated by physicians for revenue-generating purposes."[32]

Therefore, uncertainty in medical care arises from several factors. First, the extensive professional judgment required in the application of

medical knowledge to diagnosing disease and to selecting appropriate treatment. There is seldom the certainty that a symptom is associated with only one disease, and that there is a "best" treatment for the illness. Second, the content of medical services is not precisely defined. A physician has significant discretion in defining what services he has performed when billing patients. Third, the professional autonomy uniquely enjoyed by the medical profession gives physicians power to monitor and to control medical services.

VI. A Mathematical Model

An earlier section discussed a necessary condition to offering health insurance, namely, it must be possible to ascertain with accuracy, the risk to be insured. However, a health insurance firm, regardless if it is a Blue Shield plan or a commercial company, faces uncertainty in price and quantity of medical services since physicians influence both. How does the possession of this economic power by the doctors, affect the economic behaviors of the insurance firm?

Assume the firm maximizes its expected profit or surplus and the decision-maker (insurance management) is risk averse. His preference for risk and profit may be written in the form

(1) $U = U(\pi, \sigma_\pi)$

where π denotes profit and σ_π denotes standard deviation of profit.

The expected profit equation is given by:

(2) $E(\pi) = pV - n(\bar{f} + u)(\bar{q} + v) - ADC$

p denotes the premium rate; V denotes the quantity of insurance sold; n represents the number of people insured, and f and q denote respectively the

expected physician fee and quantity of services per insured; u and v represent the deviation from the mean fee and mean service respectively. They are normally distributed random variables which can be controlled by physicians; ADC denotes the incremental administrative expenses per quantity of insurance.

The level of expected physician fees and average quantity of services per insured can be controlled by physicians through individual cooperation and group actions which are denoted by DOC.

$$f = G_1 \text{ (DOC)}$$

$$q = G_2 \text{ (DOC)}$$

Moreover, the random variables u and v are such that the values of their variances can be affected by DOC. They can be written in the form:

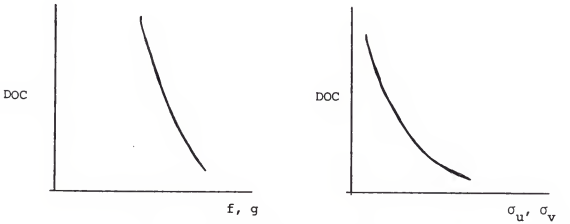
$$\bar{u} = o \qquad \bar{v} = o$$

$$\sigma^2_u = F_1 \text{ (DOC)} \qquad \sigma^2_v = F_2 \text{ (DOC)}$$

Figure 5.1 depicts two relationships between DOC and f or q and DOC and σ_u or σ_v. Why physicians are willing to cooperate with the insurer will be fully explained in Chapter 6. It will be sufficient to summarize two principal motives for the discussion here. First, physicians face uncertainty in receiving payment for services rendered. The loss to bad debts is as high as 25% for doctors.[33] Cooperation with the insurers assures the physicians that a higher percent of their bills will be paid. Second, the medical profession is dedicated to the relief of pain and suffering. Financial costs of medical care create a barrier for many patients to obtain the medical care they need. Insurance is a means to reduce this barrier. Moreover, physicians like to make medical decisions without financial constraint; health insurance makes this possible. As a result, physicians are willing to assist the insurer in making insurance available.

When physicians cooperate with a firm, they do so at the individual level as well as exercise formal professional controls and peer pressures to reduce the variance in fees and utilization rates and the quantity of services for a given condition or the average fees charged.

Figure 5.1



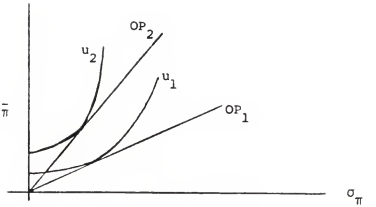
The willingness of physicians to become involved and cooperate with the insurance firm depends on a number of factors. For example, the firm may offer financial incentives to induce physicians to take an active role in monitoring their colleague's fees and medical practices. Also, a firm could reduce a physician's loss to bad debts by paying him directly for services rendered to the insured if his charge falls within a predetermined range. Lastly, physicians could establish cooperative relations with a firm from past transactions, and continue to value that historical relationship. In the next chapter, we will examine the strategies used by insurance firms to induce physicians to cooperate and reduce uncertainty.

From equation (2) we can write

$$\sigma_\pi = m(\sigma_u, \sigma_v)$$

The isoutility contours and the opportunity locus are shown in Figure 5.2.

Figure 5.2



The concavity of the indifference curves u_1 and u_2 reflect the risk aversion of the decision-makers. OP_1 represents the opportunity locus of a particular strategy adopted by a firm to obtain cooperation from physicians. OP_2 represents the opportunity locus of an alternative strategy. When an insurance firm can induce physicians to cooperate and shift the opportunity locus from OP_1 to OP_2, the firm will certainly try to do so. How the insurance firms do this and the effects this has on economic efficiency depend upon what the firm has to trade-off for physician cooperation. This question will be examined critically in the next chapter.

VII. Conclusion

Uncertainty has long been recognized as a major characteristic of medical care. Its prevalence has given impetus to the development of health insurance. Insurance which is a contract between two parties, transfers the risk from insured to insurer. In order for the insurer to be able to assume the risk, it has to be able to predict its future financial obligations with some degree of certainty. Yet, the control of the primary input factor to insurance, the quantity of medical services and its price, is in the hands of doctors. Since physicians can regularize the quantity of care for certain illnesses and can reduce the variation in medical cost, they can reduce the uncertainty in medical care into manageable risks that enable insurance firms to provide insurance. Moreover, physicians can control the average price per service and quantity utilized per insured. As a result, physicians exert strong economic power over health insurers.

Many studies have documented the variation in the quantity and price of medical services. For instance, the age-sex adjusted rates of seven frequently performed surgical operations show a 12-fold difference for a discretionary procedure, and a 3-fold difference for a nondiscretionary procedure. In laboratory tests, studies found a 17-fold difference in the mean annual lab cost per patient among thirty-three faculty internists caring for a homogeneous patient population at a university clinic. In addition to the variations in quantity, studies also found the fees charged for the same procedure in the same market area vary almost 2-fold.

At the same time, the medical profession has been deliberately granted autonomy by legislation, including the exclusive right to evaluate the work and activities of its members. The profession has been accorded the special privilege of freedom from the control of outsiders. When the medical

profession decides to do so, it can control the variations among physicians in the quantity and price of medical services. Studies have shown the variation in surgical rates can be reduced to one-third of its initial dispersion. The variance of fees can be narrowed significantly.

Since the medical profession can control medical cost, which is critical to the insurance firms, the firms try to obtain the physician's cooperation in reducing the level and uncertainty of medical cost. We have developed a model which shows that the firms are willing to give up a portion of their profits to physicians in exchange for a reduction of uncertainty.

In conclusion, there exists uncertainty in medical care in the form of the quantity and price of medical services. Physician power to control this uncertainty and average medical cost has been documented. Insurance firms must face this reality when they offer to insure the financial losses that arise from illness. We have shown in our model that insurers are willing to offer concessions to physicians to reduce the level and uncertainty of medical cost. How the insurance firms go about obtaining the cooperation of physicians and the impact on economic efficiency are the subjects of the next chapter.

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Chapter 6

Cooptation Versus Isolation: Health Insurance Organizations' Responses to Physicians

I. Introduction

Health insurance was originally viewed as the simple means by which an individual could ease the financial hardship often accompanying episodes of illness. However, over the past few decades, it has become a complex mechanism that has an impact on access to care, the utilization of services and the cost of the entire system. By providing the financial underpinning for medical care, health insurance organizations have become the center of a web of transactions between physicians, hospitals and their patients. Insurer decisions on coverage, reimbursement for fees, and procedures define these transactions, determining who must pay whom, for how much, and for which services.

The relationship between physicians and health insurance organizations is one where each party controls resources of importance to the other party. Insurers face distinctive environmental constraints on their scope of action. One of the constraints comes from the physicians. They draw much of their professional autonomy and economic power from the fact that the causes and treatments of illness are highly variable and unpredictable, requiring large degrees of medical judgment. Through the exercise of this judgment, physicians control much of the allocation of medical resources and through that, the level and variation of liabilities faced by health insurance organizations. This control makes physician activity critical to insurers.

In the previous chapter we examined the basic nature of insurance and the need by insurance firms to be able to make reasonable predictions of the

risk they insure. Because organized medicine and individual physicians can control both the level and variability of the quantity and price of medical care, health insurance organizations must respond to these external pressures.

For physicians, interaction with insurance organizations is critical because insurers determine a major portion of their income and offer freedom to make technical decisions unencumbered by financial considerations. Insurer decisions, such as those defining which services are "standard medical practice," specifying what level of fees are "reasonable" and will be paid in full, resolving whether physicians will be paid directly or patients will be reimbursed, determine the economic well-being of the medical profession. With approximately two-thirds of all physician services paid by insurance organizations,[1] their power is considerable.

R.H. Coase maintained that the conduct of firms depends on the system of relationships that come into existence when resources important to one organization are controlled by another economic agent.[2] This chapter is devoted to the examination of a system of relationships that has evolved between physicians and health insurance organizations given each was dependent on the other for its own economic well-being. How do these two groups react to each other and what kind of stable relationships have resulted? How does their relationship affect the price and quantity decisions of medical care?

Relations between health insurance organizations and physicians take on several forms - ranging from situations of intense physician involvement in the administration of health insurance organizations to situations of limited involvement where physicians are the distant end of a series of transactions between an insurer and the insured. We will show that the degree of physician involvement in the insurance organization cannot be characterized by

either cupidity on the part of insurers or conspiracy on the part of physicians, but instead are a product of bargains and compromises, and adaptation to economic realities.

Our analytic description of the accommodation between insurers and physicians is mostly derived from the information gathered from our field study of ten insurance organizations and numerous practicing physicians. A description of our study was presented in Chapter One with reference given for the documentation of this study. In this chapter, we first identify two types of organizational behavior. Following this descriptive analysis, we discuss how the two types of organizational behavior affect the conduct and performance of the physician market.

II. Two Alternate Models

We have isolated two distinct models of health insurer response to resolving the physicians' market power over medical cost. Named the "Cooptation" and Isolation" models, they represent two identifiable patterns of reducing the impact of physicians' control over the price and quantity of medical services which cause the insurer's liabilities to be quite variable. The first is a situation of mutual dependency and accommodation, while the second is one of calculated independence. The first pattern has characterized the Blue Shield plans, while the second has been the preferred mode for commercial insurance companies. Which model an insurance firm adopts depends on the magnitude of incentives that the firm can offer to physicians to enter into a cooperative relationship.

We assume the physician maximizes a utility function with income, leisure and social responsibility maximands (the full model of physician pricing behavior is developed and explained in Chapter Five). An increase in the pro-

portion of people insured has positive impacts on physician income and social responsibility maximands. An increase in insurance reduces the number of patients who do not pay physicians for the services they supplied. In addition, a rise in insurance coverage increases demand for medical care. If the physician market is not perfectly competitive, an increase in demand will increase physicians' income.

Furthermore, physicians ascribe to certain social responsibility. They are dedicated to use their skills to heal those who are ill, not for selfish gains. It follows, then, medical care should be rendered to anyone who is sick, regardless of his ability to pay. But in reality, physicians' technical decisions over the use of resources are constrained by the patient's ability to pay. Consequently, physicians would like to foster the expansion of insurance coverage as part of their social responsibility so patients can obtain the medical care they need, unconstrained by financial considerations. Hence, an increase in insurance coverage increases physicians' utility from discharging their social responsibility. In order to maximize their utility function, physicians would be willing to give up some resources of importance to them.

In Chapter Two, we analyzed the behaviors of insurance firms. All types of insurance firms, Blue Shield plans, stock and mutual commercial insurer, maximize profits[3] subject to the demand constraints and physicians' control over the price and quantity of medical services. As shown by the model in Chapter Three, the insurance firms are willing to trade-off some resources to alter their opportunity locus for higher profits and stable earnings. The firms will do so until its marginal cost is equal to the marginal benefit. A firm's capacity to change its opportunity locus depends on the incentive it can offer to physicians which is a function of the firm's market share.

Therefore, the market share held by an insurance firm determines whether it follows the cooptation or isolation model. The major portion of this section will consider how these two models differ in their attempts to reduce the claim liabilities and the unpredictability of physician actions.

Cooptation Model

Health insurers following the Cooptation model are distinguished from other health insurers by the large market shares they hold. All of them are Blue Shield plans. Because of the large shares of the insurance market held by the plans, they control resources of importance to physicians. Thus, Blue Shield plans are in a position to bargain with physicians to win concessions that enhance the goals of the insurers. In many areas, plans held as much as sixty to seventy percent of the market.[4]

Under the cooptation model, the insurers give physicians a major role in the operation of insurance organizations in exchange for reduction in medical costs and in the unpredictability of the claims. Under this practice the medical community is involved in organizational decisions on fee-setting, utilization review, coverage, and claim adjudication. Philip Selznick calls this "cooptation," the process by which an organization absorbs external groups in order to avert threat to its stability.[5] Contrary to lay usage, the term "cooptation" does not imply "buying off" or "selling out"; rather, it entails a mutual agreement to exchange influence. The insurer "coopts" in order to obtain concessions from an external group that would not provide them otherwise. The medical community, in turn, uses cooptation to gain influence over the organization that affects its interests. Physicians enter into a cooptive relationship for various economic gains. They reduce their problems with bad debts, increase their profits and lower their operating

costs through streamlined claim procedures, and attract patients by minimizing paper work. We will show that cooptation is not captive, the reasons will be explained in the last part of this section.

Most Blue Shield plans follow the Cooptation model to achieve their corporate objectives by reducing the level and the unpredictability of medical costs. This is done with the cooperation of the medical community and individual physicians. Of the six plans we studied, five followed this model in the past, and four still operate according to it. The plans have developed several different forms of cooptation, usually carried out simultaneously. One broad form is cooptation between the plans and the medical community or their representatives. Another form of cooptation is between the plans and the individual physician.

The best known and most controversial means of cooptation is membership on the Board of Directors. Frequently, a certain number of seats on the boards are specifically designated for physicians who represent the medical community. As of 1978, the House Committee on Inter-State and Foreign Commerce[6] found that the Board of Directors of 36 of the 69 plans were composed of at least one-third of physicians, while in still another eight plans, medical communities nominate a number of seats on the board. In sum, 44 of the 69 Blue Shield plans have a heavy representation of physicians on their boards.

Board membership serves as an efficient mechanism for an exchange of influence. Insurers keep their part of the cooptation bargain by allowing physicians to have certain power, making policy decisions in their own interest. Four of the six plans we studied closely approximate this description. In these plans, the Board of Directors, which are numerically dominated by physicians, control the policy on fee schedules, insurance coverage

provisions, and relations between the plans and organized medicine. This control has led to actions favorable to physician interests, such as coverage of diagnostic laboratory tests. This coverage is very costly for insurers to administer because of the large volume of transactions.

The second facet of cooptation is physician participation in internal policymaking committees which decide on questions affecting the economic welfare of physicians. In fact, we found these committees may have more influence on Blue Shield plans than that through board representation. Five of the six plans we studied had fee committees whose membership largely consisted of physicians. The fee committees decide the criteria governing reasonable fee determination, the frequency of updating fee profiles, and relative price of various medical procedures. All six Blue Shield plans we studied have utilization review committees composed almost exclusively of physicians. The committees define the lists of acceptable medical treatments, review questionable medical practices and adjudicate disputes related to the complexity of procedures. The utilization committee decides what procedures are medically necessary to perform for a given diagnosis and thus are an insurer's liability.

Physicians are included on these committees in order to provide medical expertise, and to protect patients from sub-standard medical practice and exorbitant fees; but this physician input is not as limited as it first appears. Decisions involving medical expertise have wide economic consequences for both physicians and insurers. For example, decisions to cover experimental procedures can increase physician income but at the same time raise the financial liability of a plan. In short, physicians' medical expertise gives them influence in economic matters as well as in matters relating to the technical practice of medicine.

Both of these cooptation mechanisms reduce the level and uncertainty of medical costs by enlisting the representatives of the medical community to serve on policy boards and committees. They set the norms for fees and medical practices which can narrow the variation among physician practices and reduce the average medical cost for a given condition. Furthermore, the medical community also supports insurers' decisions to reduce charges that exceed a norm, or decrease the number of procedures considered exceptional (i.e., deserving of unusual payments), and to update physician charges less frequently. Such concessions decrease the uncertainty of medical costs, which is necessary for medical care to be insurable.

The third cooptation mechanism, in contrast, attempts to reduce average claim cost and uncertainty by ties with individual physicians. Unlike insurers that follow the Isolation model, cooptive insurers utilize the "participation agreement." Under this agreement, individual physicians sign a contract with a plan, promising to accept insurance reimbursement as full payment for the covered portion of the bill. For agreeing to this, the physician receives special privileges, which offer considerable gains. The Blue Shield plans promise to pay participating physicians directly. This reduces physicians' loss to bad debts. Apparently when claim payments are sent to patients, many of them use the money to pay other bills. Hence, patients delay their payments to physicians or default on them entirely.

Participation also provides greater efficiency in billing procedures as insurers allow participating physicians to submit their claims in batches. One plan we studied provides participating physicians with a standardized typewriter/key punching machine that can simultaneously type out a patient's bill and produce a tape for direct input into the Blue Shield plan's computer system. This process reduces the operational cost for the physician as well

as expedites payments from the insurer. Another example of an economic incentive offered to physicians to participate was a case in which a plan promised to update the fee profile of a participating doctor every six months rather than every twelve months. In another instance, when forced to reduce physician reimbursements due to financial exigency, a plan lowered the payment to participating physicians by only five percent instead of ten.

The degree of participation varies across the plans. In our study, we observed participation rates ranging form 27 to 96 percent. According to a study conducted by the House Committee on Inter-State and Foreign Commerces in 1978, 82% of the plans for which information was available had over 70% of local physicians participate. Great proportion of physicians' participation reduces the level and variation of claim cost for the insurer. Also, higher participation increases the attractiveness of Blue Shield's full-payment service benefits.

Participation agreements enable Blue Shield plans to offer full-payment service benefits. These benefits, as the name suggests, pay for specific medical services in their entirety rather than specified indemnity amounts as in traditional policies. Such an insurance benefit subjects the insurer to a greater uncertainty because the patient is totally insulated from cost when he demands care which increases the insurance effects on consumer demand. However, that uncertainty is reduced by having physicians sign contracts that allow the insurer to set the reasonable price range for a service and to determine whether the service rendered was medically necessary.

In short, Blue Shield plans have enlisted the involvement of physicians in three ways. They have in most cases given the physician community and other health care providers a majority on their boards of directors. They have assigned important policymaking decisions, such as setting levels of

reimbursement and determining the medical necessity of claims, to physicians. And finally, they have enlisted the cooperation of many individual physicians through participation agreements. These ties have been created to reduce average medical cost and the uncertainty of these costs generated by physician control over the price and quantity of medical services.

Cooptation also offers advantages to Blue Shield plans. First, it reduces uncertainty defined as the variance of the quantity and price of physician services. Second, insurers are able to demand and win concessions from the medical community and from individual physicians. Organized medicine agrees to use its influence to control those physicians who charge excessively and those who provide unnecessary services. This reduces the average cost of medical care and thus lessens premium rates. Also, insurers are often able to resist pressure to raise reimbursement rates by arguing higher rates lead to higher premiums and a potentially weakened competitive position. This argument is in turn supported by representatives of the medical community. In addition, two of the six plans we studied had won concessions from individual participating physicians. In this instance doctors agreed to accept 95% of their fees as full payment when these bills were paid by Blue Shield. All of these advantages put Blue Shield into a stronger competitive position. The plans have lower claim costs. This is vital since these costs make up 90% of group health insurance premium rates. The lower claim costs explain, in part, the large market share gained by Blue Shield plans.

The Cooptation strategy also provides another important advantage to Blue Shield plans. Given a high physician participation rate, they are able to market full-service benefit coverage, something insurers following the Isolation model are not able to do. This gives the Blue Shield plans a

monopoly over an insurance product and it further enhances the competitive position of the plans.

Our Cooptation model, therefore, differs from other representations of the relationship between physicians and insurers that imply the "capture" of insurers by physicians. According to a definition offered by Posner,[7] the capture theory describes a situation that over time, a regulatory agency comes to be dominated by the industry regulated. The interaction between the regulatory agency and the regulated firm can be characterized by a metaphor of conquest. We argue that the situation with the present Blue Shield plans is just the opposite of a capture model. The plans were sponsored, organized and dominated by physicians as producer cooperatives. But as we have analyzed in Chapter Two, the lack of equity control diminishes the ability of physicians to maintain effective control over the Blue Shield plans beyond the first generation of members. A large share of power has passed onto the management of the plans who have their own corporate objectives which differ from those of doctors. Several examples would illustrate this point. First, individual physicians and organized medicine have typically demanded more frequent update of physician fees than what Blue Shield plans allowed. Second, many plans have won discounts from participating physicians provided Blue Shield paid the bill. This reduced physician income. Third, Blue Shield plans have refused to pay fees and services that deviated from the norms set by the plans. These practices also reduced the income and technical freedom of many doctors.

Cooptation exacts a price from both the insurer and physician. Crucial organizational independence is lost by insurers. For example, insurance coverage for a certain high risk group of people (e.g., the low income population) is offered at the insistence of the medical community because it wants

to reduce bad debt. In order to make the insurance affordable and attractive to a sufficient number of low income people, premium rates for low risk groups are raised to generate a surplus which is used to cross-subsidize the premium rate for the high risk group. This places the insurer at a disadvantage to compete for business among the low risk groups. Nevertheless, this practice is widespread among Blue Shield plans due to pressure from the medical community. As for physicians, cooptation can mean loss of professional autonomy since physicians agree to accept the insurer's decisions about the price and necessity of medical services. Moreover, many physicians experience some reduction in income because the medical community cooperates with the insurer in lowering fees and in maintaining the length of the interval between fee profile updates.

The Isolation Model

Insurers following the isolation model are distinguished by the small shares they hold in the insurance market. Almost all the commercial insurers are in this situation. Without a large market share, an insurer could not provide sufficient incentive for the medical community to cooperate and spend the resources to review and monitor the fees and utilization rates of physicians in a community. The insurer could not exert the market pressure needed to induce individual physicians into participation agreements, which are the key to the successful operation of the cooptation model. The insurer simply does not represent enough of a physician's patients to make it necessary for the physician to grant the insurer the concessions he has given to Blue Shield plans. On the other hand, the small market share of each insurer also doesn't justify its devotion of personnel and other resources necessary to establish a close relationship with physicians. The marginal cost simply

exceeds marginal benefit. Unable to compete with Blue Shield plans on their terms, the insurers were forced to take another route.

The Isolation model is in direct contrast to the Cooptation model by the absence of close ties to the medical community. Mutual indifference and limited interaction are the rule, with only a few physicians involved in the operation of the organization. While isolative insurers also need medical informational inputs to design the appropriate reimbursement policy, the insurers obtain the expertise from their physician-employees rather from the practicing physicians in the community.

Despite this decided contrast to the Cooptation model, however, the Isolation model is a solution to the same problem of physician control over medical cost that is faced by all insurers. The Isolation model, however, reduces uncertainty by the use of indemnity features in insurance contracts that limit financial risk before any medical service is rendered. An indemnity contract promises to indemnify the insured according to a pre-established fee schedule or to the physician charge, whichever is less. Usually the indemnity schedule for medical services is set at a level less than the prevailing fees in the market place. This, in fact, limits the liability of the insurer. An indemnity contract also frequently contains a provision which states that the insurer has the final authority in deciding what services are payable under the contract. The decision is not based on medical necessity which requires detailed medical knowledge, but is based on the legal obligations as spelled out in the contract. This provision insulates the insurer from the professional dominance of physicians over medical decisions. By clearly limiting its liability on fees and preserving the power of making decisions over whether a claim is payable, the Isolation model reduces the uncertainty of medical costs. As a result, the insurer does not have to

seek the participation of physicians in the organization.

All four of the commercial health insurance companies we studied follow the Isolation model. In each case, connections with the medical profession takes only limited form. First, their boards of directors are primarily composed of business leaders, as befits national corporations offering several types of insurance products. Second, while commercial insurers do receive physician advice on policy and operational decisions that require medical expertise, the advice comes from physicians as in-house experts employed by the firm rather than from representatives of organized medicine. All four companies we studied have several physician employees on their staff. The firms also use outside medical consultants on special cases where the insurers do not have the in-house expertise. In extremely serious cases of disputed claims, the commercial insurers would refer them to the local medical society for non-binding arbitration. This is the only point of contact with organized medicine. By controlling the cases that are referred to the medical society, the insurer can restrict the influence of the medical community on the firm's operation.

And finally, unlike the Blue Shield, commercial insurers do not use participation agreements. In fact, physicians do not even receive payment directly from commercial insurers; reimbursements are sent to patients who then are supposed to pay their physicians. Commercial insurance contracts stipulate that all claims are to come from patients and be paid to patients. Under this indirect payment scheme, patients are responsible directly for the payment of the bill. The commercial insurers are a distant third party. Physicians must pressure their patients to pressure the insurer if reimbursement is not satisfactory. Doctors have no contract or formal relationship with the insurance organization. Commercial health insurance firms thus

sidestep much of the pressure for higher reimbursement that Blue Shield plans are often subject to.

In short, the connections between isolation-style insurers and the medical profession are of a different quality than those between cooptive insurers and physicians. Here medical expertise is taken as only one of several informational inputs along with financial and marketing considerations. Moreover, physician input, particularly in the case of peer-review activity, is taken on a case-by-case basis. Few precedents or policies are established.

The commercial insurers' carefully circumscribed relations to physicians can first be attributed to the fact that they have managed to blunt the impact of physician decisions on the financial fortunes of the organization and second, to the fact that they have reduced the incentives for physicians to involve themselves in insurance policy decisions.

Besides indemnity insurance contracts, commercial insurers have also developed another method to minimize the risk they assumed when insuring medical costs. For group insurance which comprises most of the business for insurers, they established the experience method of rating customers. Under this system, premiums are based largely on the actual liabilities incurred by each customer. This is in contrast to the "community rating," traditionally used by Blue Shield plans, where the premium for any customer is based on the past claim costs incurred by the population of a given geographic area. Under experience rating, a customer pays an estimated premium. When the contract year is over, the insurer provides the group customer with a detailed accounting of the claims actually incurred. Adjustment is made to the estimated premium to reflect some part of the difference between actual and estimated claim liability. If the estimated premium rates are insufficient

to cover actual liabilities, a portion of the deficit amortized over a three to five year period, is recovered from future premium collections. Experience rating thus reduces the risk assumed by insurers. This method also increases the accuracy of group insurance premium rates since they are based on the experience of each customer and on the demographic and health characteristics of the population.

In sum, insurers following the Isolation model employ three methods to limit physician-related uncertainties. First, the firms design and market products that set a narrow limit on the fees and medical services for which the insurers have responsibility for payment. Second, the isolative insurance firms keep their direct contacts with physicians at a minimum. The insurance transaction is between the insured and insurer. Although the economic interest of physicians are affected, they can only exert indirect pressures on insurers through their patients. Third, the experience rating formula allows the insurer to control the extent of risk the firm assumes. While the Isolation model is successful in reducing uncertainty for the insurer, the model does not provide the conditions by which the insurer can obtain concessions from the physicians. This situation frequently puts the insurers who follow the Isolation model at a competitive disadvantage in premium rates and in product offerings.

Physicians benefit from the isolation approach. While they lack the influence on insurance policies and operations that they have under the Cooptation model, physicians dealing with commercial insurers gain the option to bill patients for amounts beyond the insurers' reimbursement. Thus, physicians retain total autonomy over their fees and render medical services as they see fit without interference from insurers.

III. Why These Solutions?

Why did Blue Shield plans develop the Cooptation model while commercial insurers adopted the Isolation model? The answers are partly historical circumstance--when and how the health insurers were originally formed--and partly a result of economic factors.

Blue Shield Plans

The historical origin of Blue Shield explains much of the ideology that permeates the plans. They don't consider themselves an insurance operation, but a prepayment plan. Blue Shield is oriented towards removing "financial barriers" to medical care by helping consumers prepay it. Second, Blue Shield plans believe they offer a community service by providing the means by which high income people subsidize the premium rates of low income people. The same principle is also carried to healthy and sick people. The healthy groups should subsidize the sick groups. These ideologies coincide perfectly with the ideals subscribed by physicians in the 1920's.[8] At that time price discrimination was widely practiced by physicians. It was justified on the grounds that those who can pay should help those who can't pay, yet need medical care. Prepayment of medical care also provides freedom for physicians to make technical decisions unconstrained by economic considerations. From these ideologies came community rating for premium calculation and full-payment service benefits. But the former action is not consistent with the firm's objective to maximize surplus. Competing commercial insurers were able to establish experience rated groups and offer lower premium rates to healthy people, thus taking business away from Blue Shield. The same offering was made to higher income people whose premium rates were lowered by removing charges for cross subsidies. At present Blue Shield plans have

abandoned community rating and shifted to experience rating. In certain states Blue Shield plans continue to cross subsidize high risk individual health insurance products by surcharging low risk groups. The magnitude of this cross subsidy is relatively small, but it is keeping in the tradition of community service on which Blue Shield plans were founded.

Close physician involvement with Blue Shield plans continued to this day because of the plans' decision to offer full service benefits. Because these benefits cover the entire bill for specified medical services, they are largely uncertain. Plans that do not attempt to control this uncertainty frequently follow a path that leads to disaster. This point is made clearly by the history of some physician-controlled insurance organizations. Both the early versions of the California and Michigan Blue Shield plans were organized by physicians and marketed full service benefits. Neither had any mechanisms for controlling the increased demand due to availability of insurance and the discretionary power of physicians over price and quantity of services. Both plans ran quickly into financial difficulties as claims proved impossible to predict and premium failed to approach the levels necessary to cover claims. Each had to retrench and set up mechanisms for regularizing the claim costs.[9]

While the above history explains the origins of physician involvement in Blue Shield plans, it does not explain the present cooptive ties. Cooptation exists because of the large share of the insurance market held by the plans now. Once a plan has gained a large share of the market, the alternative of non-cooperation by the medical community and non-participation by individual physicians is a costly option. A non-participating physician faces the risk of losing patients to participating doctors due to the latters' lower cost to patients and lessened paper work for payment of bills and submission of

claims. As a result, the proportion of physicians participating is related to Blue Shield market share.

Commercial Insurance Companies

The Isolation model used by the commercial insurers can be traced to their late entry into the private health insurance market. Commercial insurers had long argued medical costs were too risky to insure because of adverse selection and unpredictability of the financial cost of illness. The rapid growth of Blue Shield plans in 1930's had demonstrated that there was a strong demand for health insurance.[10] Also, the financial success of several plans during the same period showed insurance could be developed for medical care. When commercial insurers actively began selling health insurance in the early 1940's, Blue Shield plans had already established a strong competitive position and captured a large market share because of their early entry into the market. By early 1940's, the plans had secured such advantages as tax exemption and fee discounts from participating doctors. Therefore, when commercial insurance firms developed strategies to compete with Blue Shield plans, they were not able to follow the Cooptation model. Commercial insurers did not have a close relationship with the medical community nor the market power to induce the physicians' cooperation.

This other route, isolation, offered an essential element that enabled the commercial insurers to compete successfully with Blue Shield plans. Under the Isolation model, practicing physicians had minimum influence over insurance practices. Commercial insurers didn't have to respond to physician concerns for making insurance available to low income people by cross subsidization through community rating. Therefore, the insurers, by using experience rating, were able to segment the insurance market between higher income

and lower income groups, healthy versus less healthy groups. This was done by basing the premium rate on the claim experience of each employer group. Large employer groups with young and healthy workers switched by droves from Blue Shield plans to commercial insurers. Under pressures from physicians, Blue Shield plans initially held fast to community rating, but eventually had to give in to experience rating.

The commercial insurers were also led to adopt the Isolation model because the original developers of health insurance, the accident and casualty insurers, believed that health insurance should be similar to other forms of insurance. According to this tradition, insurance protected against catastrophic financial loss, through a contract to pay specific cash sums in order to compensate for the loss. Indemnity health insurance benefits, under which insurers pay cash benefits to the insured who then do whatever they wish with the money, are the direct descendants of casualty insurance. This is in clear contrast to the ideology of Blue Shield which aims, not at mitigating financial losses, but at providing access to medical services. Just as ideology pushed Blue Shields into offering full service benefits which in turn led to cooptation, the commitment of commercial insurers to the traditional practices of insurance led them to indemnity benefits and the Isolation model.

Evaluation of the Models

The Cooptation and Isolation models offer radically different approaches to minimizing the organizational uncertainties generated by physician discretions over the price and utilization rate of medical services. Two questions need to be answered. First, do the models succeed in reducing uncertainty of medical care for insurers? Second, how do the Cooptation and Isolation models affect the price and quantity of physician services?

Both the Cooptation and Isolation models were primarily developed by insurers to address the common problem of uncertainty of risks and physicians control over medical care. Given the particular circumstances we have described, the two models do succeed in reducing the uncertainty of the size and number of claims presented to insurers. As a result, they are able to estimate their claim liabilities with reasonable certainty and calculate premium rates to cover the risks.

The Cooptation model is a strategy where two parties exchange influences because each control some resource that is important to the other. Both insurance organizations and physicians seek to advance their self-interest and do so rationally. Insurers try to minimize their cost and the uncertainty of the risk they insure. Organized medicine demands the highest possible reimbursement rates and assurance of payment for services delivered. An individual physician demands that reimbursement rates for his services be as high as possible, but reimbursement for other physicians to be as low as possible, allowing the insurance premium rate to be kept lower than if every physician were reimbursed at a high rate. With lower premium rates, more patients would purchase insurance. A larger proportion of patients covered by insurance would increase physician income and freedom to make technical decisions unconstrained by financial considerations.

While the cooptive insurer faces demand from physicians for higher reimbursements and broader coverage of medical services, it simultaneously faces demand from the insured for insurance products at the lowest cost. Moreover, the cooptive insurer is confronted with competition from isolative insurers which also limits the concessions that Blue Shield plans can supply.

In previous sections, we have explained the mechanisms of the Cooptation model. Now we want to evaluate more closely the effects on this model on the price and quantity of physician services. Cooptive insurers constrain physician-related costs by regularly reimbursing some physicians at a lower level than submitted claims. Under the reimbursement system of one of the Blue Shield plans studied, for example, a physician routinely charges three hundred fifty dollars for an appendectomy operation, and submits a claim for that amount, but the plan only pays three hundred dollars. Since the physician "participates" with the insurer, that reimbursement is the total amount paid by both the insurer and the patient. Thus, the lower reimbursement becomes the total cost for the physician's services.

There are several rational reasons for physicians to accept a reimbursement that is below what they would like to charge. The economic incentives offered by the cooptive insurers, for physicians to participate have been analyzed previously. Equally important, the medical community also cooperates with the cooptive insurer to control both fees that exceed certain limits, as well as the frequency of updating fee profiles. We assume that the medical community wants to maximize the aggregate income of all physicians and that there is a trade-off between reimbursement levels and the percent of the population who would purchase insurance. Therefore, the medical community is willing to constrain the physicians who set their fees much higher than the median fee. The maximum limits being set are a function of

the voting patterns of physicians. In an ideal situation where there is a group of homogeneous doctors, the median voting rule would predict the prevailing limit to be set at the 51 percentile. In reality, the limit is usually set at the 75 to 90 percentile. A part of the explanation for the high percentiles is the desire by the insurer to induce a higher number of physicians to participate in a plan.

The policy of setting the prevailing limit signals to all doctors what the majority of the medical community considers as the maximum limit of the reasonable charge (called the prevailing level) for a procedure. Peer pressure can be applied to those who choose to violate this norm. Physicians who continuously charge above the prevailing level are known to the Blue Shield plan and its fee committee. Both the formal procedure established by the fee committee and the informal network among physicians in a community can be used to pressure an errant doctor to conform to the fee norm. A frequently applied economic sanction involves the referral of patients. Physicians whom we interviewed told us that their selection of a peer for referral purposes would certainly include the consideration of whether the doctor would "overcharge" the patient. The economic effects of the referral network among physicians are fully examined in the next chapter.

If market equilibrium price is properly related to resource costs, the lower fee reimbursed as full payment by cooptive insurers would provide an incentive for physicians to lower cost. Those physicians whose marginal cost exceeded the reimbursement amount would reduce the quantity supplied. As a result, the efficiency of physician services would be improved since the more efficient doctors would supply greater quantities. However, patients' demands are not directly affected under the cooptive arrangement. Consumers have no direct incentive to economize by becoming more informed about the

fees charged by different physicians and to substitute a lower-price doctor for a higher-price one.

The quantity of services supplied by physicians is also affected by the cooptive relationship between the insurer and the medical community. Organized medicine assists the cooptive insurers in establishing diagnostic and treatment norms for certain categories of illness. Whenever a practicing physician exceeds the set limit, the cooptive insurers apply the same economic sanction and peer pressure to constrain him. For those physicians who frequently perform services that are outside of the established norms, the insurer's utilization committee, composed of largely practicing physicians in the community, would review any questionable cases. The committee asks the physician in question to explain and to justify his medical treatment. This review process includes obtaining written explanations as well as conducting informal hearings. This review pressures many doctors to conduct their medical practice within the boundary set by the medical community.

As a result of the cooperation given by the medical community to the cooptive insurers, the actions of exceptionally errant physicians are constrained. But this group of physicians is small, totalling less than 10% of all physicians. The typical documented savings from either reducing the charges to the allowable level or denying payment for unnecessary services, is approximately 3% to 7% of the total payments made by insurers. Of course, this is not an accurate measurement of the monetary impact of cooptation. Many physicians who would have charged more or supplied more questionable services in the absence of the cooptive relationship, modified their behavior to conform to the established norms. The documented reductions do not measure effects of these voluntary curtailments.

The relationship between the two parties in a Cooptation model reaches

an equilibrium state when the marginal benefit to be gained by the other party equals the marginal cost that the first party has to pay.

The behavior of isolative insurers also has impact on the price and quantity of physician services. This impact is an indirect result of the insurers' product design. Isolative insurers raise consumer out-of-pocket medical costs because patients pay the difference between the insurance reimbursement and the physician's bill. These increased consumer costs can affect consumer behavior in two ways. First, consumers may reduce their demand because of the out-of-pocket cost. Second, they may be encouraged to shop more carefully for physicians that charge less for the same procedures. Thus, medical prices could decrease in response to altered demand and price competition.

The demand curve under the Isolative model is depicted in Figure 6.1. The patient has a demand schedule represented by D_1D. Price represents the monetary price of the medical service that the patient has to pay. AO represents the non-monetary opportunity cost (e.g., transportation cost, time cost, etc.) of patients demanding medical services. When a consumer purchases insurance, it indemnifies him for a given medical procedure at price P_I, this shifts his demand schedule from D_1D to D_2D. Price is increased and quantity supplied rises. Figure 6.1 depicts a situation where the indemnity amount is less than the market price. Therefore, the price elasticity of demand reduces the market price at P_o. This is compared to full service benefit coverage which promises to pay the fee in full. In this case, the patient would demand quantity Q_o and price would be P_f if the cooptive insurer did not obtain any concessions from physicians on fees.

The incentives faced by the patient with indemnity insurance would be very different from those he would face under a full payment service benefit.

He faces the full cost of every dollar's worth of additional care that exceeds the indemnity schedule. The user cost would not only be non-zero; it would equal the full resource cost of the care if the selling price were properly related to costs. More expensive types of care would cost the patient additional money, and he would have an incentive to substitute a lower-cost form of care. It would be in the consumer's interest to become more informed about the prices of care rendered by alternative physicians. If he did so, physicians who did in fact reduce costs and prices and maintain quality would attract more patients and more net income. Physicians who had high costs because of inefficiency would lose business.

However, the impact of Isolation model on price and quantity may not be as significant as just discussed. In order for indemnity insurance to produce the full effects described above, the patient must know how much a particular physician will charge for a given service, combined with a perfect knowledge of the indemnity schedule in his insurance contract; the patient can then determine the direct out-of-pocket cost to him when he demands a particular service. But the patient typically doesn't know what service he needs. He goes to a physician for a diagnostic examination and tests, which determine treatment regimen. The medical decision process is a sequential one where the next step is conditioned upon what was discovered in the prior step. As a result, it is difficult and sometimes impossible for a patient and his doctor to determine in advance what services are needed. Without this information, the patient would not be able to ascertain the cost he has to pay out of his own pocket. The lack of adequate information would impair the effectiveness of indemnity insurance in affecting the demand for medical services. All of the insurance organizations we had studied cited an acute problem with indemnity insurance. Somehow a large portion of the insured

assume their indemnity insurance covers the whole or a large part of their bills. The insured becomes dissatisfied with the insurer when they discover, ex-poste, that the insurance does not pay as much as they had expected.

In sum, both the Cooptation and Isolation models affect the price and quantity of physician services. Under Cooptation, physicians and insurers exchange influence. The aggregate quantity supplied and average reimbursement rate are held below the quantity and price that would have emerged under a system of full-payment service benefit but without a cooptive relationship. The Isolation model also affects the price and quantity of physician care. Patients are responsible for that part of the fee which exceeds the indemnity schedule. Their reduced demand and price shopping in response to payment of the cost above the indemnity amount would increase the efficiency of physician care. Since physicians provide care to all patients regardless of the type of insurance they have, the benefits of increased efficiency from either the Cooptation or Isolation models are gains to all consumers.

Conclusion

All health insurance organizations are confronted with a basic problem, the discretionary power of physicians to control over medical costs. From our field study of ten insurance organizations, we identified two radically different approaches to reduce physicians' discrediscretions, enhancing the insurability of medical costs. We described one type of approach as the Cooptation model and the other as the Isolation model. While physicians control an input factor that is critical to health insurers, they also control a factor that is important to physicians.

Health insurance organizations often follow the Cooptation model when they have a large share of the insurance market. It provides the economies

of scale by which insurers can offer various incentives to practicing physicians to cooperate with the firm. At the same time, it becomes cost-effective for organized medicine to invest the resources to cooperate with the insurance firm to exchange influence. The two parties - insurer and physician - can offer incentives to each other and obtain concessions from one another. Their cooptive relationship reaches an equilibrium point when the marginal benefit to be gained equals the marginal cost of the concession to be given in return.

Insurance firms with only small market shares, follow the Isolation model. It reduces the uncertainty of medical cost by isolating physician influence on the size and number of claims. The insurers maintain control over the size of claims by an indemnity contract which promises to pay the insured only up to the scheduled amount. The insurers also reserve the right to determine what services are covered by the insurance contract, regardless of their medical necessity. Hence uncertainty is greatly reduced for the insurers. On the other hand, the uncertainty of a financial loss is increased for the patient since he is responsible for whatever the insurer does not pay.

Both the Cooptive and Isolation strategies have modest effects on the price and quantity of physician services. The Cooptive insurers increase efficiency by offering simplified claim filing and payment procedures. Also, the insurance firms provide direct payment to participating physicians which improve their cash flow and greatly reduce their bad debt losses. If fees are properly related to cost, then physician fees would be lower due to these greater administrative efficiencies. Moreover, Cooptive insurers are able to win concessions from organized medicine and from individual physicians. The medical community helps to control excessive fees charged and monitor

services that are rendered but perhaps medically unnecessary. Individual physicians participate in the insurance plan and accept whatever the plan reimburses as full payment. These measures pressure errant physicians to modify their economic and professional behaviors. The efficiency benefits generated by the Cooptation model extend to all patients.

The Isolation model affects the price and quantity of physician services by letting patients bear the uncertainty of medical cost and the responsibility for charges that exceed the indemnity schedule. Thus, patients have the incentive to be more informed about the price of care charged by alternative physicians and select the lower-cost doctors. This competitive pressure on physicians induces cost minimization and yields efficiency benefits. Again these benefits are non-exclusive and extend to all patients.

FOOTNOTES FOR CHAPTER 6

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Chapter 7

Physicians and Their Fees

I. Introduction

Physician pricing has long received the attention of economists. Kessel wrote in his classic article in 1959 that the physician behaved as price discriminator.[1] His model received wide acceptance because it corresponded realistically to physician price setting behavior at that time. During the intervening years, physician pricing behavior has changed. They no longer price discriminate. Nonetheless, fees in real terms have increased. Economists have employed a number of neo-classical economic models trying to explain fees, including simple and complicated competitive models, simple monopoly models, oligopoly models, and demand induced models, but none has generated a satisfactory explanation for the price and quantity of medical services. Unlike traditional competition or monopoly models, the theory of physicians pricing is complicated by three factors: information, agency and third party payments of fees.

There is an asymmetry of information between physician and patient. The patient seeks out the physician for medical advice and direct treatment. The physician not only provides services performed by himself, but he also provides information to patients on the need for and value of services that he or others will provide. The agency role gives the physician the ability to influence patients' demand. Martin Feldstein has argued that the physician can act as a perfect agent. The physician may act on behalf of the patient given a set of prices and the patient's budget constraint.[2] On the other hand, Robert Evans has argued that the physician can exploit the uninformed patient to the physician's advantage, including the inducement of demand for his services.[3] If the physician induces considerable demand, the traditional economic models are of little use

since the patient's true demand curve can't be observed and little normative significance can be attached to the quantity of price observed in the market place.

Another complexity in developing a theory of physician pricing comes from third party financing of physicians' services. The typical physician receives 64% of his revenue from government programs and insurance organizations.[4] Physicians may influence reimbursement policy in order to maximize their own utility. In Chapter 6 we developed two behavioral models of insurance firms. Under the cooptation model, individual physicians set their own charges but the physician community sets the reimbursement levels. Insurers only pay in full the charges that do not exceed the usual and prevailing limit. Under the isolation model, the individual physician can set his own charges, but must collect the difference between his charge and the indemnity amount from his patient. The mediating role of the insurers in physician price setting can affect market equilibrium conditions. The market may not clear due to the rigidities of the complex price setting mechanism between the physician and the insurance firm. The medical community can also apply professional sanction to sway the price setting behavior of individual physicians by way of the referral network.

This chapter is organized into five sections. The next section analyzes the market structure of physician services. It examines the supply and demand of medical care with special attention given to the referral patterns. Section III describes the reimbursement system adopted by insurance firms and the economic effects that have resulted from these practices. Following that, we developed an individual physician pricing model to examine the marginal conditions. The last section presents the conclusions derived from the analysis in this chapter.

II. Market Structure of Physician Services

Supply

The market for medical services is localized. Patients usually demand services from physicians within a reasonable distance from where they reside. The distribution of doctors among communities varies. In general, most market areas have a few producers. In an urbanized community with high population density, there could be several primary care physicians from whom patients may choose. In a thinly populated area, the patient may only have one or two primary care doctors who serve that community. Table 7.1 shows that in densely populated communities there are approximately 6 primary care physicians per 10,000 people while in thinly populated areas, there are 3 per 10,000. The supply of physicians also differs by specialty. In the more densely populated communities, there are 4.8 pediatricians for every 10,000 children age 14 and under, while only 0.2 per 10,000 in thinly populated communities. The distribution of other specialties follows a similar pattern. However, the ratios of specialists per capita do not necessarily give an accurate portrayal of the supply of specialists. Patients who live in a distant community but need highly specialized care may be referred to the specialists outside of their community. Hence, these crude data for specialists may not present a reliable picture of their supply. In the aggregate, while most communities have 10 to 15 physicians per 10,000, in thinly populated communities, there are only 3.9 doctors per 10,000. Again, supply varies by population density.

Product differentiation is prevalent in medical services. There are many specialties within medicine: family medicine, internal medicine, pediatrics, surgery, dermatology, pathology, etc., more than thirty in all. The number of subspecialties is also large and continues to proliferate as medical technology becomes more complicated. Medical

subspecialties can be grouped into five classifications: primary care, medical specialties, surgical specialties, psychiatry and other. Table 7.2 shows 38.7% of physicians are in primary care, i.e., general practice, family medicine, internal medicine or pediatrics. 5.5% are in medical specialties which include cardiology, allergy, gastroenterology and dermatology; 27.8% are in surgical specialties, i.e., general surgery, obstetrics and gynecology, orthopedics and urology, etc. Psychiatry is relatively small, representing only 7.7%. Pathology, radiology and anesthesiology make up most of the doctors grouped into the classification labeled "other".

Within each major classification, except those classified "other," physicians are close substitutes. This is especially true among the primary care group. For instance, there is no strong distinction between general practice and family medicine. General practitioners usually also offer services to the whole family; internists also do the same. Among surgeons, many general surgeons perform complicated procedures that may fall within a surgical subspecialty; the specialized orthopedic surgeon may also do general surgery. There is also some substitutability of services among the major groups. For example, some primary care doctors may perform minor surgeries and many surgeons may also practice internal medicine. In fact, studies show surgeons spent 35% of their time in general practice.[5] However, the substitutions among major specialty groups are limited. Psychiatrists would seldom perform surgery unless it was an emergency, and pathologists would not practice internal medicine.

Product differentiation among physicians is not limited to specialty designations. Physicians also differentiate their products by their "bedside" manners, the amenities they offer the patient, and waiting time for appointment.

The practice and art of medicine is an intangible product; it is based largely on the trust and confidence of patient toward his doctor. The technical information gap between doctor and the patient often prompts the patient to evaluate his doctor on social characteristics: by the manner in which he treats the patient; by the empathy he displays; by the thoroughness in which he explains the treatment; and the amount of time he spends with the patient. Confidence in the doctor is the frequent response by patients when asked about doctor preference. But confidence is not based simply on technical competence; rather, it is frequently based on direct social contact. Thus, product differentiation may exist in the form of social skill.

Physician services may be heterogeneous to patients for another reason. The health outcome consists of both production and consumption. Patients consume physician services from which may alter their health conditions but the recovery is uncertain. Therefore, while a set of services produced from physicians' point of view may be technically homogeneous, it appears heterogeneous to the patient because the health outcome was different.

Barriers to entry into the medical profession have existed for a long time. Government agencies and organized medicine restrict entry by licensure, limit practice by foreign medical graduates, establish acceptable training standards, and accredit medical school. Several decades ago, Friedman and Kuznets hypothesized the economic abnormality in the medical market was largely due to barriers to entry. They argued that limited places in medical schools and licensing requirements raised the barriers so high that physicians acted as monopolists.[6] By 1963, the U.S. government undertook concerted efforts to increase the supply of physicians. First, the government provided significant subsidies to medical schools if they increased their enrollment. Second, immi-

gration laws were changed to permit a greater inflow of trained doctors from foreign countries. With both policy instruments successful, the barrier to entry was reduced and the aggregate number of physicians increased from 260,484 in 1960 to 334,028 in 1970 and to 437,486 in 1978. Each year the number of graduates from American medical schools has increased: from 6,994 in 1960 to 14,966 in 1978. The foreign medical graduates admitted to the United States to practice has increased from 1,419 in 1960 to 7,419 in 1973.[7] Active physicians per 10,000 people has increased from 14 in 1960 to 20 in 1978. Yet, while barriers to entry have been significantly lowered and the aggregate supply increased dramatically, the economic abnormalities in the physician market remain. The price of services among geographic areas vary directly with the number of doctors per 10,000, the real price of physician services continued to rise, and the uneven distribution of physicians between communities remains. Now studies conducted by the government and by the Council on Medical Education find we will have too many physicians by 1990.[8]

Although economists have hypothesized that the barriers to entry caused both the dramatically high earnings of physicians relative to other comparable professions and the physician shortages in some communities, the subsequent increase in aggregate supply tends to show that barriers to entry are not the major reason for these outcomes. Moreover, barriers to entry between geographical locations is small. On the whole, physicians are free to set up practice wherever they choose. States have licensing laws but many have reciprocal agreements where they admit the licensees of other states.

Instead, it's more likely that the market power of physicians is derived from asymmetry of information and their control of various inputs for the production of health. Because physicians possess far greater medical knowledge than patients, doctors have

wide discretion in selecting the type and quantity of services to supply for a given condition. Moreover, patients cannot demand directly for many medical goods. For example, patients are not legally permitted to demand prescription drugs, hospital care or visiting nurse services. They can be requested for the patient only by a physician.

Another major source of physician market power is the result of its professional autonomy. The states have delegated the regulation of the medical practice to the profession itself. Organized medicine has the exclusive right to determine who can legitimately perform medical services and how the work should be performed. As a result, the medical community has control over the technical and economic terms of their work.

Organized medicine has adopted a set of principles to guide the conduct and the behavior of individual physicians. Several provisions regulate the agency role of doctors. The agency relationship between a doctor and a patient will be examined closely in the next section of this chapter. Here we study physician guidelines and examine how they affect physician conduct. In the *Principles of Medical Ethics* as interpreted in 1969 by the American Medical Association's Judicial Council, organized medicine acknowledges the agency role and specifies several provisions to define the ethical conduct of the physician as an agent. For example:

> "Physicians should merit the confidence of patients entrusted to their care, rendering to each a full measure of service and devotion."[9]
>
> It is unethical and contrary to Section 4 of the *Principles* for a physician to be false in any manner to the *trust imposed in him by his* patients."[10]

The *Principles* also regulate many practices of imperfect agency in existence and explicitly restricts them. For example, it prohibits the widespread practice whereby the patient contracts one surgeon to perform an operation but the surgeon substitutes another to perform the operation without the consent of the patient.[11]

Besides governing the agency relationship, the *Principles* place many other limitations on physician behavior. Some provisions are to reduce competition among doctors. The best known example is the prohibition of advertisement. This practice raises the information cost to consumers and reduces their search for the physician who maintains quality but charges a lower price. Lessened price competition among physicians increases their profits. There is greater price dispersion in this market because search cost is raised by the medical profession's restriction on advertising.

The medical profession restricts physician advertising by making it unethical to solicit patients by "the action of making information or intention known to the public."[12] The professional ethics do not allow a physician to mail out a general announcement to the public of the opening of an office, display insignia, or wear keys which show the physician's credentials.[13]

Another example of organized medicine's practice to reduce competition is not allowing any physician, unless he is the attending physician, to give the patient information about his illness and the nature of his treatment, thereby reducing the objective information a patient may possess about his physician. The *Principles* are interpreted to state that "a physician, in his relationship with a patient who is under the care of another physician, should not give hints relative to the nature and treatment of the patient's disorders; nor should a physician do anything to diminish the trust reposed by the patient in his own physician."[14] "When a physician does succeed another physician in charge of a case he should not disparage, by comment or insinuation, the ones who proceed him."[15] These codes prohibit physicians from giving information that patients need to choose among providers. By raising the cost of information, the medical profession reduces the competition in the physician market.

Another provision in the *Principles* deal with referral of patients among physicians. Physicians are not allowed to receive payment for referring patients. The *Principles* explicitly prohibit payment of commissions or fee splitting. It states, "In the practice of medicine, a physician should limit the source of his professional income to medical services actually rendered by him, or under his supervision, to his patients. His fee should be commensurate with the services rendered and the patient's ability to pay. He should neither pay nor receive a commission for referral of patients."[16]

Any violation of these rules is considered a serious matter by the medical profession. Any payment for referral is regarded as unethical and the penalty is severe. It is grounds for revocation of license or other disciplinary action by state licensing agencies.[17] The Judicial Council of the American Medical Association "wishes to record its condemnation of fee splitting wherever it may be found, and component (medical) societies and constituent associations must purge their membership of any who willfully refuse to desist from such practices, the continuation of which can only bring dishonor and reproach on the medical profession."[18]

The prohibition of financial gain from referrals is strict and widely followed by physicians. This restriction may be economically inefficient unless we assume the physician is a perfect agent. When the physician decides whether or not to refer a patient, many considerations enter into that decision. The well-being of the patient is one. The physician considers the marginal benefit of substituting another physician's services for his own. At the same time, the referral of a patient reduces his own marginal revenue. If the physician is not a perfect agent, he may provide the medical service himself although it is inferior. If explicit payment is allowed for a referral, there could be an

improvement in the patient's welfare because the physician would be compensated for his loss of marginal revenue. But that is explicitly forbidden by the professional ethics.

The physician community enforces its principles of ethics through various means. One avenue of enforcement is through legal institutions such as licensing boards. Another avenue is through the county and state medical societies. The local societies can sanction a physician in two ways. First, it can deny membership to a physician. In many communities membership in a county medical society is a prerequisite for obtaining hospital privileges. Second, it can conduct review of a physician's practice when a complaint is received by the medical society. Sometimes patients and insurance organizations do file complaints with the county medical society when serious abuses occur. Another avenue of sanction is through the informal network of referring patients. Through his agency role the physician can exercise an influence on the demand for his peers' services by referring patients only to physicians who conform to the rules of behavior laid down by the whole physician community. This referral demand will be discussed more fully in the next section.

Demand

A patient demands medical care to produce health for himself and to relieve pain and suffering. He maximizes his utility function subject to a budget constraint by consuming various quantities of goods according to their prices. Since insurance reduces the patients' out-of-pocket cost for medical services, his demand for care is increased. However, physicians also demand medical care on behalf of their patients because they frequently lack adequate knowledge to make rational choices.

The demand for physician care comes from two sources: patients and other doctors. Patients often are uncertain about their illness and the efficacy of alternative medical procedures. Also patients may lack the knowledge to assess the quality of care provided by physicians.

Smallwood and Smith pointed out the asymmetry of information that exists on both sides. Physicians possess superior technical information, but the patient knows his preferences much better. There does not seem to be any disincentive for the patient to disclose his preferences fully, but the difficult task of obtaining his patient's preferences may cause the physician to make decisions without an adequate knowledge of his patient's tastes.[19]

Imperfect knowledge does not characterize all physician contacts. Patients do initiate the first visit. They also may be quite knowledgeable in purchasing services for conditions which they have experienced before. Mark Pauly suggests that competition might be thwarted only by conditions of "reducible" uncertainty. This is the situation where physicians possessed relevant information which patients do not.[20]

Partly due to asymmetry of information, the physician performs four complex and related functions: (1) he provides information, advice and direction to patients; (2) he

demands certain medical goods and services on behalf of patients; (3) he organizes and directs the production process, and (4) he provides a major productive input. Hence, the physician is thrusted into a position where he is both a demander and supplier of medical services.

When he is a perfect agent, the physician demands exactly the quantity of care that the patient would choose if he had the information and knowledge that the physician has. From the viewpoint of the patient, his utility is maximized if he receives the quantity of services he would have demanded if he were fully informed and faced a price equal to the user price. Mark Pauly puts it this way. "The physician is a perfect agent when his ostensible maximand would be the patient's utility, and his choices would duplicate the choices the patient would make, if the patient had the same information as does the physician."[21] Under these conditions, the physician who can act as a perfect agent must find out his patients' preferences, his degree of risk aversion, his budget constraints, his insurance coverage, his shadow price for pain and suffering, etc. When confronted with these arduous tasks, it is plausible that the physician would only obtain partial information from the patient and act accordingly.

Moreover, the agency relationship is further complicated by the role of physicians who are also suppliers of services. The question is whether the physicians' own utility function would supplant a large part of the patient's preferences. Mark Pauly found that if the market is perfectly competitive, there is no reason for the physician not to act as a perfect agent. But if the physician has strong market power to influence demand, as it appears to be, then it is inconsistent to assume that the physician is an income maximizer when he sets price, but not when he offers advice and demands services on behalf of the patient. The same motivation which leads him to set prices above margi-

nal cost will lead him to distort the advice he gives.[22] This suggests that physicians may not act as perfect agents. When it is necessary to induce demand to maximize their own utility function, physicians may do so.

While a theoretical model has not been developed by which we can separate out the unique marginal conditions of induced demand,[23] there has been a number of empirical studies which tend to show that the physician does not act as a perfect agent. Monsoma examined the surgical rates under two different organizations of medical care. Under pre-paid health care plans, the physician is salaried, and the marginal revenue to the physician is zero for additional units of service supplied. However, the marginal revenue is positive and significant under a fee-for-service system. Monsoma found the surgical rates are almost fifty percent higher under fee-for-service. He concluded that surgical rates are affected by the economic incentives accrued to the physician.[24]

Victor Fuchs also conducted empirical studies of induced demand theory. He specified an econometric model which permits him to keep demand constant while estimating the effects of supply on quantity. Fuchs found statistical support for the hypothesis that surgeons can and do shift the demand for their services.[25]

Economics of Referral

Patient referral is an important part of the demand for physician services. As medical science becomes more complex, the diagnosis and treatment of a patient is divided among many specialists. Internists will treat a stomach pain from indigestion but will not treat the patient if the pain is due to a bleeding ulcer. He will refer the patient to a surgeon. Meanwhile, a surgeon who finds a patient with an enlarged liver will refer the patient to an internist rather than treat the condition himself. Referring a patient to other specialists is a large part of the advising function of the doctor. It accounts for a

significant portion of the demand for medical services. Moreover, it is an important vehicle by which the physician community applies economic sanction to its fellow members whose behaviors deviate from the norms established by the profession.

When the physician selects a doctor to whom he refers his patients, he would consider the other physician's medical training, technical skills, reputation in the medical community, along with an economic factor - price. Some of these factors can be specified with greater certainty than others. A physician's formal medical qualifications can be ascertained, but his pastoral care of patients cannot be measured with equal precision. As the result of imperfect information, physicians are not taken as perfect substitutes for each other even if their formal technical qualifications are the same. The lack of homogeneity of services reduces the importance of price as an allocative factor in the referral system and its effect on final demand.

Another economic consideration enters into the referral decision. Different medical specialties offer complementary services, as well as substitute services. For example, most general surgeons offer primary care services.[26] They treat the common cold, diarrhea, and the flu. Some general practitioners also do minor surgery. Within each major specialty, there is stronger substitution among physicians. A general practitioner can treat a patient with high fever without calling an internist who is an infectious disease specialist for consultation, albeit the outcome for the patient may be different. Meanwhile, an internist specializing in infectious disease can render primary care services. The substitution among different specialists, however, creates price competition that may inhibit the physician from acting as a perfect agent. He may be reluctant to refer his patients to a physician whose fees are exceedingly low because he could lose patients to the referred physician due to much lower prices. Even when the patient

doesn't shift physicians, he may feel that the referring physician is overcharging him. The doctor-patient relationship could be impaired which increases the psychic cost to the physician.

In our field study,[27] we examined the validity of our hypothesis that the motive of avoiding price competition reduces physician referral to low price doctors. Among scores of physicians we interviewed, they responded consistently that the price another physician charges does enter into their referral decisions. However, they seldom have exact information on fees partly because of an inexact definition of quantity of services. Instead, they know whether a physician charges the going rate, or above or below that rate.

The physicians also told us that they are less likely to refer patients to a physician who charges far below the going rate. They explain their decision on the basis of quality rather than on price competition. Most physicians interviewed stated that those physicians who charge low rates may offer less quality in their services. The most frequently cited source of quality variation is the time input for a given service. The physician who charges very low fees may reduce his time input which diminishes the quality of care.

The referral demand curve is illustrated in Figure 7-1A. D_r depicts the referral demand that faces a typical physician. When he charges a fee that is between P_1 and P_2, the comparable range of fees charged by his colleagues (the going rate), the demand from referrals is inelastic. The P_1-P_2 price range exists because of the imperfect knowledge of price by the referring physician and because of the heterogeneity of physician services.

When the physician sets his price above P_2, which could be the prevailing limit set by the Blue Shield plans, he faces an elastic referral demand. The referring physician

reduces his referrals to protect the financial interest of the patient.

When the physician sets his price below P_1, he faces a positive elasticity of demand. The reasons for this phenomenon have been explained earlier. It is because the physician believes that quality is inferior or alternatively he wants to avoid price competition from a competitor.

Hence, the demand for physician's services consists of two parts. One demand schedule is generated by patients and another by referrals. Figure 7-1B represents the demand by patients. We assume there is monopolistic competition and the physician faces a downward sloped demand curve.

Figure 7-1A, B, and C

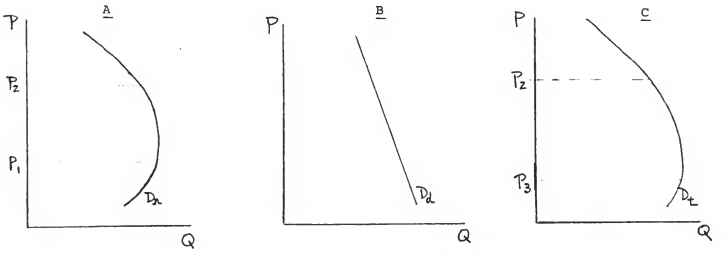

Figure 7-1C depicts the total demand curve representing the sum of patient demand and referrals. D_t is very elastic when price is above P_2, but it becomes rapidly inelastic as price declines. At some price below P_3, the demand curve may turn upward sloping. The combination of referral demand and consumer demand would explain a widely held belief by physicians that if their fees are low in relation to their competitors, they will lose rather than gain patients.

The particular shape of the demand curve has several important economic implications. First, price competition is limited in the physician market. Doctors would not set their price below P_3 to compete for patients. This is especially significant for new physicians entering into the market place. Economic analysis has demonstrated that if pure profit is being made in a market, free entry will eliminate profit. But in the situation portrayed in Figure 7-1C free entry will not reduce price below P_3. Our model predicts that increases in the supply of physicians do not reduce the real prices of medical care. There are several reasons for us to argue this conclusion. First, data collected from our field study reveal that new doctors tend to charge the median market price. The variances of the fees charged by new doctors is lower than those of established physicians. Second, demand is quite price inelastic between P_3 and P_2, therefore fees would move up to P_2 when there are no institutional constraints from third party payors. Also, given price elasticity of demand is $>|-1|$ at point above P_2, and if the marginal cost and shadow price of physician time exceeds P_2, the physician cannot increase price nor will he supply enough to meet patient demand. Under these circumstances, there will be excess demand in the physician market.

III. Reimbursement for Physician Services

Physician revenues are paid from five sources: Blue Shield plans, Commercial insurers, Medicare, Medicaid and patients. Approximately two-thirds of their revenue is from private and public insurance programs, commonly called third party payers. They sometimes with the help of the organized medicine, decide which medical services are paid, which are excluded, what level of fees the insurer will pay and how the payments are made. Physicians respond to these incentives. Their reaction functions determine the price they will set and the quantity they will supply.

Reimbursement procedures are complex. Physicians are paid under two methods. The most widely used one bases its approach on the "usual, customary, and reasonable" (UCR) concept. The other payment method uses a fee schedule.

Under the UCR, a profile is maintained for each physician on the fees he has and is currently charging. The insurer considers the fee a physician has been charging on a given date (e.g., July 1 of each calendar year) as the usual fee. The insurance firm mandates that the physician must have charged that fee for some duration, such as six months before the set date in order for that fee to be established as the usual fee. For several Blue Shield plans we studied, a participating physician had to notify a plan in advance of a fee increase so that the fee would be entered into his fee profile. The physician had to justify any increase. For example, he may explain that the annual rate of inflation has been 10% and that his fee has not been increased for a year. Frequently the physician may also document that input costs have risen: rent, capital input, malpractice premium rates, nurses' wage, etc. The Blue Shield plan may request additional information if they find the documents inadequate to support an increase in the fee. After a Blue Shield plan agrees to an increase, that new fee becomes the usual fee.

Since the Blue Shield plans only control the fee but not the input factors, this practice distorts the production function. There is an incentive for physicians to substitute other labor and capital inputs for his own time. The shadow prices of these input substitutes to the physician are a function of the demand elasticity for physician services. Since two-thirds of physician fees are paid by third party payers, the constraint from demand is weak. This could explain, in part, the large investment in capital input for physician services where the marginal cost has far exceeded the marginal benefits to patients.

Some plans have less stringent procedures. Physicians do not have to justify fee increases, but simply charge higher fees. These higher fees will automatically enter into their fee profile. They are recognized in the reimbursement rate at the next update of usual fees.

Some plans recognize new fees once a year, while other plans adjust them every six months. Those plans which update fee profiles more frequently may create a more inflationary condition. However, that is not necessarily the outcome.

If the physician sets his fee to maximize his income, he may set the rate of increase according to the frequency that a Blue Shield plan adjusts his fee profile. If it is updated frequently, the physician can increase his fee at smaller increments but do it between shorter intervals. If the update occurs at longer intervals, he increases his fee each time at a higher rate, but less frequently.

The other part of the UCR system is the customary fee. It represents the fee charges by similar physicians in a community. In operational terms, a Blue Shield plan tabulates the statistical distribution of usual fees for each procedure in a community. The fee committee sets an arbitrary percentile as an upper limit. This limit is called the prevailing charge. Usually the limit is set between the 75th and 90th percentile. Most insurers treat general practitioners different from specialists. Separate distributions are tabulated for the two groups by which different prevailing charges are established. For a given procedure, the prevailing charge for specialists is usually higher than the one for the generalists. The economic implication of this practice will be discussed later.

A community is defined in a very broad sense for the purpose of establishing prevailing limits. Most states are divided into two "communities" - urban and rural regions. Only the most populated states such as New York and California are divided

into several regions. Thus, the prevailing charges are not really the distribution of charges of a reasonable market area, but a large region within a state. This practice allows some equalization of fees within a region.

A claim for a covered service will be paid in full when it does not exceed either the usual charge or the prevailing charge. Otherwise the amount reimbursed is the lower of the two charges. If a claim exceeds either criteria, a physician can still receive full payment if he can show there are extenuating circumstances in that particular case. Whenever there is a dispute between Blue Shield plan and a physician, a committee of physicians pass the final judgment on the reasonableness of a charge.

Under the UCR system, without other market constraints, we expect physicians to raise their fees until they reach the prevailing charge. Statistically there should be a bunching of fees at the allowed prevailing level. Hsiao has analyzed the statistical distribution of fees actually charged by physicians in twenty-four states. He found there was no bunching of fees at the prevailing charge level. This seems to indicate there are other market forces at work which determine how fees are set.[28]

Commercial insurers also offer insurance coverages advertised as reimbursing patients according to the UCR scheme. But in reality except under very unusual situations, a commercial firm does not have a sufficient regional market share to construct a fee profile for usual and customary fees. Most commercial firms only insure a few percent of the population in a given community. They do not have a sufficient number of claims filed with them to ascertain the usual charges of the physician. As a result, commercial firms may say they offer payments based on a UCR system, but in reality they set a maximum fee for each procedure. This limit is based on the informed judgment of claims personnel in consultation with the company's physician-employee. When charges

exceed the established maximum limit, the patient has to pay the difference.

A few years ago, the trade association for the commercial insurers - the Health Insurance Association of America - began to assemble data from its member companies to compile a fee profile for each state. Now commercial firms use these statistics to set their prevailing limits. However, each individual commercial firm still lacks sufficient data to monitor the usual fee charged by an individual physician.

Under many UCR insurance plans, they pay higher fees to specialists than to generalists for performing the same procedures. This practice distorts economic efficiency since many medical services can be performed equally well by a generalist. By paying higher fees to specialists for producing the same service, the cost is not minimized. Moreover, this practice also induces a shift in physician supply toward specialists. For a given service, the shadow price per unit of specialists' time is higher than for the generalist because the specialist has had more training, but for the same reason the specialist's time input per procedure should be less. Under pure competition the total shadow price of specialist input for a given procedure equals the total shadow price of a generalist's input. However, the UCR reimbursement scheme compensates the specialist more. Therefore, this reimbursement practice induces some doctors to become specialists. In fact, this is the situation today in the United States. We have an oversupply of specialists and a shortage of generalists so the specialists are supplying a great quantity of generalist services - i.e., primary care.

The second payment method employed by governments and health insurers is the fee schedule. The insurers spell out the maximum fee that they will pay for a given procedure. The schedule is specified in the insurance contract. Usually the fee in the schedule is less than the median fees charged in a region. When a physician charges

higher than the fee schedule, the patient is responsible for the difference between the charge and the amount reimbursed under the schedule. Commercial insurers design their insurance products to reimburse patients for physician services according to a fee schedule. A few Blue Shield plans have also adopted the fee schedule method.

Reimbursement policy for the Medicare program follows the UCR approach, but with some significant differences in its administrative practices. The government specifies the frequency by which a fee profile should be updated usually once a year. The customary charge is defined by government regulations as those physician charges made during a twelve months period that ended on the last December 31. As a result of these administrative regulations, the customary charges allowed under Medicare lags the current charges by 12 to 18 months. Also, the Medicare program sets its prevailing limit at the seventy-fifth percentile which is lower than what private programs set. The increases in prevailing limit is restricted by indexing the limit to general inflation indices. With all of these administrative actions, Medicare is able to retard the fees payable under its program below the actual inflation rates of physician fees.

Medicaid finances health services for poor and low income people. State governments manage the program. As a result, there are a variety of reimbursement procedures. Each state has a scheme of its own. Many states establish fee schedules. They are usually much lower than what physicians are charging to patients and insurers. Other states contract insurance firms as fiscal agents and follow the UCR system. It is impossible to generalize the Medicaid reimbursement policy across states. Most physicians receive a very small percentage of their revenue from Medicaid. But for those physicians whose practice is located in a low income area, their income is greatly effected by Medicaid.

Under the Blue Shield plan, a physician must decide whether or not to participate (i.e., accept the plan's reimbursement as full payment). If we assume the physician is a price setter, he would participate whenever the reimbursement rate is equal or greater than his fee. When his fee is greater than the reimbursement rate, he would calculate the marginal cost of participation and balance it with the marginal benefit. In a simple case where all of his patients are insured by Blue Shield, the marginal cost is the difference between the reimbursement rate times quantity demanded if he participates and the quantity demanded if he doesn't participate times his higher fee minus bad debt. The quantity demanded when he doesn't participate would be smaller than that quantity demanded if he participates for two reasons. First, since patients have to pay an out-of-pocket cost for that portion of the fee which exceeds the reimbursement rate, demand would be reduced. Second, patients who receive care from a non-participating physician have to file claims with the Blue Shield plan, the shadow price for this paper work could be quite significant, this would further reduce demand. The marginal benefits of participation to a physician are the reduction of administrative costs for the physician, reduction of bad debts and more prompt payment of bills.

Medicare allows physicians to decide whether he will take assignment on a case-by-case basis. When a physician takes assignment, he accepts the Medicare payment as the full payment, no balance billing is made to patients. When a physician doesn't take assignment, he bills the patient at his normal charge. The patient is responsible to pay the charge in full and receives reimbursement from Medicare for whatever the program would pay. In other words, patients have to pay for the difference between what the physician charges and what Medicare pays. The economic effects of assignment is similar to those for participation. In both cases, the physician would balance the marginal loss from participation or assignment with the marginal gain of participation or

assignment. The patients usually have to pay additional amounts for physicians who don't participate or take assignment.

In the case Medicaid, physicians can discriminate against Medicaid eligibles by refusing to accept them as patients. Alternatively as shown by an analysis done by Sloan, Cromwell and Mitchell, physician can Medicaid patients just to fill in available time after all other patients demands have been met.

IV. A Model of Individual Physician Price Setting Behavior

The physician has long been regarded as possessing the ability to set the price for his service, at a level determined by the patient's ability to pay. This practice is enshrined to this day in the *Principles of Medical Ethics*. It states that "the physician fee should be commensurate with the services rendered and the patient's ability to pay."[29] The physician reaps a monopolistic profit through this price setting practice. But the physician usually offers a different explanation for this it. He acknowledges that he can vary his price according to the patient's income. However, this is done for humanitarian reasons. Many patients need medical service but are unable to pay. Yet physicians still supply the service and collect whatever the patient can afford. He compensates this loss of income by charging higher fees to those who have greater ability to pay. Regardless of the motive behind the price discrimination, the outcome is still the same. Physicians can set prices.

However, the growth of health insurance coverage has led to the decline of price discrimination. Comprehensive statistical data of physician charges have been collected since the early 1970's. Hsiao has analyzed actual charges by physician in 1971 and found no evidence of price discrimination. For a given procedure, the physician charges the same fee to all of his patients, regardless of their income and insurance coverage.[30]

Our model assumes the physician is a price setter and there is monopolistic competition. He faces a demand curve as shown in Figure 7-1C. The middle range of the demand schedule is quite inelastic while the lower part has a slight upward slope.

The physician maximizes a utility function that has three arguments, π, V, and S. π denotes the net income from his medical practice; V denotes the leisure hours in a day; S denotes the physician's social concerns, i.e., his humanitarian concern toward the people in general, and to his patients in particular. The physician pledges himself to dedicate his life to the service of humanity, and his responsibility extends to the whole society where he is to improve the health and well-being of everyone.

In this model, we assume that one expression of the physician's social concern results in his desire to see that as many people as possible have health insurance coverage. This will improve the patient's financial access to medical services. At the same time, health insurance also provides a greater degree of freedom for the physician to make medical decisions purely on technical grounds with no financial constraint. Nonetheless, the physician is aware that there is a trade-off between his fee and insurance rates. The higher the fee he charges, the higher the premium rate of health insurance. The number of people who buy insurance declines as the premium rate goes up.

The structural equation of our model is:

(1) $U = U(\pi, V, S)$

(2) $V = 16 - H$

H denotes the hours of work the physician would supply;

an endogenous variable in this model.

(3) $\pi = P(Q, INS)\, Q - C(Q)$

P denotes the fee set by the physician; Q the quantity of services the physician would supply;

INS represents the percentage of the population who will buy insurance.

(4) $Q = Q(H, L, \bar{K})$

L denotes labor tiput other than the physician's own time;

$\bar{K}$ represents capital goods in the production function assumed to be fixed in the short-run.

(5) $S = S(INS; \vec{X})$

$\vec{X}$ is a vector of exogenous variables

(6) $INS = I(P; \vec{Z})$

$\vec{Z}$ is another vector of exogenous variables.

The physician's maximands are π, V and S. His decision variables are H, L and P.

The first order conditions are:

(7) $$\frac{\partial U}{\partial H} = \frac{\partial U}{\partial \Pi} \cdot \frac{\partial \Pi}{\partial Q} \cdot \frac{\partial Q}{\partial H} - \frac{\partial U}{\partial V} = o$$

$$\frac{\partial U}{\partial \Pi}(MR - MC)\frac{\partial Q}{\partial H} = \frac{\partial U}{\partial V}$$

(7a) $$U_v = U_\Pi (MR - MC) Q_H$$

(8) $$\frac{\partial U}{\partial L} = \frac{\partial U}{\partial \Pi} \cdot \frac{\partial \Pi}{\partial Q} \cdot \frac{\partial Q}{\partial L} = o$$

$$= \frac{\partial U}{\partial \Pi}(MR - MC)\frac{\partial Q}{\partial L} = o$$

$\frac{\partial U}{\partial \Pi}$ could be dropped from both sides of the eqn., thus

$$\text{(8a)}\ MR\frac{\partial Q}{\partial L} = MC\frac{\partial Q}{\partial L}$$

$$\text{(9)}\ \frac{\partial U}{\partial P} = \frac{\partial U}{\partial \Pi} \cdot \frac{\partial \Pi}{\partial P} + \frac{\partial U}{\partial S} \cdot \frac{\partial S}{\partial INS} \cdot \frac{\partial INS}{\partial P} = 0$$

$$\frac{\partial U}{\partial \Pi} Q + \frac{\partial U}{\partial S} \cdot \frac{\partial S}{\partial INS} \cdot \frac{\partial INS}{\partial P} = 0$$

$$\text{(9a)}\ \frac{\partial U}{\partial \Pi} Q = -\frac{\partial U}{\partial S} \cdot \frac{\partial S}{\partial INS} \cdot \frac{\partial INS}{\partial P}$$

The first two derived marginal conditions of the model are familiar economic results. Equation 7A shows the physician will increase his hours of work until his marginal disutility of foregone leisure (U_v) equals the marginal utility of income gained from the profit of one additional hour of work. Equation 8a shows that the physician will employ labor inputs until the marginal revenue of labor equals the marginal product of labor.

Equation 9a yields an interesting result on the price setting behavior of physicians. It shows that the physician will set price at the point where his marginal utility of income weighted by one unit of quantity equals his marginal disutility of a reduction in social concern. If the social concern is measured by insurance coverage, the physician is willing to forego some income to expand the proportion of the population covered by insurance.

V. Conclusions

The market for physician services is complicated by inadequately informed consumers, the agency role of doctors, the professional ethics for physicians and third party reimbursement. All of these factors make it difficult to apply traditional economic

models to explain the pricing behavior of doctors and to conduct a comprehensive analysis of the economic efficiency of this market. This chapter examines the special characteristics of the physician market and evaluates their impact on efficiency.

Physicians derive their market power from various sources. First, patients, lacking adequate medical knowledge to make informed choices, rely on information and advice provided by physicians to make decisions. Second, the physician serves as an agent for his patient in demanding certain medical services, and unless the doctor is a perfect agent, he can choose various combinations of inputs in producing care which maximize his own maximand instead of the patient's maximand. Empirical studies have found evidence to support the hypothesis that physicians do not act as perfect agents. They may induce demand to increase their marginal revenue. Third, physicians control several critical medical inputs for the production of health care. They control admissions and discharges from hospitals, patient's access to skilled nursing homes, etc. Fourth, organized medicine had established several measures to restrict competition among doctors. The best known example is prohibiting physicians from advertising. Fifth, the medical profession has been granted autonomy by legal authorities. The profession has the legitimate right to declare outsiders as unqualified, incapable and incompetent to evaluate physician's work and activities. Lastly, physicians are able to differentiate their products, not only on technical competence, but on quality of care.

Although physicians possess monopolistic and other market power, they cannot exercise them fully. Physicians' uses of market power are moderated by professional ethics and social responsibilities. Also, organized medicine uses economic sanctions to restrain the monopolistic behavior of individual physicians when they set fees that exceed the limits permitted by the profession.

The agency role of doctors may produce an upward sloped demand curve at lower price ranges for physician services. This results in situations where physicians are not perfect agents. They may not refer patients to low-price doctors because of their motive of avoiding price competition. Hence, price is raised and competition is inhibited by the upward sloped demand curve. Agency may also affect patient welfare in another way. Since fee splitting is explicitly forbidden by organized medicine, the physician may provide his own inferior services instead of referring the patient to an appropriate specialist because the referral would reduce his own marginal revenue.

The reimbursement practices adopted by insurers affect price and quantity of physician services in several ways. By establishing fees for specialists higher than fees for generalists for performing the same service, it offers incentives for a physician to become a specialists. This explains the persistent oversupply of surgeons while a shortage of primary care doctors continues.

Third party payers pay different fees. Also Blue Shield and Medicare give physician the discretion to balance bill the patients for what the programs would not pay when the charges are unreasonable. As a result, physicians can select patients according to their insurance coverage, taking the most renumerative patients first and accept the Medicaid patients as a last resort. Also physician can practice a modified form of price discrimination by accepting assignment on a case-by-case basis according to Medicare patient's ability to pay.

Insurers control fees but not the input factors. This practice distorts the production function by offering incentives to physicians to substitute other labor and capital inputs for physician time in the production function than what would occur under perfect competition. This distortion offers a plausible explanation for the excessive capital invest-

ment in medical care.

In sum, there are many anomalous conditions in the market for physician services which affect demand and supply. Physician pricing behavior may be best represented by a monopoly model which maximizes utility rather than income. One attribute of a physician's utility function is his social responsibility. It constrains the physician's desire to charge as much as he can to maximize income. A principal element of the social responsibility is to make medical care available to those who need it through reduction of barriers to care. Insurance is a vehicle for lessening out-of-pocket costs. Therefore, the physician will trade-off his marginal utility of income with the marginal disutility of fewer patients buy insurance when premium rates are increased to cover higher medical cost and thus raise patients' financial barrier to obtain medical care.

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Chapter 8

Economics and the Style of Medical Care

A Theoretical Model of Physician Behavior

1. Introduction

Physicians play a dominant role in the American health care sector. Yet, there is very little theoretical or empirical understanding of the economic factors that influence various aspects of physician behavior, including patterns of medical practice, organizational mode, and the price of medical services. Despite numerous recent studies in this area, much remains to be learned, particularly with respect to physician pricing behavior. This paper describes a theoretical economic model of physician behavior that can be used to analyze the interaction among the demand, supply and price of doctors' office visits.

The response of physicians to financial incentives has important implications for predicting the effects of reimbursement policies established under various government programs, chiefly Medicare and Medicaid. Recently, federal, state and local governments have been seriously concerned with the rapidly rising trend in the cost of physicians' services as part of publicly financed medical care programs. Control of the reimbursement mechanism for physicians' services frequently has been mentioned as a policy instrument to modulate the rate of increase of costs, as well as to achieve a number of other goals in the medical care sector.

In order to select an optimal reimbursement method for publicly financed health care programs, it is necessary to have a better understanding of the factors underlying the interaction between physicians fees and

physician behavior. The purpose of this paper is to provide a theoretical basis for analyzing this relationship. The framework for the analysis is an extended utility maximization model; the doctor is treated as an individual supplying labor in the context of the special circumstances surrounding the practice of medicine.* The model can also be used to derive the proper specification and interpretation of empirically estimated equations describing the price and quantity of physicians' services supplied.

Economic analysis has played a valuable role in health policy formulation by pointing out the importance of economic incentives in determining physician behavior. Indeed, any government program that neglected to take these factors into account might result in unintended consequences. At the same time, economists recognize that non-economic factors also play an important part in determining many aspects of the market for physicians' services. It is the aim of this research to bring some of these other variables into the economic analysis more explicitly.

The practice of medicine has many distinguishing characteristics that make analysis of the market for physicians' services different from that for other goods and services. This means that traditional models have to be modified appropriately to take these special features into account. As is the case of other self-employed proprietors, the supply of labor by the physician is not independent of the output of the "firm", namely the quantity of visits produced. Thus, both production possibilities and the trade-off between income and leisure must be included in the model. This differs from the usual analysis of product supply because it is not assumed that physicians (the producers) are net income (.i.e. profit) maximizers.

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*This will be described in more detail in the next section.

Further, it has been suggested that physicians' professional preferences play an important role in determining the quantity and price of the services they supply. This might include the quality of the care rendered, peer group behavior, desire for independence or other goals. Thus, the model presented here extends the traditional utility maximization approach to the derivation of labor supply to include items of particular importance to physicians, in addition to the usual income and leisure variables.

It is particularly important to take into account differences in the style of care delivered when attempting to make interregional comparisons of the price of physicians' office visits. Much evidence exists to show that the price per visit is higher in areas of higher physician density,* contrary to predictions of traditional economic analysis. However, this figure might be misleading unless one also considers the length of these visits. Figures presented by Reinhardt (1974) for 1969-70 show that in New England, where there were 161 doctors per 100,000 population, the average fee for a routine office visit was $6.79, compared to $5.21 in the East-South Central region where there were 95 MD's per 100,000 population. When total number of visits per hour of patient care are considered,** however, this translates into an hourly wage of $15.28 in New England compared to $19.02 in the East-South Central. Thus, wages per hour, if not fees, are actually higher in the South, where the physician-population ratio is lower.

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*See, for example, Reinhardt (1974), Evans (1974), and Redisch, Gabel and Blaxall (1977).

**2.25 visits per hour in New England and 3.65 in the East-South Central.

2. Specification of the Model

More specifically, the analytic framework is built on the assumption that the physician seeks to maximize a utility function in several variables. As in traditional models of labor supply, two of the elements in the physician's maximand are leisure and net income. In addition, we postulate that the nature of a physician's practice is an important aspect of decision making in this context.* This includes both patient characteristics and the style of care rendered by the doctor. For purposes of simplification in the initial specification, each of these notions will be represented by a composite variable.

These last elements in the utility function are important characteristics that distinguish physician behavior from that of other self-employed proprietors or suppliers of labor in general. The effect of these variables on the outcome of the patient-physician encounter must be taken into account when analyzing physicians' services. The style or quality of medical care in this context is a very broad term that would include such aspects as the length of the visit with the doctor, the number of paramedical personnel employed, and the volume of ancillary services and tests.** These items are important because a physician is particularly concerned with what he believes is the quality of care delivered, whether or not there are any measurable differences in health outcomes.

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*This was suggested by several authors, but was not explicitly incorporated in the formal models they presented. For example, see Reinhardt (1972) and Feldstein (1970).

**Ancillary services and tests are not characteristic of an office visit itself, but rather are included here for completeness as examples of the type of variables that are considered part of the style or quality of a visit. They will not enter further into the formal analysis.

On this basis, we assume that everything else equal, physicians have a preference for spending more time with patients themselves and having fewer aides. This might be because they perceive that care rendered by them is superior to that of aides, or that they get disutility from having to manage a large office staff rather than just practicing medicine.* Also, because doctors are risk averse and like to minimize the uncertainties inherent in diagnosing and treating most illnesses, we assume that doctors prefer to order more, rather than fewer, services and tests.

Patient characteristics enter into the interaction between the various forces in the market for physicians services two ways. First, they are crucial determinants of the position of the demand curve for doctor visits.** Second, they may enter directly into the physician's utility function. In particular, we hypothesize that the quantity and type of services a doctor is willing to provide is influenced by the doctor's perception of the health of the population and the need for medical services by his patients and the community in general (potential patients).

These elements of the physician's utility function are summarized in Equation 1, which expresses utility as a function of the style of medical care provided (S), the physician's income (Y), leisure time (L), and the perceived need of the population for physicians' services (H). This can be written:

(1) $U = U(S, Y, L, H)$

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*This was first suggested by Uwe Reinhardt (1972) who showed that physicians hired fewer than the profit maximizing number of aides, and postulated that this was due to the high psychic cost of managing a large office.

**This part of the model will be described in more detail later.

Equations 2 through 5 describe the elements of this utility function in more detail. Very simply, leisure is defined (in hours) as 16 minus the number of hours worked (W).

(2) $L = 16-W$

Style is a function of the average time spent by the physician with each patient (t) and the number of aides the doctor hires (A).

(3) $S = S(t,A)$

Equation 4 describes the physician's net income. This is equal to total revenue (price per visit x number of visits) plus unearned income ($\hat{I}$) minus costs incurred. Costs include both labor costs (wage of aides x number of aides) and non-labor costs, which are assumed to be a function of the number of visits provided and the time spent on each visit [C(Q,t)].

(4) $Y = PQ - P_{AID}\,A - C(Q,t) + \hat{I}$

The need of the community for a physician's services is hypothesized to be related to the number of doctors per capita in addition to other exogenous variables (Equation 5).

(5) $H = H\,(MD,\underline{Z})$

Although physicians are concerned with both the style of care and the number of patients seen, they cannot increase both the quality and quantity of care indefinitely. Further, there is a direct inverse relationship between style as defined here and the number of patients seen in a given period of time. This represented by Equation 6, which states that the number of visits is equal to the number of hours worked divided by the time spent per visit.

(6) $Q = W/t$

Finally, there is an equation describing the price setting conditions (Equation 7). There has been much debate in the literature over whether the physicians' market is monopolistic or competitive.* In terms of a model of physician behavior, this translates into the question of whether physicians are price setters or price takers. The initial formulation of the model to be considered here assumed that physicians are price setters.** Thus, it is necessary to introduce a demand curve in order to solve for the price-quantity combination that would be chosen by a utility maximizing physician. For the purposes of simplicity, the demand for office visits is initially assumed to be a function of the price of the price per visit, the style of care, the number of doctors per capita and other exogenous variables.***

(7) $Q = D(P,S,MD,\underline{X})$ or $P = DD(Q,S,MD,\underline{X})$

The necessary conditions for utility maximization by the physician given the constraints of the model are found in the first order conditions. Once the time per visit, number of aides and the hours worked have been established, price and quantity of visits are uniquely determined. Therefore, the model is completed by the addition of three equations (Equations

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*See, for example Newhouse (1970), Frech and Ginsburg (1972), Newhouse and Sloan (1972), Sloan and Feldman (1977), and Reinhardt (1977).

**For the purpose of formulating government reimbursement policies, it is important to understand the effect of prices on the quantity of services supplied. This care can be considered by assuming that price is exogenous to the individual physician. The model can easily be modified to deal with this situation. See Appendix for derivation of first-order conditions in this case.

***This might include insurance coverage, health status of the population, per capita income, etc. Future versions of the model will consider including these variables explicitly. For the purposes of the initial model, this equation is written in terms of a general demand function. The particular function actually being considered is the product of two terms, the number of patients per physician and the demand for visits per patient.

8 - 10) giving the first order conditions with respect to t, A and W. Substituting for all endogenous variables except t, A and W yields the following:

$$\text{Maximize } U(t, A, DD(\tfrac{W}{t}, t, A, MD, \underline{X})\tfrac{W}{t} - P_{AID}\, A - C(\tfrac{W}{t}, t) + \hat{I}, 16-W, MD, \underline{Z})$$

with respect to W, t, A

$$(8)\quad \frac{du}{dA} = -U_L - U_Y \frac{-DD_Q W}{t^2} - \frac{DD(\frac{W}{t}, t, A, MD, \underline{X})}{t} + \frac{C_Q}{t} = 0$$

$$(9)\quad \frac{du}{dA} = U_A - U_Y\,(-DD_A \frac{W}{t} + P_{AID}) = 0$$

$$(10)\quad \frac{du}{dt} = U_t - U_Y \frac{W^2}{t^3} \cdot DD_Q - \frac{W}{t} \cdot DD_t + \frac{DD(\frac{W}{t}, t, A, MD, \underline{X})W}{t^2} - \frac{W}{t^2} \cdot C_Q + C_t = 0$$

The ten equations comprising the model and a list of symbol definitions are summarized on the following pages.

Table 1

Theoretical Model of Physician Behavior

(1) $U = U(S, Y, L, H)$

(2) $L = 16 - W$

(3) $S = S(t, A)$

(4) $Y = PQ - P_{AID}\,A - C(Q, t) + \hat{I}$

(5) $H = H\,(MD, \underline{Z})$

(6) $Q = W/t$

(7) $Q = D(P, S, MD, \underline{X})$ or $P = DD(Q, S, MD, \underline{X})$

(8) $$U_L = -\,U_Y\,\frac{-DD_Q W}{t^2} - \frac{DD(\frac{W}{t}, t, A, MD, \underline{X})}{t} + \frac{C_Q}{t}$$

(9) $$U_A = -\,U_Y\,(-DD_A\frac{W}{t} + P_{AID}) = 0$$

(10) $$U_t = -\,U_Y\,\frac{W^2}{t^3}\cdot DD_Q - \frac{W}{t}\cdot DD_t + \frac{DD(\frac{W}{t}, t, A, MD, \underline{X})\,W}{t^2} - \frac{W}{t^2}\cdot C_Q + C_t$$

Table 2

Definitions of Variables

Endogenous

U = utility of physician

S = style of medical care rendered

Y = net income of physician

L = leisure time of physician

H = need for doctor by community as perceived by physician

Q = quantity of physician visits

W = hours worked by physician

A = number of aides

t = time spent with doctor per visit

P = price of a physician visit

Exogenous

MD = doctors per capita

$\underline{X}$ = vector of other variables influencing demand

$\underline{Z}$ = other variables influencing need for doctors' services

P_{AID} = wage rate of aides

$\hat{I}$ = unearned income of physicians

3. Discussion

Because of the complexity of the model, it is difficult to work out the comparative statics of these equations written in their most general form.* However, several implications can be seen directly from the basic equations presented here.

It is interesting to compare this model with either the traditional utility maximizing or the competitive profit maximizing model. In either case, the model presented here would lead to a higher level style, higher price per visit and a smaller number of visits provided by each doctor. This would also be the case when price is exogenous to the individual physician but does depend on the style of care delivered. These results are similar to the case of the profit maximizing monopolist in that price is higher and quantity produced lower than in the competitive case. However, the motivating factor and the mechanism which brings about this result are quite different.

The implications of this model can also be seen by considering the effects on price, time per visit, quantity of visits and hours worked per physician of increasing the number of doctors per capita. The initial effect of an increased physician-population ratio is to decrease the quantity of patients and office visits per physician; this is accompanied by a decrease in income, increased leisure time and a decrease in the perceived need of the community for a physician's services.

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*These will be worked out in subsequent work on this model. It is anticipated that the theoretical results will be ambiguous in many cases, so that their omission here is not serious.

The overall effect of these changes is to increase t, the time spent per patient. This occurs for several reasons. The physician is out of equilibrium with respect to leisure. More leisure is thrust upon him than he chose originally and his income is lower. Thus the physician wants to work longer and make more money. By itself, this leads to an increase in t. This effect is reinforced by the fact that the doctor now views the community as being less needy of his services thus, he can take the opportunity to improve the style of the care he renders, including increasing the length of an office visit. Since style is an element in the patient's demand function, the increased time per visit would tend to increase demand, thus offsetting the initial decrease in Q to some extent.

The time per visit also responds to changes in price. As the price per visit increases due to decreased Q, the length of the visit also increases. At the same time, the equilibrium price level is a function of time per visit. [P(t)]. The increase in t brought about by the increased number of doctors per capita is likely to lead to higher prices. In addition, it is possible that the function P(t) will shift in response to decreased demand. However, it is more likely that price will change due to a movement along the P(t) curve than a shift.*

Thus, the effects of increasing the number of doctors per capita in this model are different from those in both the traditional monopolistic and competitive models. In particular, time per visit increases and therefore it is likely that quantity of visits per physician decreases and the

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*This would be true if the number of patients per physician were relatively insensitive to the price of a visit.

price of those visits increases.*

4. Concluding Remarks

This paper has sketched the outline of a very general model of physician behavior, including both economic and medical considerations. The theoretical model was developed in order to form the basis for empirical estimation of various aspects of the market for physicians services. Towards this end, the research described here is currently being extended in several directions.

First, the current model focusses on individual physician behavior and assumes that each doctor is a pure monopolist. This assumption will be relaxed and the case of monopolistic competition will be considered. This will enable us to do general equilibrium analysis and examine interregional variations in a more realistic context.

Next, specific functional forms will be substituted for the more general formulations given here. This will tell us the exact form of the equations to be estimated. It is important in this context to use forms which are specific enough to enable us to test relevant hypotheses but at the same time are not overly restrictive in their implicit assumptions.

Finally, variants of the original equations will be considered and other important variables will be entered into the model explicitly. For example, it is probable that physicians, acting as agents for their patients, take into account patients' insurance coverage and the out-of-

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*It is unlikely that the effect of improved style is enough to offset the decrease in Q due to the increased number of physicians, and time per visit. A more general model would also include the prices charged by other doctors. In this case, cross-price effects are important in determining the final price.

pocket costs borne by patients when deciding what type of services to provide. Further, deductibles and coinsurance rates are very important components of many national health insurance proposals currently under consideration by the federal governments. By introducing these variables explicitly into the utility function of the physicians and into the patients' demand curves, this model will be very helpful in predicting the overall effects of various government health policies.

This list of possible extensions of the basis model is not exhaustive. It is hoped that other researchers will follow up on the general approach to modelling the market for physicians' services presented here, and build upon it to further our understanding of this complex situation.

Appendix

First-Order Conditions when Price is Exogenous

Case 1: $P = f(t,A)$

$$\text{Maximize } U(t,A,DD(t,A,MD,\underline{X}) \cdot \frac{W}{t} - P_{AID}A - C(\frac{W}{t},t) + \hat{I},16-W,MD,\underline{Z})$$

with respect to W, t, A

$$(8) \quad \frac{du}{dw} = - U_L - U_Y \left[\frac{-DD(t,A,MD,\underline{X})}{t} + \frac{C_Q}{t} \right] = 0$$

$$(9) \quad \frac{du}{dA} = U_A - U_Y \left(-DD_A \cdot \frac{W}{t} + P_{AID}\right) = 0$$

$$(10) \quad \frac{du}{dt} = U_t - U_Y \left[-DD_t \cdot \frac{W}{t} + DD(t,A,MD,\underline{X}) \quad \frac{W}{t} - \frac{C_Q W}{t} + C_t \right] = 0$$

Case 2: $P = \overline{P}$

$$\text{Maximize } U(t,A, \frac{P \cdot W}{t} - P_{AID}A - C(\frac{W}{t},t) + \hat{I},16-W,MD,\underline{Z})$$

with respect to W, t, A

$$(8) \quad \frac{du}{dw} = - U_L - U_Y \left(- \frac{P}{t} + \frac{C_Q}{t}\right) = 0$$

$$(9) \quad \frac{du}{dA} = U_A - U_Y P_{AID} = 0$$

$$(10) \quad \frac{du}{dt} = U_t - U_Y \left(P \cdot \frac{W}{t} - \frac{C_Q W}{t^2} + C_t\right)$$

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Chapter 9

An Econometric Model of Physician Fees

I. Introduction

The interaction among three economic players: patient, physician and insurer, determines the prices and quantity of physician services. Physician fees not only affect the patient's demand for care, but also have an impact on insurance premium rates. Hence, the quantity of insurance sold at market equilibrium price is a function of physician fees. However, insurance affects demand for medical services. In a price-setting market, the organized medicine has to consider the impacts of physician fees on the demand for medical services and for insurance.

The previous chapters have critically analyzed the structure, conduct and performance of the two separate markets: insurance and physician services. Also we have examined the interactions between the two markets. This chapter develops an econometric model of physician price-setting behavior. We suggest below that a more careful consideration of the rational physician interests necessitates a model formulation in which the physicians' price-setting decision is constrained by demand for medical care and demand for insurance. Physician's own utility maximization depends on a series of complex decisions where he sets fees and also he decides whether or not to participate in Blue Shield.

A recursive model of physician fee-setting behavior is developed to test several hypotheses. First, physician fees are determined by the demand schedules and cost function of physician's own services as well as the demand and cost function for insurance. Second, organized medicine acts in the col-

lective interest of all physicians to maximizing their aggregate income. The vehicle of achieving this goal is by setting prevailing fee limits. These are established to control physicians who charge abnormally high fees and seek reimbursement from Blue Shield for them. Such fees would raise claim costs and thus reduce demand for insurance. Third, the physician decision to participate in a Blue Shield plan (or Medicare) depends on the prevailing charge allowed by the plan (or Medicare program) and the demand schedule for his services. Fourth, the consumers' demand for Blue Shield insurance is a function of premium rates as well as the certainty that physicians will not bill them for additional payments above what the insurer will pay.

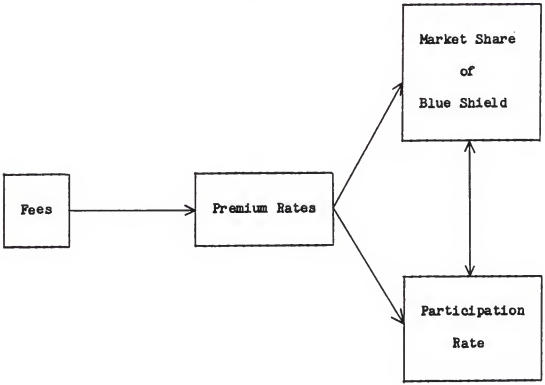
The next section of this chapter discusses the theoretical framework for our recursive model. Section III describes the data base used in the econometric model, the definition of variables and model specification. Following that, we present and discuss the empirical results. Then the regression results are summarized into eight tables. The last section provides conclusions.

II. Conceptual Framework

The physician may be regarded as maximizing a utility function with three maximands: income, leisure and social responsibility. He dominates over the technical and economic decisions of medical services, therefore he can set the price of his services. Physicians understand the relationship between their fees and the number of patients who will be insured. The fees they set will have an impact on insurance premium rates which determine the number of insured people. But an individual physician also knows that his own fee has a minuscule effect on premium rates, therefore collection actions have to be taken. The organized medicine acts in the common interest of

physicians by restraining those charging high fees through insurance reimbursement policies and through referral networks. Moreover, physicians would like to have as many of their patients insured by Blue Shield as possible, but consumer demand for insurance also depends on physicians' participation in the plan. This set of complex interactions is depicted in a recursive model which can be illustrated as follows:

Figure 9.1



There are four endogenous variables in this model: FEE, PM (premium rates), MSB (market share of Blue Shield plans), and PAR (participation rate). The four reduced equations of the recursive model are specified as follows:

(1) $FEE = F_1$ (DPH, CPH, DINS, CINS, M, N)

(2) $PM = F_2$ (FEE, DINS, CINS, M, N)

(3) $PAR = F_3$ (FEE, PM, MSB, M)

(4) $MSB = F_4$ (FEE, PM, PAR, N)

DPH and CPH are vectors of exogenous demand and cost function variables for physician services respectively. DINS and CINS are vectors of exogenous demand and cost function variables for Blue Shield insurance respectively. M is a vector of exogenous variables which determine the percent of practicing physicians who will participate in Blue Shield. N is a vector of exogenous variables which determine the proportion of population who buy Blue Shield insurance. The specification of these variables will be explained fully in the next section.

In equation (1), the physician fees are determined by all the exogenous variables in the system, not only by DPH and CPH. We postulate the demand for physician care slopes downward in the upper price range, becomes inelastic in the middle price range and upward sloping in the lower price range. The explanation of the unusual shape of the demand curve were given in Chapter 7.

Physician fees are also determined by the cost function of the physician firm. The input factors consist of the physician's own time, capital, and non-physician labor. The cost of physician labor is the shadow price of his

leisure time. Wage rates for non-physician labor as well as capital costs are exogenous to the physician who chooses an optimal mix of capital, labor and his own time input to produce medical services, influenced by the reimbursement control measures established by Blue Shield as explained in Chapter five. With constant return to scale in his production function, the physician minimizes unit cost in order to maximize his income maximand.

Our model predicts that a decrease in fees would increase the demand for physician services. In the relevant range, the price elasticity is less than $|-1|$, therefore, a drop in physician fee leads to a decrease in claim cost which increases demand for health insurance coverage. An upward shift in the physician firm cost function, ceteris paribus, would increase fees and decrease demand for physician services. An outward demand shift would increase both the fees charged and quantity supplied.

In equation (2), the premium rate is determined by the FEE set by physicians and other exogenous demand and supply variables for Blue Shield insurance. We have argued in Chapter six that Blue Shield plans were able to obtain several economic concessions from practicing physicians by giving them certain decision-making roles in the organizations. These concessions reduce the claim and administrative cost of the plans which lower their cost functions. Moreover, physicians agree to participate in the Blue Shield plans which assures consumer that their bills will be fully covered by insurance and make the product more attractive to consumers. As a result, in a static competitive world, the Blue Shield plan dominates the health insurance market.

The health insurance market is characterized by many small firms competing with one large dominating firm, Blue Shield. The Blue Shield plan sets

its premium rate to maximize a utility function, consisting of two maximands, surplus and amendities. The premium rate is regulated by limitations placed on the surplus. Other insurance firms take the premium rate set by Blue Shield and sell as much as they can, constrained by their cost functions. The health insurance market equilibrium conditions have been fully explained in Chapter 4.

In equation (2), each individual physician fee is taken as given. The insurance firm establishes a maximum level by which fees will be paid, called the prevailing charge. A physician who charges above the prevailing limit would favor its increase; since by reducing patients' out-of-pocket costs, an increase in the prevailing limit effectively raises the demand for his services. On the other hand, the physician charging below the prevailing limit would favor its decrease, since a reduction has no effect on his patients but makes higher-charging physicians more expensive to their patients. This will effectively increase demand for the lower-charging physician services. Given such a situation, the representatives of organized medicine press Blue Shield to reimburse each physician's charge, as long as it doesn't exceed certain limits. This median level of charges is the sustainable limit which represents the majority of physician interests. In other words, each physician prefers a prevailing charge limit as high as his own charge, but not higher.[1]

The prevailing charge method is an approach to maximize the aggregate income of physicians in a community conditioned upon the fees they are charging. The method allows price dispersion caused by various market conditions. Those doctors who charge below the prevailing limit receive full payment, and their fees are determined by market forces. Those doctors who charge above

the prevailing limit receive partial reimbursement for what they charge. This reimbursement control measure maintains the support of the majority of physicians in a community while reducing the free-rider problem.

When the dispersion of physician fees follows a normal distribution pattern, our model predicts that higher levels of physician influence on the Board of Blue Shield plans causes the prevailing charge to be closer to the median level.

In the cooptation model described in Chapter 6, we argue that the strength of Blue Shield's bargaining power with physicians is a direct function of the market share the plans hold. The larger the market share a plan holds, the greater its influence over the physician's financial interests. Therefore, in equation (2), we predict that the exogenous variables which determine the market share of Blue Shield plans ffects the insurance cost function and thereby influences the premium rate.

An important factor affecting the Blue Shield premium rates is government regulations. The regulatory authorities modulate premiums by controlling the level of surplus that a Blue Shield plan can earn and retain. Thus, the premium rates should be inversely related to the prior year's surplus level. In other words, if the surplus level is high at the end of the previous year, the premium rate for the next year must be reduced in order to decrease the surplus retained. (A more likely case is the rate of increase in premium rate will be lower due to a high surplus level from prior year). When the surplus is depleted, the premium must be increased to cover the anticipated rise in claim costs and re-build the surplus position to the level allowed by regulations. As a result, our model predicts the premium rates are inversely related to the previous year's surplus level.

In equations (3) and (4), we specified that PAR and MSB are determined by FEE and PM. However, while there is a simultaneous effect between PAR and MSB, they are also influenced by exogenous variables M and N respectively. The physician decides whether or not he will participate in a Blue Shield plan based on the net marginal benefit to him. If the physician charges less than the prevailing charge of Blue Shield, it is to his advantage to participate in a plan. If his fees exceed the prevailing limits, he has to take into account the market share of Blue Shield to calculate his net marginal benefit. This causes the simultaneous condition between PAR and MSB, assuming consumers' demand for Blue Shield insurance depends on the percent of physicians participating in the plan.

We predict that the physician located in a low income community, ceteris paribus, is more likely to participate. His patients' demand schedules, with tighter budget constraints, are likely to be more price elastic. Also low income patients are more likely to delay paying or not pay the difference between the physician's charges and the prevailing limit. The physician's bill collection cost and bad debts will rise in this case, increasing his net marginal benefit from participation. Moreover, even in the case where his net marginal benefit is slightly negative, the physician may still participate to avoid the psychic cost of pressing patients for payment of delinquent bills.[2]

In equation (4), we hypothesize that the market share of a Blue Shield plan is determined by the market equilibrium premium rate and the attractiveness of a plan's protection against financial uncertainties such as represented by PAR. The Blue Shield plan accepts the FEE as set by physicians in its cost.

III. Specification and Data

The four equations of the recursive model were estimated using various econometric techniques. The Ordinary Least Squares method was used to estimate all four equations. However, the Two Stage Least Square method was also employed for simultaneous equations (3) and (4). We compared the results from OLS and Two Stage Least Square for equations (3) and (4) in Tables 9.7 and 9.8. For a more appropriate analysis, a logit model was also used to estimate equation (3), the participation rate. Since PAR is a probabilistic function limited to a unit interval, Ordinary Least Squares estimates are inefficient, and the estimated standard errors are biased. More importantly, conditional predictions may fall outside the unit interval. Logit model is a more appropriate technique when the dependent variable is bounded. The results from the logit analysis are presented in Table 9.6. While a logit analysis yields better results for PAR, the same method cannot be used for MSB and in a simultaneous equation. Hence, the simultaneous equations were estimated with TSLS.[3]

Data of individual physicians were used in estimating equation (1) and the logit analysis of equation (3) where FEE and PAR variables were available for each individual doctor. Endogenous variables PM and MSB in equation (2) and (4) respectively were measures for Blue Shield plans which were organized on geographic regional basis, grouped data for each region had to be employed in estimating these equations. Furthermore, the TSLS regression results for equation (3) and (4) also had to be estimated with grouped data.

We used cross-sectional data to conduct our econometric study. This data came from two major sources. Information of individual physicians were collected by the ABT-NOAC Physician Survey, 1976, which was a sample of 2053

self-employed, full-time practicing physicians who receive their revenue on a fee-for-service basis. The sampling units were selected from 101 nationally representative primary sampling units (PSU's). They were stratified by geographic region, by county and SMSA size to ensure the sample was representative of fee-for-service physicians nationwide. The survey contacted each physician and obtained detailed information on his operations for 1975 which included the following: (1) characteristics of his patient population such as income and racial mix; (2) physician's work efforts such as number of home and office visits, surgical operations and administrative tasks, etc.; (3) type of organization, i.e., solo versus group practices; expenses and income sharing arrangements; (4) participation decision in a Blue Shield plan and the fee allowed by the plan; and (5) physician's production cost, fees and income.[4]

The second major data source was the Blue Shield plans. Forty four plans responded to our requests and provided premium rates for two years, 1975 and 1976. It should be noted that health insurance for large employer groups was tailor-made and experience rated, therefore, there were no meaningful standard group rates that could be used in a cross-sectional study. Consequently, we selected community rates for non-group insurance with comprehensive coverage of outpatient physician services and surgical operations as the data base for our study. These premium rates were regulated by states. Other data on Blue Shield plans were gathered from secondary sources including the Blue Cross/Blue Shield Annual Fact Book and the 1978 Report of the U.S. Congressional Committee on Interstate and Foreign Commerce on Conflict of Interest on Blue Shield Boards of Directors.

Other data needed for the study were gathered from various statistics published by the federal and state governments. They included the population statistics, consumer price index and personal income per capita by region, supplies of hospital beds and physicians by region, and unionization, data from a published article by Freeman and Medoff.[5]

The data we used for the four endogenous variables, FEE, PM, PAR and MSB, came from the following sources. FEE, the fees charged by each individual physician, came from the ABT-NORC Survey. There were no unambiguous summary measures of physician fees, each doctor performed many procedures and separate fees were established for each. The ABT-NORC Survey collected fee information for various office and surgical procedures. We selected the fees for the most common office and surgical procedure, i.e., routine office visit and uncomplicated inguinal hernia procedure, for equation (1). Data for PM were obtained from the Blue Shield plans as described above. Information for PAR used in the logit analysis was obtained from the ABT-NORC Survey which asked the individual physician's decision on participation. The aggregated participation rates for each Blue Shield region which were used in simultaneous equations (3) and (4) came from the 1978 Congressional Report. Data for MSB were collected from the Blue Cross/Blue Shield Annual Fact Book.

The exogenous variables were grouped in six categories. The DPH variables measured exogenous forces on the demand schedule for physician services. The CPH variables measured exogenous influences on the physician firm's cost function. The DINS variables measured exogenous forces on the demand schedule for health insurance. The CINS variables measured independent influences on the cost functions of the Blue Shield insurance products; and lastly, M and N variables measured exogenous forces affecting physician

participation and market share of Blue Shield respectively.

DPH: Demand Variables for Physician Services

Patients' demand for physician care is influenced by their health condition. Health status of people could vary among communities because of difference in environmental conditions, lifestyle, habits, cultural background and occupation. Unfortunately there are no accurate statistics on a given population's health status. The best available data are mortality rates. We used the age-adjusted mortality rates as a proxy variable to represent the heath status of people in a given region. But this could be a problem because medical services may determine the mortality rate, hence it should not be treated as an exogenous variable. Nonetheless, we used the mortality rates in our regressions as an exogenous variable due to the unavailability of a better health status variable.

A person's age determines a significant part of demand for medical care. After reaching maturity, health stock depreciates with the passing years. On the average, people age 65 and over consume three times the medical services as do adults between age 19-64.[6] We use the percent of the population over age 65 in a community as a variable which measures the age effect on demand. We expect a higher percentage of the older population to increase the demand for physician care and and in turn increase physician fees.

A set of exogenous economic variables influencing demand include: average incomes in the county where the physician practice and the proportion of each physician's patients covered by insurance, average percentage of the population below the low income level and average unemployment rate in the community. The incomes per capita, Y, are taken from published federal

sources. We expect that patients with high income demand a greater quantity of physician services. Therefore, we expect the sign of the regression coefficient on Y to be positive. Insurance decreases patients' out-of-pocket costs. The proportion of patients for each physician covered by private or public insurance, INS, is expected to have a positive impact on the demand schedule and on fees. The data for INS were obtained from ABT-NORC Survey where the physician supplied the information on insurance coverage of his patients. The average percent of the county's population below the low income level as defined by the federal government, BPOV, measures several factors. First, studies have found low income adversely affects people's health.[7] Therefore, we expect BPOV to have a positive effect on demand and fees. On the other hand, the pure income effect reduces demand which lowers fees. That effect, however, is offset somewhat by the fact that many low income people are eligible for Medicaid. Although the program pays physicians below their usual fees, Medicaid does reduce the monetary cost to the patient and increases demand. As a result, we predict that BPOV has a positive effect on physician fees.

The unemployed rate, UNEMP, influences demand for physician care. Many workers and their families suffer from the stress of being laid off or from uncertainty of unemployment itself which results in psychological and physical illness. Some laid off workers use the time between jobs to take care of health problems for which they have delayed seeking care because of the opportunity cost of losing pay. Conversely, other workers fearing they might be laid off and lose their health insurance, demand medical and surgical services which they might otherwise have put off for a later time. We predict the unemployment rate to have a positive impact on demand and on fees if the

economic slump was short, and if the recession was long, we expect the income effect and reduction of people covered by health insurance to reduce demand and fees.

Demand for physician care is affected by its substitutes. Inpatient care substitutes for outpatient care. When there is a greater supply of hospital beds per capital, HSPBED, there is a predicted decrease in demand for outpatient care. We expect the supply of substitutes to have a negative impact on office visit fees. The impact of HSPBED on surgical fees is similar. Hospital care is a complementary good for surgery. Greater numbers of beds per capita indicate a greater supply of surgical services which will have a negative impact on surgeon's fees.

As the number of physicians per capita, MD, rises, demand per physician falls and the equilibrium price declines. The physician's income decreases, hence, his marginal utility of income increases. This alters the trade-off between his income and social concern maximands. If the demand schedule facing an individual physician is inelastic, then the physician could increase his fees to increase his income. The expected regression sign for MD is positive.

CPH: Cost Variables for Physician Services

Two variables are used to represent the non-physician component of medical practice expenses. The variable COST is a composite measurement of both labor and capital expenses. The 1976 ABT-NORC Survey obtained detailed information on physician practice costs. COST, measured in dollars, is the sum of the capital expenses consisting of rent, depreciation, and interest expenses, plus labor costs consisting of salaries to non-physician employees,

expenses for legal and accounting services, and fringe benefits. In addition, other overhead expenses such as malpractice insurance and supplies, are also included in COST. We expect COST to have a positive impact on fees. Another included exogenous cost variable is GCOL which is an index which measures the difference in cost of living among the 101 PSU's. It measures the geographic variation of the marginal opportunity cost of physician's own time because the marginal income of physicians, in real terms, should vary by the differences in the nominal price of goods among localities. We expect GCOL has a positive effect on the fees set by physicians.

The variable PTN represents the type of medical practice in which the physician works. Some physician practices are solo offices while many are partnerships. PTN measures the number of physicians practicing together in one office. PTN has two major economic effects. First, physicians practicing together enjoy economies of scale, with the average and marginal cost varying inversely with group size.[8] Thus, we expect PTN to have a negative impact on fees. On the other hand, there is much greater intra-firm referral for multi-specialty partnership firms. The total demand schedule facing the partnership firm may be less price elastic. As a result, the fee set by physicians may vary positively with PTN. The expected regression sign on PTN is ambiguous.

Physicians undergo different amounts of professional training. For some medical specialties, greater amounts of training produce a higher quality of services. In a perfect competitive market, the fees for standard procedures should not vary by specialty, but in an imperfect market where physicians set fees, we expect the larger investment of human capital in additional training to result in higher fees for specialists. A variable SB, the specialty

board certification, measures the differences in physician training. We expect SB to have a positive effect on fees.

Another variable, AGE measures the age of the physician. As the physician gains experience and skills, he may charge higher fees. On the other hand, our field study found a persistent opinion that the social concern in the physician's maximand has declined over time. Previously, preference for social welfare was emphasized in the selection and training of medical students. Role models in medical school stressed the social responsibility of doctors. Now that emphasis has lessened. In Chapter 7 our model of individual physician behavior predicts physicians trade-off higher income for social goods. If there is a decline in the educational emphasis on a physician's social responsibility, then AGE is expected to have a negative impact on fees.

DINS: Demand Variables for Blue Shield Insurance

Several variables influence demand for insurance. Because most insurance is provided through places of employment, the proportion of population employed in a Blue Shield plan region affects demand for insurance. Moreover, an increase in the percent of population covered by public insurance programs leads to a decrease in demand for Blue Shield insurance.

Organized labor has long favored Blue Shield because of its non-profit nature and also its offering of comprehensive insurance coverage. Moreover, unions are organized and they are better informed buyers of insurance. We expect UNION has two effects on PM. First, an increase in unionization leads to greater price competition among insurers due to the search activities by unions who are better informed buyers. Thus, price will decline. Second, an

increase in UNION, ceteris paribus, boosts demand for Blue Shield insurance, a larger market share leads to greater economy of scale, lowering administrative cost of insurers, and a decrease in premium rates.

Among the insurance benefits offered by Blue Shield plans is a partial service plan which provides full reimbursement to the eligible insured whose family income falls below certain set limits.[9] This type of benefit differs from the full service benefits, for which there are no income limits for eligibility. The variable INC measures per capita income in each of the Blue Shield plan regions. It is a proxy for the proportion of people who are eligible for partial service benefits. As INC rises, we expect the demand for Blue Shield insurance to fall and its premium rate to decrease accordingly.

Under perfect competition, the demand for Blue Shield insurance is determined by the price charged by its competitors. However, as we have analyzed in Chapter 4, the insurance market is one where there is a dominating firm with many competitors on the fringe. The dominating firm is a price-setter, while the small competing firms are price-takers. They take the price set by Blue Shield and sell the greatest quantity that they can at the set price, constrained by their cost functions. Under this model of the insurance market, there is no need to include a price variable for commercial insurance companies premium rates in the PM regression equation.

CINS: Cost Function Variables for Blue Shield Insurance

The basic cost of health insurance is the amount per insured spent for medical services. This amount is the total of quantity times price paid by the insurance firm. For the Blue Shield plans the prevailing charges represent the upper limit of reimbursable fees. We used the prevailing fee,

PCHR, to measure the price paid by the Blue Shield plan. If we have complete data, we should use two variables in the estimation, PCHR and another measure for the usual fee. Unfortunately, the data on usual fees for 1975 is unavailable. Thus, PCHR consists of the 1975 prevailing fees which was reported by insurance firms to the United States Health Care Financing Administration. We predict PCHR will have a positive impact on Blue shield premium rates.

The quantity of medical services per insured will be influenced by a number of exogeneous variables. The average age of the insured population, AGE, is included as an exogenous variable to measure the demand for medical care that varies with aging. BPOV, the percent of population below the poverty level, is another proxy variable for health, since many people in low income are in poor health status.

The supply of physicians and hospital beds determines the quantity of medical services provided. The quantity sold in the price-setting market varies directly with the supply of physicians. Econometric studies of the medical care market have always found that supply affects demand for care.[10] A variable RSURG, the number of surgeons per 100,000 population is included in the regression to measure the supply effect on quantity of medical care, and hence the impact on the insurance claim cost. The number of surgeons is used instead of the number of physician per capita because the largest portion of insurance claim cost arose from surgical operations. A variable, RHSPBED, hospital beds per 100,000 measures the supply effects of hospitals on demand for medical care. Since hospital beds are a complementary good to surgery, we expect it to have a positive impact on insurance premium costs.

A variable, BOARD, measures physician representation on each Blue Shield Board of Directors. BOARD is the percent of Board seats occupied by

physicians or nominated by organized medicine. We expect BOARD to have a negative impact on premium rates if organized medicine's preference for social concern is greater than their preferences for total aggregate income for all physicians. We expect BOARD to have a positive effect on premium rates if the income preference is stronger than for social welfare.

Blue Shield premium rates are regulated which was fully explained in Chapter 2. The regulatory agencies determine rates by evaluating the estimated amount of surplus a Blue Shield plan will have at the end of the year if certain premium rates are allowed. The variable, SURP, measures the retained surplus as a percent of premium income of each Blue Shield plan in year (t-1). We expect a high SURP to have a negative impact on the premium rates of next year if the regulations are effective and works as we have hypothesized.

M: Variables Affecting Physician Participation

The most important variable to determine whether a physician will participate in a Blue Shield is the fee he has set for his services. When the marginal benefit of participation exceeds the marginal cost, the physician will participate. The net marginal benefit is determined by the difference between the physician's own fee and Blue Shield plan's reimbursement rate. We expect that the higher the FEE, the less likely a physician is to participate. On the other hand, we expect the reimbursement rate, PCHR, to have a positive impact on participation. The higher the PCHR, ceteris paribus, the greater the probability the physician will participate.

The net marginal benefit of participation is also a function of MSB, Blue Shield market share. Higher MSB means the plan's reimbursement policies

have greater effects on the physician's financial interest. An upward shift in MSB should have a positive impact on physician participation in Blue Shield plans.

The variable, Y measures the income per capita in the county in which the physician practices. As Y rises, the patient's ability to pay increases, the less willing physicians are to accept Blue Shield's reimbursement rate as payment in full. We expect Y to have a negative effect on PAR. For similar reasons, the percent of low income patients, BPOV, will have a positive impact on PAR.

The percentage of bad debt, BD, experienced by the physician should affect the physician participation decision. If the physician has difficulty collecting bills from patients, he may prefer to accept payment directly from Blue Shield and take it as full payment. Unfortunately, there is no exact measurement of BD, our data only provides us with interval measurements, i.e., a physician's bad debt is above 20% of his billing, 15-20%, 10-15%, 5-10%, and 1-5%. Also BD should be a measurement for billings to non-Blue Shield patients because participation affects the total BD of a physician. Unfortunately, the precise data is not available. Thus, we use a dummy variable for BD in our regression equation, where 0 represents collection rate greater than 90%, while 1 represents collection rates of less than 90%.

The variable BOARD measures the percent of physicians on Blue Shield boards. In our model, we hypothesize that stronger representation of organized medicine on the Board of the Blue Shield plan leads to stronger support of the plan by members of the physician community, and they are more likely to cooperate with the plan by accepting its payment as full reimbursement. Thus, we expect BOARD to have a positive impact on participation rates.

The practicing cost, COST, determines a significant part of the physician cost function. Given a higher COST, ceteris paribus, the less likely the physician is to accept Blue Shield reimbursement as full payment. We hypothesize that COST will have a negative effect on a physician's willingness to participate in a Blue Shield plan.

IV. Empirical Results

The regression results for the medical fee (i.e., the charge for a routine office visit) are presented in Table 9.1. The sample includes all physicians, regardless of their specialty. The results by each separate specialty are presented in Table 9.3. In most instances, the signs of the parameter estimates are in accordance with our expectations and the t-statistics for most of the important variables exceed 2.0 and are significant at the 0.01 level. We shall first discuss the most important findings and then deal with the few inconsistencies. Our calculations of marginal impacts assume that all variables under consideration are at the sample mean values.

The parameter estimates show physician fee setting behavior is strongly influenced by demand and cost variables. A rise in personal per capita income shifts the demand outward and increase the fees charged. The regression coefficient implies that an increase in $1,000 of personal income per capita above the sample mean raises routine office visit fees by approximately 8 percent. Also an increase in the percentage of the population insured leads to a reduction of out-of-pocket cost for office visits and raises the demand for services. The positive coefficient of INS is consistent with our expectations.

As we have discussed above, HSPBED is a substitute for outpatient services, an increase in HSPBED leads to a decrease in demand for office visits. The negative coefficient of HSPBED is in accordance with our expectations, but not significant at the 0.5 level.

The positive sign on the coefficient of MD implies that greater supply in an area raises the fees. The regression is significant at the 0.01 level. The regression estimate suggests that a 10 percent increase in physicians at the sample mean boosts office fee by 1 percent. This result suggests that physicians do not set fees as high as possible under a simple income maximizing model. It is plausible that their social concern maximand constrains their fees. When faced with a decrease in quantity of services demanded per physician due to an increase in the aggregate number of physicians per capita, the individual physician will lose income unless he increases fees. If fees were previously set at the level to maximum income, then an outward shift in supply will not produce an increase in fees, regardless of whether or not physicians can induce demand. The significant positive coefficient supports our hypothesis that physicians maximize a utility function, that includes income and social responsibility maximands. There is a trade-off between the income maximand and the social responsibility maximand. When confronted with a decline in income, the physician's marginal utility of income increases and hence he increases his fees.

The coefficients on COST and GCOL variables (i.e., the physician's cost function variables), are statistically significant with anticipated signs. PTN, the number of physicians practicing in the same office, has a statistically significant positive sign. This implies the reduction in competition from intra-office referrals exceeds any savings resulting from economies of

scale. The estimated coefficient for board certification, SB, shows a positive sign, consistent with our expectations and the regression is statistically significant at the 0.01 level. This result implies specialists are able to set higher prices because of their more extensive training. Furthermore, patients perceive a difference between generalists and specialists and are willing to pay a higher fee to specialists.

The regression coefficient for AGE, age of the physician, is negative and is significant at 0.06 level. This finding is important in the sense that experience after residency training is not highly valued. The negative sign tends to support the hypothesis that medical schools have steadily reduced the attention given to the social responsibilities of physicians and have increasingly stressed the academic qualifications of its students and their technical education in medical schools.

The regression coefficient of BPOV is statistically significant at the 0.01 level with a positive sign that is consistent with our prediction. In general, the poorer health conditions of low income families coupled with payments of their medical expenses by the Medicaid program, lead to greater demand and higher physician fees. The positive sign on the regression coefficient of AFDC is what we predicted. But the regression is not statistically significant at the 0.05 level. This could have resulted from the possibility that AFDC and BPOV are measuring the same influences on demand from poor health due to low income and Medicaid financing of medical care.

The sign on the coefficient of UNION, the variable which measures the percentage of workers belonging to unions, is negative as we have anticipated. It is statistically significant at the 0.01 level. The negative coefficient implies that organized labor, which tends to favor Blue Shield

comprehensive full-service insurance, strengthens the market share of Blue Shield. A larger market share fosters the bargaining power of the plan which leads to lower fees. This regression result supports the hypothesis generated from the cooptation model as explained in Chapter four. The regression coefficient sign on BD, bad debts, is negative as anticipated, although it is only statistically significant at the 0.06 level. The negative sign implies that BD influences physician participation decisions. Higher bad debts lead to higher participation rate and the UCR reimbursement system becomes more effective in holding down the average fees.

Coefficient for variable OV65 is inconsistent with our anticipation. Regression coefficient on variable OV65 was expected to be positive, but the estimation produced a negative sign. although it's not statistically significant, we had expected the percent of population over age 65 increases demand and raises physician fees because health stock depreciates with age. We are not able to explain why OV65 performs unsatisfactorily here.

Table 9.2 presents the regression results for the surgical fee for inguinal hernia. The data used for the estimation include only 246 general surgeons. The parameter estimates for the surgical fee yield the same signs for coefficients of all variables as for office visit fees.

Table 9.3 presents the regression results for routine office visit fees by various medical specialty groups. In broad terms, the results are similar and consistent across specialty groups. The signs of coefficients of the important variables remain stable and consistent for all medical specialties. The signs of the coefficient on AFDC vary although they are not statistically significant. We are unable to offer a reasonable explanation for this.

The regression results for equation (2) with endogenous variable PM, premium rates, are given in Tables 9.4 and 9.5. One important variable in estimating equation (2) is physician fees, the regressions on PM were done using various measures of physician fees. Table 9.4 results use the prevailing initial office visit fee as the variable for the charge allowed by the Blue Shield plans, while regression results in Table 9.5 use the prevailing surgical fee for inguinal hernia as the allowable charge variable. The estimation was done with pooled data for two years to enlarge the sample size. Judging from the R^2, we obtained very satisfactory results. The cross-sectional study yields R^2 around significant, although the signs are as we predicted.

The regression coefficient on the regulation variable, SURP, is statistically significant at the 0.01 level with the expected sign. This implies that regulatory authorities effectively constrain PM, and that an increase in a Blue Shield plan's surplus in year (t-1) leads to a reduction in PM in year t, ceteris paribus.

The positive sign on the regression coefficient of PCHR implies that higher reimbursement rates result in higher premium rates. The coefficients on the medical fees shown in Table 9.4, are statistically significant at the 0.01 level, but the regression coefficients on surgical fees, shown in Table 9.5, are not statistically significant. Moreover, these coefficients are not at large in numerical values as one would expect. These poor results could be due to two reasons. First, our sample size is relatively small which can cause the inefficiency. Second, because Blue Shield plan regions are so large that the variation in fees among individual physician fees is lost because PCHR is the average prevailing charge established for the whole

region.

One regression result in both Tables 9.4 and 9.5 is contrary to our expectations. The negative sign on the coefficient for RSURG implies the greater the number of surgeons per capita within Blue Shield plan region leads to lower premium rates. We predict that more surgeons mean a greater quantity supplied at an equilibrium price. Greater quantity boosts claim costs which lead to higher premium rates, however, our regression coefficient RHSPBED, hospital bed per capita, in the Blue Shield plan region, so it seems to capture the quantity effect on PM. The multi-collinearity between RSURG and RHSPBED may affect the sign of the coefficient on RSURG.

Table 9.6 presents regression results for the dependent variable PAR, physician participation rate. The estimations were done with logit and OLS techniques. Their regression results are presented separately in Table 9.6.

The parameter estimates from the logit model have signs in accordance with our expectations, and most of the regressions are statistically significant at the 0.01 level, judging by the chi-square statistics. As we have noted, the fee set by the individual physician, ceteris paribus, has a strong influence on his participation decision. The negative sign on the coefficient FEE implies that the higher a fee the physician sets, the less likely he will participate. The regression is statistically significant at the 0.01 level. The positive sign on PCHR, the reimbursement rates of the Blue Shield plans, suggests that physicians are more likely to participate when the reimbursement rates are set higher which is also consistent with our predictions, but the regression is not statistically significant at the 0.05 level.

An increase in the market share of the Blue Shield plans, MSB, should increase the marginal benefits to physicians and encourage them to

participate. The positive coefficient of MSB is consistent with our expectation. The regression is significant at the 0.01 level. Likewise, the positive sign on the coefficient of BOARD is in accordance with our prediction, i.e., a stronger representation of physicians on the Blue Shield board increases organized medicine's cooperation with the Blue Shield plan. The closer relationship enhances the loyalty of individual physicians to the plan. Also the organized medicine may use its professional ethical disciplinary measures on members to induce their cooperation with the Blue Shield plan.

As we expected, a rise in personal income per capita, Y, should increase the patient's ability to pay out-of-pocket medical costs, and the participation rate should fall. The negative coefficient of Y is consistent with our predictions. We also expected a rise in physicians' bad debts, BD, to lead to a greater willingness to participate. The positive coefficient of BD is consistent with our expectation and the regression is statistically significant at the 0.05 level.

The OLS regression results are very similar to the logit analysis. One difference is the coefficient sign of PCHR. It is negative instead of positive as we had expected. Although it is statistically insignificant, we do not have a reasonable explanation for this result.

In our specification of the recursive model, the dependent variables PAR and MSB are determined simultaneously. Table 9.7 and 9.8 present the regression results of these two simultaneous equations. Separate estimations were performed with ordinary least square and two stage least squares. Their comparative regression results are presented in the two tables. Table 9.7 gives the regression results for PAR and Table 9.8 presents the regression results

for MSB.

The parameter estimations of the simultaneous equation PAR and MSB suffered greatly from data limitation. Data on market shares of Blue Shield plans necessarily limit the number of observations to the total number of plans in existence which is 69. In addition, we had to collect the premium rates from the plans for a standard insurance product. The products among Blue Shield plans vary. Although we were able to select an insurance coverage which was offered by most Blue Shield plans, nevertheless, many plans didn't market that product. Furthermore, physician participation rates were not available on all Blue Shield plans. The end result is that we were able to collect complete data only on 30 plans. This limits the degree of freedom and efficiency of parameter estimates.

In general terms, the regression results for PAR as presented in Table 9.7 have signs according to our predictions, but only one regression is statistically significant, BOARD. All other regressions have t-ratios which are insignificant at the 0.05 level. The positive signs on the coefficients of MSB, BOARD, and BD imply that an increase in market share, physician representatives serving on Blue Shield boards and physician bad debts losses all lead to increases in the probability that physicians will participate in the Blue Shield plan. However, since most of the regression coefficients are not statistically significant, not much reliance can be placed on these results.

The regression results for MSB in the simultaneous equations are presented in Table 9.8. The signs of the regression coefficients from OLS and from TSLS are in accordance to our expectations. Higher participation rates make Blue Shield insurance more attractive and lead to greater market

share. An increase in UNION raises the demand for Blue Shield insurance and boasts its market share. However, none of the regressions for the important variables are statistically significant. Not much reliance can be placed on these results. Again, we believe the poor regression results are largely due to the small sample used for estimating the parameters of the simultaneous equations because we have not been able to obtain adequate data from all Blue Shield plans.

V. Conclusions

The regression results from the recursive model strongly support our hypothesis and physician fees are determined by the economic forces of the two markets. As we expected, physician fee setting behavior is affected by a combination of demand and supply factors for their services and demand and supply for health insurance. Moreover, institutional practices in the insurance market also affect physician fees. An increase in demand for insurance boosts demand for medical care. The insurance market forces constrain physician pricing behavior because the insurance reimbursement policy affects the demand and the financial well-being of physicians. Insurance reimbursement determines the out-of-pocket cost for physician services which affects patients' demand for services and leads to price competition among doctors. In addition, insurance reimbursement influences physician's collection and billing cost and loss to bad debts for physicians.

An important finding of this study is the empirical support for our hypothesis that organized medicine acts in the majority interest of practicing physician. It limits the fees of potential high charging doctors. An increase in the medical representation on the board of the Blue Shield plans lead to a reduction in prevailing charge limits and moves them closer to

median charge.

We have assumed that the physician maximizes a utility function which requires him to trade-off between his income and social concern. Our regression results on MD support this hypothesis. The positive coefficient on MD implies physicians do not use their market power to obtain the maximum income possible. There is a trade-off between their income and their social concern maximands. When an increase in MD leads to a decline in income, the marginal utility of income increases, and the physician raises his fee to off-set the loss of income until a new equilibrium is reached where the marginal utility of income and social concern are equal.

The econometric results also support our hypothesis that regulation depresses Blue Shield premium rates. Regulatory authorities control premium rates by constraining Blue Shield surplus. The negative sign on the regression coefficient of SURP implies regulations are effective in reducing the premium rates.

Lastly, as we predicted, the physician's decision to participate in a Blue Shield plan depends on the fee he has set and the plan's prevailing charge. The market share of the Blue Shield plan also has a strong influence on the physician's participation decision as well as with the physician's difficulties in collecting his bills. The market share of Blue Shield plans has a strong moderating effect on physician fees.

Table 9.1: Physician Medical Fee Regression
(Routine Office Visit Fee)
Means, Standard Deviations and Regression Coefficients

Variables	Sample		Regression (OLS)	
	Mean	SD	Coefficient	t-statistics
Routine office visit fees	11.43	4		
HS	711.08	35.84	-.014	-3.38
OV65	9.79	2.07	-.069	-1.03
Y	4365.00	881.00	.0009	4.27
INS	86.65	14.52	.021	3.66
BPOV	13.50	6.37	.090	2.67
AFDC	5.54	2.80	.064	1.56
UNEMP	9.32	2.02	.032	0.55
HSPBED	5.26	2.28	-.064	-0.89
MD	1.66	1.06	.685	3.64
COST	23472.00	25931.00	.000013	4.06
GCOL	96.86	10.87	.115	5.63
PTN	1.94	1.85	.129	2.67
SB	.48	.50	1.33	7.42
AGE	51.45	10.06	-.016	-1.82
URBR	.19	.39	.151	0.54
BOARD	42.1	18.6	-.012	-1.52
BD	.35	.48	-.343	-1.91
SURP	14.09	12.03	-.011	-1.02
UNION	25.41	6.34	-.067	-2.40
CONSTANT			-5.07	-1.25
R^2			.34	
n			1752	

Table 9.2: Surgical Fee Regression
Mean, Standard Deviation, Regression Coefficients, and t-statistics

	Sample		Regression(OLS)	
Variables	Mean	SD	Coefficient	t-statistics
HS	689.12	31.68	−.022	−2.61
OV65	9.77	1.80	−6.510	−1.62
Y	4343.20	822.50	.016	1.43
INS	91.20	9.60	.829	1.62
BPOV	13.67	6.28	5.160	2.84
AFDC	5.87	2.88	2.330	1.13
UNEMP	9.38	2.150	−.279	−0.10
HSPBED	5.26	2.280	−103.243	−2.71
MD	.390	.18	174.250	3.12
COST	22881.00	12324.00	.0006	1.46
GCOL	96.08	10.05	4.860	5.43
PTN	2.03	2.02	.756	0.31
SB	.70	.45	14.510	1.44
AGE	51.20	9.50	−.288	−0.61
URBR	.16	.37	15.530	0.91
BOARD	42.10	17.70	−.676	−1.94
BD	.36	.48	−9.100	−0.91
UNION	25.45	6.49	−2.860	−2.32
CONSTANT			288.850	2.77
R^2	.33			
n =	246			

Table 9.3: Physician Medical Fee Regression by Specialty and Types of Practice
Regression Coefficients (t-statistics in parentheses)

Variable	All Physicians	Solo Practice	General Practice	Internists	General Surgeons	OB/GYN
Routine Office Visit Fees	11.43	11.21	9.33	13.63	11.31	14.17
HS						
	-.014	-.018	-.009	-.016	-.012	-.018
	-(3.38)	-(3.38)	-(2.05)	-(1.89)	-(1.12)	-(1.44)
OV65	-.069	-.119	-.035	-.119	-.039	.410
	-(1.03)	-(1.43)	-(0.55)	-(0.85)	-(0.19)	(1.72)
Y	.0009	.0013	.0005	.0017	.0003	.0047
	(4.27)	(4.51)	(1.77)	(4.43)	(0.50)	(0.75)
INS	.021	.021	.005	.004	.025	.023
	(3.66)	(2.78)	(0.89)	(0.26)	(0.98)	(1.08)
BPOV	.090	.126	-.024	.243	-.015	.152
	(2.67)	(2.99)	-(0.67)	(3.36)	-(0.14)	(1.33)
AFDC	.064	-.008	.080	-.091	.010	.126
	(1.56)	-(0.15)	(1.54)	-(1.07)	(0.09)	(1.04)
UNEMP	-.032	-.075	.068	.093	-.114	-.128
	-(0.55)	-(0.98)	(1.06)	(0.77)	-(0.75)	-(0.74)
HSPBED	-.064	-.028	-.070	-.138	-.032	-.620
	-(0.89)	-(0.29)	-(0.95)	-(0.83)	-(0.17)	-(2.46)
MD	.685	.670	.360	.622	.709	1.34
	(3.64)	(2.63)	(1.60)	(1.73)	(1.24)	(2.29)
COST	.00002	.00001	.00003	.00006	.00003	.00001
	(4.06)	(2.89)	(4.49)	(4.93)	(1.36)	(0.37)
GCOL	.115	.099	.057	.148	.115	.074
	(5.63)	(3.79)	(2.61)	(3.52)	(1.98)	(1.19)
PTN	.129		.150	.215	.004	.083
	(2.67)		(1.43)	(2.77)	(0.04)	(0.62)
SB	1.33	1.64	.867	.595	.613	1.25
	(7.42)	(6.87)	(2.53)	(1.69)	(1.24)	(2.24)
AGE	-.016	-.035	-.019	-.004	-.028	-.013
	-(1.83)	-(3.03)	-(1.73)	-(0.21)	-(1.16)	-(0.49)
URBR	-.151	.058	-.119	-.681	.515	-.367
	-(0.54)	(0.16)	-(0.39)	-(1.19)	(0.60)	-(0.41)
BOARD	-.012	-.007	-.016	-.019	-.039	-.049
	-(1.52)	-(0.66)	-(1.98)	-(1.25)	-(1.85)	-(2.10)
BD	-.343	-.399	-.003	-.307	-.686	-1.39
	-(1.91)	-(1.73)	-(0.02)	-(0.81)	-(1.39)	-(2.62)
UNION	-.067	-.049	-.065	-.083	-.074	.002
	-(2.40)	-(1.34)	-(2.17)	-(1.40)	-(0.96)	(0.02)
SURP	-.019	-.015	-.016	-.027	-.017	-.054
	-(1.02)	-(1.05)	-(1.38)	-(1.24)	-(0.54)	-(1.65)
CONSTANT	5.07	9.21	10.17	-.557	7.68	12.70
	(1.25)	(1.73)	(2.36)	-(0.06)	(0.69)	(0.99)
R^2	.34	.38	.37	.50	.25	.40
n	1731	1084	587	367	270	285

Table 9.4: Blue Shield Premium Rates Regression
(Pooled data - 1976-1977) - PCHR Medical
Mean Standard Deviation and Regression Coefficients
(t-statistics in parentheses)

Variables	Sample Mean	Sample SD	Regression (OLS) Single	Regression (OLS) Family
PREMIUM RATES - SINGLE	7.86	3.57		
FAMILY	33.93	8.42		
UNION	21.32	7.31	-1.30	-.279
			-(1.33)	-(1.43)
UNEMP	8.12	1.99	- .075	.147
			-(0.38)	(0.35)
RBPOV	13.86	6.44	-.351	-.872
			-(4.16)	-(4.86)
RAFDC	5.08	1.82	.086	1.17
			(1.28)	(1.85)
INC	4116.00	701.00	2.87	13.26
			(2.26)	(2.61)
PCHR (Medical)	10.31	2.14	.11	.223
			(2.79)	(2.65)
ROV65	9.78	2.50	-.034	-.066
			-(0.18)	-(0.16)
RHSPBED	5.36	1.48	8.20	21.90
			(3.02)	(3.79)
RSURG	30.58	6.11	-.186	-.642
			-(2.22)	-(3.61)
BOARD	48.66	16.62	.043	.104
			(1.62)	(1.84)
SURP	12.70	10.73	-.123	-.199
			-(3.59)	-(2.74)
DUMMY 1977			.66	2.27
			(1.19)	(1.93)
CONSTANT				
R^2			.69	.76

n = 50

Table 9.5: Blue Shield Premium Rates Regression
(Pooled data - 1976 and 1977) - Surgical Prevailing Charge
Mean Standard Deviation and Regression Coefficients
(t-statistics in parentheses)

	Sample		Regression (OLS)	
Variable	Mean	SD	Single	Family
UNION	21.32	7.31	−.212 −(1.75)	−.385 −(1.51)
UNEMP	8.12	1.99	.099 (.48)	.519 (1.20)
RBPOV	13.86	6.44	−.366 −(3.96)	−.905 −(4.61)
RAFDC	5.08	1.82	.498 (1.83)	1.59 (2.76)
INC	4116.00	701.00	4.62 (1.94)	11.37 (2.21)
PCHR (Surgical)	288.81	50.02	.006 (0.60)	.001 (0.04)
ROV65	9.78	2.50	.134 (0.62)	.32 (0.70)
RHSPBED	5.36	1.48	8.36 (2.65)	20.86 (3.12)
RSURG	30.58	6.11	−.212 (2.31)	−.704 (3.62)
BOARD	48.66	16.62	.050 (1.70)	.124 (1.99)
SURP	12.70	10.73	−.085 −(2.40)	−.129 −(1.72)
DUMMY			1.15 (1.85)	3.02 (2.28)
CONSTANT			4.32 (0.38)	9.97 (0.42)
R^2 =			.62	.71
n = 50				

Table 9.6: Physician Participating Rates Regression
Ordinary Least Square and Logit Analysis
Regression Coefficients (standard error in parentheses)

Variable	OLS	LOGIT
FEE	−0.016 (0.0034)	−0.084 (0.020)
PCHR	−0.0012 (0.003)	0.0008 (0.018)
MSB	0.008 (0.00084)	0.052 (0.0058)
Y	−0.000009 (0.00002)	−0.00007 (0.0001)
BPOV	0.0022 (0.00059)	0.015 (0.0042)
BD	0.072 (0.026)	0.44 (0.17)
SB	0.023 (0.025)	0.10 (0.16)
BOARD	0.0016 (0.0007)	0.016 (0.045)
COST	−0.000003 (0.000001)	−0.00002 (0.000006)
CONSTANT	0.49 (0.098)	−0.77 (0.60)
	$F = 24.6$	$\chi^2 = 203.72$ (9 d.f.)
	$R^2 = 0.17$	D = 000.16

n = 1112

Dependent variable participation rate = 74.6%

Table 9.7: Physician Participation Rates Regression
Two Stage Least Squares Compared with OLS
Regression Coefficients (t-statistics in parentheses)

Variable	OLS	Two Stage Least Squares
MSB	.47 (1.84)	.43 (1.04)
PCHR	-.13 -(1.82)	-.14 -(1.79)
PM	.15 (0.45)	.13 (0.38)
BOARD	.40 (2.35)	.40 (2.32)
BD	.69 (2.15)	.74 (2.07)
INC	-.11 -(0.62)	-.08 -(0.94)
URBR	.35 (1.27)	.37 (1.24)
CONSTANT	6.22 (0.24)	6.91 (0.26)
R^2	.55	
n	30	30

F-STATISTICS = 4.29

Dependent variable
participation rate = 76.8%

Table 9.8: Market Share of Blue Shield Plans Regression
OLS Compared with Two Stage Least Squares
Regression Coefficients (t-statistics in parentheses)

Variable	OLS	Two Stage Least Squares
PAR	.151 (1.35)	.181 (1.10)
PREM	−.058 −(0.32)	−.176 −(0.90)
UNION	.423 (1.91)	.518 (2.03)
UNEMP	−.027 −(0.691)	−.041 −(0.894)
PCHR	−.054 −(1.55)	−.043 −(1.01)
GCOL	1.23 (4.72)	1.06 (3.04)
CONSTANT	−76.65 −(3.13)	−61.83 −(2.24)
R^2	.48	
n	30	30

F-STATISTICS = 6.22

Dependent Variable
Mean Market share = 48.7%

FOOTNOTES FOR CHAPTER 9

1. Lynk, W. "Regulatory Control of the Membership of Corporate Boards of Directors: The Blue Shield Case." The Journal of Law and Economics 24 (April 1981): 159-173.

2. Sloan, F. and Steinwald, B. "Physician Participation in Health Insurance Plans: Evidence on Blue Shield." Journal of Human Resources 13 (Summer 1977): 237-263.

3. We can use the values of log-odds of PAR in the simultaneous equations. The regressions of the transformed values of PAR could be done as an extension of this study.

4. Sloan, F.A., Cromwell, J., and Mitchell, J. Private Physicians and Public Programs. Lexington, MA: D.C. Heath, Lexington Books, 1978: 9-21.

5. Freeman, R.B. and Medoff, J.L. "New Estimates of Private Sector Unionism in the United States." Industrial Labor Relations Review 32 (January 1979): 143-174.

6. Mueller, M.S., Gibson, R.M., and Fisher, C.R. "Age Difference in Health Care Expenditure, Fiscal Year 1976." Social Security Bulletin 40 (August 1977): 3-14.

7. Luft, H.S. "Poverty and Health: An Empirical Investigation of the Economic Interactions." Unpublished Ph.D. dissertation. Harvard University, 1972.

8. The variable PTN may be correlated with COST because of the effects of economies of scale on COST.

9. Reed, L.S. and Carr, W. The Benefit Structure of Private Health Insurance. U.S. Department of Health, Education, and Welfare, Social Security Administration, Office of Research and Statistics, Report No. 32, 1970.

10. Econometric studies which found these results include:

    American College of Surgeons and the American Surgical Association. Surgery in the United States: A Summary Report of the Study on Surgical Services for the United States. Chicago, IL: American College of Surgeons and the American Surgical Association, 1975.

Fuchs, V.R. and Kramer, M.J. Determinants of Physicians' Services in the United States, 1948-68. National Center for Health Services Research and Development, DHEW Publication No. (HSM) 73-3013. Washington, D.C.: DHEW, Health Services and Mental Health Administration, December 1972.

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Chapter 10

Physician Pricing Behavior: What We Learned and What It Means for Medicare?

It is widely accepted that 80 percent of health services expenses are decided by physicians, although payment for physician services consists of only 20 percent of the nation's health expenditures. How physicians practice medicine, what laboratory tests they order, what surgical operations they preform, and how long they keep patients in the hospital determine the amount of resources used for health care. Physicians' decisions are influenced by how their services are paid. Now the nation's health expenditures have reached 10 percent of the GNP and continue rising, the public is compelled to turn their attention to physician reimbursement.

The Medicare program provides financial access to health care for elderly and disabled persons. Part B of the Medicare program finances physician services. It has been estimated that in 1981 persons age 65 and over spent $35.6 billion in hospital care and $15.6 billion for physician services. The Medicare program finances 54.5 percent of the total expenditure for physician services for the aged (United State Senate, Committee on Finance, 1983). Part B of the Medicare program is projected to spend $20.4 billion in FY 1984. Approximately 20 percent of physicians' income is obtained from Medicare program. Since the inception of Medicare, the program has been wrestling with the problem of establishing a fair, reasonable and equitable method to compensate physicians for the services they render to the aged population. The present Medicare reimbursement policy adopted has been criticized as unfair, inflationary and inequitable. As a result, HCFA has funded several research studies to discover knowledge about the physician market in order for the policymakers to have accurate and adequate information in developing a rational reimbursement policy.

In the enactment of Medicare legislation, Congress adopted the "usual and customary" (UCR) approach to pay physician services. Congress agreed to this method of paying physicians partly because Congress was in search of political peace with the greatly agitated physician community, and partly because Congress feared the physicians would boycott the program (Brown, 1983). Furthermore, Blue Shield has left the Congress with the impression that the UCR approach and balance billing were the traditional method by which physicians were paid. But in fact the UCR approach was first adopted in Wisconsin in 1954, and in the the 1960's this approach was not widespread and its definitions, data, calculations differed greatly from place (United State Senate, Committee on Finance, 1970). Moreover, commercial insurers did not use the UCR approach to pay physician services; commercial insurance were mostly paying physician services on indemnity schedules.

In a reasonably competitive market, the usual and customary fees could be the competitive prices, determined largely by market forces. The competitive prices would be the minimum costs for producing the services. However, if there are serious market failures (such as the preeminent position of physician) in the market, the usual and customary fees would not be the competitive prices, but some arbitrary prices set by physicians.

This study was one among several research projects funded by the Health Care Financing Administration to study the market for physician services. The scope of this research project is confined to the following questions:

1. Do physicians charge patients according to their ability to pay (i.e., price discrimination)?

2. What are the statistical patterns of physicians' charges? What implications do these patterns hold for public policy?

3. Do physicians follow the relative value schedule promulgated by Blue Shield or medical societies?

4. What are the roles of insurers in the market for physician services? Do insurers influence physician prices and quantities supplied?

5. What major factors determine physician prices?

This chapter is organized into four sections. The first section summarizes the major findings from this research project. The second section reviews and synthesized current knowledge of physician economic behavior, and what economic, legal and political forces are operating in the physician market. The third section outlines and evaluates the major Medicare options to reimburse physicians. Lastly, the author offers his recommendations.

I. Major Findings of This Research Project.

The findings from this research project are organized into four categories: (A) statistical patterns of physician charges, (B) insurers' organizational interactions with physicians, (C) physician pricing behavior, (D) comparison of physician charges with a normative standard to ascertain price distortions. The research findings for each category are presented below. We first describe briefly the data and research method used for each category. The the findings and their policy implications are presented.

(A) Statistical patterns of physicians' charges.

Records of physician charges from 26 States were obtained for this research project. This data set consisted of the charges billed by physicians for medical and surgical services in calendar year 1971. It was comprised of approximately 500 million records of services delivered by physicians, including ambu-

latory visits, hospital visits and surgical procedures.

The volume of data necessitated us to work with a sample set. A stratified sample was taken from which statistical analysis were conducted. The sample was stratified by geographical location, procedure and by physicians' specialty. Six common medical procedures plus six common surgical procedures were selected for the sample. A random sample is drawn from each stratified category of physicians. The sample size for each strata was determined by first calculating price variance among physicians, then a sampling size was decided to minimize the difference between the true and estimated means. Using these stratified samples, we conducted the following analysis.

1. Price discriminating. It was widely known for several decades that physicians charged patients according to their ability to pay. This practice was accepted by the public because it was believed that those who can pay should pay more, while those who were poor pay less. This practice, commonly called price discrimination, is a strong evidence of the monopolistic power held by physicians in the marketplace. When a supplier can discriminate its price according to the consumers' ability to pay,the supplier, in essence, extracts the consumer surplus from the patients for his own gain. Practice of price discrimination shows that physicians have monopolistic power over consumers. Reuben Kessel (1975) published his classic article to show that physicians were monopolists in the marketplace. One evidence used by Kessel to draw that conclusion was price discriminating.

Although it was commonly known that physicians had practiced price discrimination in the past, it is unknown whether physicians are still practicing it after public and private insurance have become widespread. This study used the

twelve procedures selected in the sample to ascertain whether or to physicians continue to practice price discrimination. The sample contained the whole year 1971 billing records for the sampled physicians. The study tabulated each physician's charges for a given procedure. The distributions of charges for each physician were printed out for inspection.

Our study found that physicians, in general, were not practicing price discrimination. In a few cases, physicians charged different prices for the same procedure. But only a very small percentage of doctors had done so. On the whole, physicians charged one price to all of their patients regardless of their insurance status or income. Our statistical analysis concluded that physicians by 1971 were not charging patients according to their ability to pay. If there was price discrimination, that was practiced indirectly.

It is possible that physicians have changed to a different form of price discrimination. Namely, they bill patients the same price, but for those patients who are unable to pay or unwilling to pay, the physician would write off the unpaid bill as a bad debt. In this case, the physician can exercise discretion as whose bill should be reduced after the patient has failed to pay his bill. The unpaid bill can be reduced according to the patient's ability to pay.

2. Distribution of physicians' fees. Distribution of physicians' prices for a given procedure was analyzed by county (or even smaller regions) whenever the data allowed us to do so. We found that physician's fees do not follow a normal distribution. Often it was trimodal. The distribution of fees tended to be skewed to left for medical procedures and to the right for surgical procedures. In other words, there were more physicians charging low fees than

those who charge high fees for medial procedures while the opposite was true for surgery. More importantly, the difference in the charges among physicians for the same procedure varied two to three-fold in the same county or community.

Another important issue was whether physicians charged as much as the prevailing fee screens allowed in order to maximize physician income. It had been hypothesized that physicians would set their charges at the prevailing fee limits established by the Medicare program or Blue Shield if there were little marketing forces constraining the physicians. Therefore, Medicare reimbursement policy could be inflationary because it signals to physicians what they are allowed to charge. Physicians charging less than the prevailing fee would move their fees to the limits. We analyzed the distribution of physician fees in the 26 States, broken down by region whenever possible. We did not find any strong evidence to support this hypothesis. In other words, there was no bunching of physician charges at or near the prevailing charges. Instead, as we pointed out earlier, the distribution tended to be trimodal and the fees charged by most physicians were not close to the prevailing charges. The policy implication of this finding is that there must be some other forces at work in constraining the physicians as what they should charge. The establishment of prevailing charge levels is not necessarily inflationary because the other constraints are more binding.

3. Relative value schedules. We developed two statistical methods to evaluate whether physicians follow the California Relative Value Schedule (CRVS) in pricing their services. If the physicians follow a relative value schedule, their fees for various procedures would be a fixed ration of each other as specified by the CRVS. The first method we developed was a resistant estimation procedure, where the term "resistant" means insensitive to extreme observations

in estimating the relative value of the scale. The resistant estimation procedure permitted us to observe how far physicians' charges deviated from the CRVS schedule. In addition, another statistical method was developed to apply a non-parametric procedure known as the median test. The median test corresponds to analysis of variance techniques that assumes equal variance and identical frequency distribution among procedures. To apply the median test, the data for each procedure were pooled for all observations of the charges made by physicians. The median for sampled procedure was calculated and then compared with the median of the specified procedure. If the proportion of the sample was less than the specified median, then a chi-square test was performed to ascertain whether the null hypothesis was accepted or rejected at the 95 percent confidence level.

Physician charge data were tabulated and pooled to conduct both of these statistical tests. Both tests revealed that physicians did not closely adhere to the CRVS. This conclusion applies to both medical procedures as well as surgical procedures. The level of nonconformity to the CRVS varied between States. In some states there were close adherence, such as in Alabama, Colorado and Arizona. Meanwnile, there were large deviations in Illinois, New York, Oklahoma, and New Hampshire. As a result, no general conclusion can be observed as to which State might more likely conform to the CRVS than some other State. The overall conclusion is that physicians do not follow closely the CRVS promulgated by the Blue Shield or local medical societies.

The policy implication of this finding is that although the organized medical community or the Blue Shield plans promulgate a set of relative value schedules, physicians may not necessarily closely adhere to them because the insurers (or medical societies) do not (or cannot) strictly enforce the

schedule. Physicians charge varying relative amounts for procedures that may differ from CRVS. The relative price among procedures may be shaped by market forces and other institutional factors. This finding is important because the result leads us to examine what other forces may constrain physician practices.

(B) Organizational studies.

Unlike most economic transactions, the market for health care consists of a tripartite relationship: (patients, providers, and insurers) rather a bilateral relation. Most studies of physician services have assumed that insurers are passive players. They simply serve as a financial intermediary, receiving premiums from patients and paying physicians for services rendered. In reality, of course, we know that insurers play a more active role in establishing fee schedules and reimbursement policy (e.g., usual and customary or indemnity), and limiting what services will be paid by insurers. These constraints placed on price and quantity by insurers could greatly influence medical practices and physicians prices. One major aim of this research project was to obtain a more comprehensive and accurate understanding of the role of insurance firms in the health care system.

The study set out to discover what goals the management of insurance firm try to achieve, what factors constrain managerial decisions, and how insurers interact with the organized medical community and individual physicians. Information and data were collected through field studies of ten insurance firms -- four commercial insurance companies and six Blue Shield plans. On site in-depth interviews were conducted at each firm. Executives being interviewed ranged from the managers of claims, directors of professional relations, vice presidents for marketing, financial vice presidents, actuaries, to presidents

and members of the board of directors. Information collected through these interviews was supplemented by written material collected from the insurance firms, including operational manuals, guidelines for claim review, and documents on the process used by insurance firms in setting their physicians reimbursements.

Several important findings were produced from the organizational study. First, we found that insurance firms lack sufficient market power to effectively moderate physician charges or their discretion in choosing the modality of treatment. The firms have to set premiums in advance, they want predictability in the price and utilization rate of physician services. But physicians control both. Because of their medical expertise and superior knowledge, physicians largely decide what diagnostic and therapeutic procedures should be performed and how frequently they should be done. Physicians have wide latitudes in deciding treatment as well as setting their prices. Meanwhile, legal sanction is given to the medical profession to be free of outside reviews. As a result, the insurers have to accommodate to the professional and economic power of doctors. Insurers are in a weak position to regulate or bargain physicians. When an insurer has sufficient economic leverage (e.g., cover a large percentage of the population), the insurer can bargain with the organized medicine for lower fees and for peer control of quality and quantity and often wins concessions from the organized medicine. On the other hand, when an insurer has little leverage (i.e., small share of the insurance market), the insurer has to accept whatever the physicians decide to do as given. These insurers usually design insurance policies that insulate their own financial liabilities that may arise from the variability of medical treatment and prices, and leave the variable financial burden to the insured.

Our study also found that Blue Shield dominates the traditional insurance market because it covers a large percentage of the population in a region. As a result, Blue Shield is a dominant firm with many commercial companies competing on its fringe. The insurance premium is set by Blue Shield and the commercial companies have to compete based on that price. Consequently, innovation comes to the insurance market very slowly and the competition among health insurers is relatively weak because Blue Shield dominates the product design and the price. Blue Shield plans attained this dominating position partly because they were non-taxpaying and partly because they were able to bargain for discounts from physicians and hospitals.

The policy implication of our organizational study findings is that the traditional insurance would not be able to provide effective constraint on physicians. The professional power of physicians is not a result that insurers are captured by organized medicine. Quite to the contrary, Blue Shield plans with larger market shares are willing to bargain with physicians and able to win concessions from physicians on price and utilization. The dominating position of the medical profession is a result of their expert knowledge, the high social status accrued to physicians, and the legal sanction accorded to doctors which frees them from and external review.

(C) Modelling of physician behavior.

There are several approaches in modelling physician pricing behavior that are important for public policy. The approach used depends largely on what questions we want answered with a modelling effort. For instance, if we want to understand how price would affect individual physicians' decision on how many hours he or she will work, or what specialty he or she may choose, then we would

develop a model based on the concept that an individual physician faces an opportunity set and she chooses an option based on her individual preference function. If we want to understand in aggregate how the market forces affect the physician's behavior, then we would develop a model based on the interaction of various actors in the market. For this research project, we seek to understand physician's market behavior because we are most interested in how physicians react to different reimbursement policies. We developed, therefore, two models to investigate the aggregated market behavior of physicians.

The first model was based on the tripartite relationship between physicians, insurers, and patients. A recursive econometric model was developed to examine how patients' demand, insurers reimbursement policy, insurers' market power, affect physicians' prices. The second model was based on the theory that physicians have several control variables to achieve a target income. The target income is set in relationship to the income of other professions, such as attorneys, managers, and accountants. This is a relative target income hypothesis. Physicians have several levers with which to attain their target income. These levers include price, quantity, mix of procedures, definition of service, assignment, and selection of patients based on their ability to pay.

The models found that there was statistical evidence to support the relative target income hypothesis. But that does not mean the market forces have no influence on doctors. We found that patients' demand has a modest influence on physicians' prices. Also, the market power of the insurers has a moderating influence in constraining physicians' prices. Equally important is that physicians' prices may be restrained by medical ethics. Although these market and institutional forces have some impact on physicians' prices, they are incapable of limiting physicians' income because physicians have many levers to attain

their target income. Within a reasonable range, physicians can compensate any reduction in their income resulted from price control by changing quantity of services, mix of procedures performed, billing practices, and assignment rates. In other words, our research found that price regulation by external agencies such as the insurer or the government is unlikely to reduce the total expenditure for physician services; regulation can reduce price but not total expenditures.

(D) Evaluation of current relative prices against resource cost.

One of the methods in evaluating whether there is serious price distortions is to investigate the relative of price of physician services. We conducted such as study by comparing the relative prices of services to a normative standard. First part of the research question was whether a method can be developed to establish the normative values of physician services. If a method can be developed to establish the reasonable and equitable prices, then we can compare the actual charges with the normative standard.

After considering different alternatives we decided to develop a normative price based on the input resource cost. The price of any commodity or service, in economic terms, should be closely and directly related to the input resource cost. In a perfectly competitive market, the price should be the marginal resource cost used in producing that commodity. Therefore our study developed a method to measure the input resource cost for physician services. Then we compared the resource cost with the actual physician's charges.

The input resource cost method we developed was to quantify the four major types of inputs for physician services: time, complexity of that time, training required to perform a given procedure, and overhead costs associated with per-

forming that procedure. Time can be measured accurately for both ambulatory services and surgical procedures. Quantity of time spent on a given procedure was relatively simple, the complexity of that time was much more difficult. Complexity included the intensity of time, and the risk to the patient and to the doctor. To measure complexity, we conducted in-depth interview with physicians, asking them to rank-order the complexity of selected procedures. Then, using a statistical conversion formula, we converted the rank-order to cardinal numbers.

The value of education required for performing a particular procedure was determined based on human capital investment theory. We calculated the opportunity cost of different types of specialty training. The overhead costs were based on published data on physicians' practice expenses, such as office, rent, personnel cost, supplies and insurance.

Several important findings were produced by this part of the research. First, we have demonstrated that it is feasible to use a scientific method to establish rational physician prices based on the input resource cost. Although these resource costs may not be 100 percent accurate. Nevertheless, it gives us a reasonable measurement of the true cost in producing physician services. Therefore, we conclude that the government or private insurers industry can determine input resource cost for physician services and use that as a basis for payment to physicians. Second, by comparing a sample of the input resource cost with the actual charges, we found there were enormous differences in the price charged versus the input costs. This indicates that there are significant market distortions in physician services where the price charged was so different from the cost of producing that service.

Our research finding showed that currently the price for technology-intensive procedures are vastly overpaid as compared to cognitive procedures. The technology-intensive procedures are paid three to four times of those requiring cognitive skills. There are several reasons for this distorted pricing structure. First of all, as we have stated earlier, the medical profession is given the legal sanction to dominate over medical decisions free of outsiders review. Therefore, the profession has the power to set prices. Moreover, price could be set arbitrarily without creating hardship on patients since insurance are paying the services. One major reason for the technology intensive procedures to be paid much more is a when they were initially developed these procedures were the most sophisticated new technology and very few physicians were trained to use them. Furthermore, these procedures are usually experimental. As a result, the fees for performing the new technical procedures were set very high. But as time goes on, more physicians learn how to perform these new procedures. Furthermore, as more physicians do a new procedure, they gather clinical experience. The procedures become simpler and more standardized. On the other hand, the relative value accepted initially by the insurers continue unchanged. Insurers allow this practice because of the dominating role of the medical profession in medical care and lack of competition in the insurance market.

The overpayment of technology-intensive procedures induces physicians to choose technical procedures over cognitive services. Equally important is that new medical graduates would be attracted with greater financial rewards to those specialties that perform the technology-intensive procedures. As a result, the supply of these technical specialists would increase. These specialists treat patients with the skills the learned. Consequently we witnessed an increase of

technical specialists such as surgeons and an acceleration of technology-intensive services. This leads to rapid inflation in health expenditures because the technology-intensive procedures are costly and frequently require hospitalization.

In sum, this research project found that physician prices are modestly constrained by patients' demand and by insurers' bargaining for low prices and by government regulations. But the medical profession occupies such a exalted place in medical care that they have several levers to compensate any loss in income due to price regulation.

Moreover, this project found that the prices among different services are greatly distored. Technology-intensive procedures are vastly overpaid which leads to over utilization and cost inflation.

II. Summary of current knowledge.

During the past decade, there has been a number of studies research into the physician market and physicians' economic behavior. Many of these studies were funded by the government. This section synthesizes the findings from this research project with research results of other studies. We summarize the current knowledge that are relevant to setting physician reimbursement.

(A) Preeminence of physicians.

Physicians in the United States possess enormous professional and economic power over medical decisions. This power accrued to physicians rose from four major factors. First, medicine is not a pure science. There is considerable uncertainty in the diagnosis and treatment of disease. Physicians can choose one procedure over another. Second, medicine requires unusual skill, training and knowledge. Most patients do not possess adequate knowledge to choose what

medical services they need nor able to judge the technical quality. Patients have to turn to physicians as their agents to make decisions. Thus the normal consumers' constraint on the supplier is exceedingly weak. Third, the professional autonomy accorded to the medical profession by law has freed physicians from outside reviews. Lastly, insurance provides an open checkbook to physicians to render medical services, thus the profession finds no need to restrain itself. Hence there is no pressure within the profession to restrain itself through self policing.

While medicine is based upon scientific knowledge, application of this knowledge is a matter of judgment "in fact, medicine remains more of an art than a science" (Enthoven, 1980). In addition, there is significant difference of opinion among doctors regarding the proper use of many procedures and their relative effectiveness. For some diseases, there is also disagreement whether medical or surgical management would be best. Discretion and judgment in the practice of medicine has been well documented by Wennberg (1973), Schroeder (1980), Lewis (1969), Heasman and Carstairs (1971). There is substantial evidence to show that physicians have wide discretion to decide how much and what kind of procedures they will perform for a given condition.

Medical knowledge is complex and sophisticated. Based on biomedical sciences, the study of medicine requires native intelligence and long year of training. Most patients do not have adequate knowledge about their illness. Patients usually experience symptoms, but symptoms are not labelled with their diseases. A set of symptoms can be associated with many diseases. Medical tests are used to diagnose the disease but they are not one hundred percent reliable. For a given disease, there are several possible treatments, each of which may be legitimate. Because of the lack of information and inexactness of

medical science, patients lack sufficient information to make their own decisions. Patients have to rely on the experts - physicians. Therefore, the usual restrain we expect to consumer to exert on the supplier is weak.

While technical competence may place physicians in a preeminent role where their diagnostic and therapeutic decisions are rarely challenged, our legal system further re-enforced it by granting physicians professional autonomy. Eliot Freidson (1970) observed that "medicine's position today is akin to that of the state religion yesterday -- it has official approved monopoly over the right to define health and to treat illness. The distinction between the medical profession and other occupations lies in its legitimate organized autonomy." By its legal status accorded to it, doctors have the special privilege of freedom from control by outsiders. Unlike other occupations, medicine is given the right to control its own work, including the exclusive right to determine who can legitimately do its work and how the work should be performed. More importantly, it has the recognized right to declare outsiders as incapable, incompetent, and unqualified to evaluate its work and activity. This almost absolute autonomy was granted by the legal authorities. As a result, effective reviews that could have come from organizations such as insurers or government are considered illegitimate and intolerable. Usually the outsiders have to delegate the reviews and controls to the medical profession itself. But the medical profession has no incentive to constrain its own members because the way health care is financed.

Insurance provides an open checkbook to physicians to do what they wish to do, removing the only remaining effect constraint on physicians. The open checkbook removed the necessity for the medical profession, as an organized body, to monitor and policing their members. When medical care is given unlim-

ited resources, there is no need for the medical profession to make hard decisions as where the resources should be used most beneficially for the patients or whether members are overpaid. The current payment system encourages the medical profession to allow each members to do what he or she wants to do based on his own judgment and discretion.

(B) Levers available to physicians.

The professional autonomy gives physicians power over medical decisions as well as economic decision. A physician has several levers available to him to manage his own economic well being. He can set higher prices subject to some modest market restraints, he can induce patients' demand within a certain range, he can select the type and intensity of treatment given to satisfy his own goals, he can alter the label of his service to maximize his revenue, he can decide whether or not to take assignment, and he can select his patient by the type of insurance coverage they have.

While these levers are available to a physician he may not like to use them unless it's necessary. That is because physician behavior is partly guided by ethics and tradition. Altering any lever to achieve physician's target income may give him a ping consciousness. For example, a physician may wish to treat all the sick people. He would treat Medicaid patients, cetius paribus. However, if Medicaid pays very low fees, the physician may decide not to accept Medicaid patients. He nevertheless is troubled by his decision to trade-off not accepting all sick patients for higher income. The physician would like to avoid doing that if it is possible.

In addition to setting fees, research studies found strong evidence that physicians would use one or more other levers to achieve their target income.

When fees are being regulated by the government or insurers, physicians compensate by using other levers. We give a brief summary of these findings.

1. Quantity of services. In spite of increases in the number of physicians per capita in the U.S., and the price controls adopted by Medicare and Medicaid, physicians have been able to maintain a stable target income. One lever used to offset rate regulation is by increasing the number of services. For example, a New York City study found that in 1970 when Medicaid established a fee schedule that was significantly below the normal charges made by physicians, the number of visits per capita increased by more than 30 percent within a six-month period after the fee schedule was put into effect. Upon subsequent auditing, the New York City Health Department was satisfied these services were rendered by physicians. The Department found that there had been an increase in number of visits per capita, but physicians had shortened the time they spent with patients per visit.

Rice (1983) used all Medicare data in Colorado to evaluate the effects of price on quantity. Rice found that one percent decline in the reimbursement rate in medical services result in a 0.27 percent increase in the quantity of surgical services provided. Meanwhile a one percent decline in surgical reimbursement rate results in a 0.14 percent increase in surgical service provision. He concluded that his "study results are consistent with the theory that demand inducement exists."

2. Type of services and modality of treatment. Physicians can choose a particular procedure to perform among several to treat a patient. When there is price control, physicians have the discretionary power to select a modality of treatment that is more remunerative to them. For example, when West Germany established a fee schedule to control physicians charges, physicians set up

diagnostic laboratories in their offices and ordered more laboratory tests. A similar situation occurred in Japan. The Japanese government has a fee schedule that is based on "skill" points. This reimbursement method is an attempt to hold down physicians' fees. When this control was implemented, the number of prescription drugs which were sold directly by physicians increased by a large percentage.

Thomas Rice (1983) used the data from all Medicare claims for Colorado physicians between 1976 and 1978. During that period, a change was made in the state's Medicare reimbursement system, resulting in a large increase in some physician reimbursement rates and relative decrease in others. Using this natural experiment, he found that there is a change in the payment rate, physicians change their provision of care toward more highly intensive medical and surgical services, greater quantity of surgical services, and ordering more laboratory tests. Rice found that the one percent decrease in the reimbursement rate for medical services resulted in a 0.61 percent decrease in medical services intensity, an one percent decline in the surgical reimbursement rate resulted in an increase of 0.15 percent in the intensity of surgical service provided.

3. Billing practices. Several empirical studies were conducted to investigate the discretionary power of physicians in their billing practices. William Sobaski (1975) investigated the economic impact of revising the medical procedure codes from a four-digit system to a five-digit system. he found that the reported intensity of medical services has increased as a result of changing this coding. The change in reporting pattern of services boosted doctors' gross revenues by 7 percent for hospital visits. Holahan and Hadley (1979) analyzed the billing by physicians under the Medicare and Medicaid programs in

California. They found the indefiniteness of medical procedures permits many doctors to fragmentate their bills.

4. Participation rates. Several studies evaluated the effect of payment system on physicians' willingness to participate in a insurance program. Sloan and Steinwald (1978), Sloan, Cromwell and Mitchell (1978), Lee and Hadley (1978), and Rogers and Musacchio (1983) have made empirical estimates of the physicians' response to reimbursement levels in their willingness to take assignment. These studies found that the greater the additional revenue from a private patient relative to the Medicare fee, the less likely the physician is willing to accept assignment from Medicare. Rogers and Musacchio estimated that a 10 percent increase in reasonable fees will increase assingment rates by 3.8 percent under the Medicare program, Paringer (1980) used a weighted average method and estimated a comparable 4.8 percent increase. Similar results were found in physicians' participating in Blue Shield plans. The greater the Blue Shield reasonable fee is to the revenue expected from commercial companies, the more likely the physician will participate in Blue Shield.

5. Patient selection. Physicians can select patients by their insurance status. Medicaid patients is a clear illustration of this type of selection. When Medicaid fee schedule is close to normal fees charged by physicians, they usually accept Medicaid patients. Sloan, Cromwell and Mitchell (1978) theorized that physicians first select private paying patients and then treat Medicaid patients when they have the time. Their study found that physicians' willingness to treat Medicaid patients is directly related to the Medicaid fee level. If the level is close to his normal charges he would treat Medicaid patients.

6. Long run effects. In the long run, physicians can choose where they locate their practice, and which specialty to enter. A few studies have evaluated the impact of price on location choice in the U.S. Fuchs and Kramer (1973) and Cantwell (1979) found that higher price is associated with greater supply of doctors in a locality. This statistical association is compatible with both the target income hypothesis as well as the normal supply and demand theory. In other words, under the target income hypothesis if there are more physicians in a community, higher price would be charged in order to achieve the desired income. On the other hand, the supply and demand model would explain that the community which has higher prices would attract more physicians. Therefore, these findings cannot help us to differentiate the economic behavior of physicians other than to show there is a statistical correlation between higher prices and greater supply of physicians.

Harrison and Jad (1973) found that there is also a statistical correlation between a location that gives a physician higher income and the higher number of physicians located in that area. A study done in Philadelphia by Ramaswany and Tokuhata (1978) found there is a statistical correlation between the higher prices and greater number of services rendered to patients. In other words, higher prices are associated with greater utilization.

From these studies, evidences support the conclusion that higher prices (or income) are statistically correlated with more physicians. However, these statistical evidences are insufficient to differentiate whether the correlation is due to supply and demand or because of trying to achieve the target income.

In the long run, different relative prices between specialties also affect medical students' choice of specialties. Sloan (1970), Lee (1980), and Hay (1981) found that income expectation has some impact on specialty choice.

Medical specialties that have high relative income tend to attract more medical students. In other words, the more lucrative the specialty, the more the supply.

In summary, then, physicians have eight levers at their command to achieve a target income. In short term, within a reasonable range, physicians can vary prices, alter quantity, change intensity and type of services, revise billing, refuse assignment, select patients by insurance coverage. In the long term, physicians can also choose where they locate their practices and what specialty to enter. A number of empirical studies have analyzed and evaluated whether physicians do use these levers in response to price controls. In general, the empirical findings strongly support the theory that physicians do induce demand, change the intensity of services, select more lucrative services to perform, fragmentate bills, and refuse assignment to achieve a target income. In the long run, physicians do respond to the relative prices in choosing where they locate their practice and their specialty.

III. Alternative policies in Reforming Physician Reimbursement

A. Goals in reforming Medicare reimbursement to physicians.

The current Medicare reimbursement to physicians has been criticized as inflationary, inequitable, complicated, and shifting the burden to patients. The current impetus in reforming the payment system to physicians are several, but foremost is to reduce expenditures for the Medicare program.

Because of the anticipated large Medicare deficits in the next decade, the Congress and the Administration would like to adopt new approaches in paying physicians that would lead to reduction in Medicare outlays. While attempting to achieve this goal, the government also wants to minimize any cost shifting to

patients and other payors that may result from a new reimbursement policy. At the same time, government would also like to minimize any reduction in access to medical care for the elderly population, as well as in the quality of service they may receive. At the same time, any new reimbursement system should be simple and easy to administer. Lastly, another goal would be to have payments to physicians to be "neutral" when physicians make medical decisions. In other words, tne financial compensation to the physician should not influence his medical judgment.

These are ambitious goals. No single reimbursement option could achieve all of these goals. As a matter of fact, some of the goals stated above are in contradiction with each other, for example, reducing Medicare expenditures wnile not reducing the access to care. Nevertheless, several incremental changes could be made by Health Care Financing Administration (HCFA) to make some improvements in its physician reimbursement methods.

Before we outline some recommendations that are specifically related to Medicare, it would be helpful to describe briefly the major options available to the government in altering the physicians services. Most of these major policy options are not feasible for the Medicare program because it only covers a small portion of the population. More importantly, most of these options are not politically viable at this time because of the interest group politics which determines our public policy. However, by first outlining the major changes needed to achieve the goals stated above, we can see how effective the Medicare options may be in changing the physician services market.

(B) Major policy alternatives.

There is convincing evidence to show that physicians occupy the preeminent position in the provision of medical services. Physicians have the power to make medical and economic decisions that affect their own economic well-being. The basic cause for cost inflation, duplication of facilities, over-utilization can all be traced back to the lack of regulatory or market constraint on physicians' decision-making. Therefore, any effective moderation of physician behavior has to come from a major overhaul of the legal, political and market systems. There are three major policy options available to the government.

First, the professional autonomy enjoyed by the medical profession have to be reduced so that there will be greater balance between the physicians' private interests and the societal interest. The reduction of professional autonomy can be done through several ways. Among the policy instruments are: reducing the legal protection given to medical profession from outside review, reducing the medical profession's ability to define what is the appropriate care and how it should be done, strengthening the power of consumer groups and government regulatory authorities. Unifying the health financing and regulatory agencies.

One of the most feasible and effective options is unifying health regulatory and financing agencies. The current separation of regulatory and financing authorities gives the regulators no financial stake in their decisions. For example, state's Certificate of Need agencies can approve capital expenditures without having to pay for them. As a result, there is no incentive for regulatory authority to control hospitals or physicians effectively. HCFA wants to control physicians' medical practices and prices, but it lacks direct regulatory authority. Canada has demonstrated that by combining together the financing and regulatory authority into one agency the government officials have to trade off

between effective regulation or greater budget outlays. Theodore Marmor has argued convincingly that Canada has been able to control its health expenditures because of the unified government financing and regulatory authority.

The second policy choice is to enhance self policing by the medical profession. This is a recognition that lay people lack sufficient knowledge and power to review and control physician decisions. As a result, control has to be given to the medical profession itself, but with aggregate fiscal limitations placed on the profession so it self regulate. One possible approach under this option is to provide regional or global budget for physician services. By closing the open checkbook that has been given to doctors, they would have to decide how the limited resources should be divided among themselves. This approach will promote competition and negotiation among physicians groups and that would foster greater self policing. The different specialty groups may check-and-balance each other for their own welfare as well as that of their patients.

Another option of promoting internal professional control is by providing a gatekeeper. Medical cost for providing care to the patient could be capitated to a primary are physician who serves as the gatekeeper for the patient. The gatekeeper, a physician, will monitor the performance and charges of other physicians. Examples of such approaches are the physician network, "managed care," and physician reimbursement.

DRG reimbursement for physicians has gained wide attention because hospitals are being reimbursed on a DRG basis. Also Congress has mandated HCFA to consider reimbursing physicians on a DRG method. Conceptually, DRG reimbursement has a great deal of appeal, but is suffers from three weaknesses. First, translating this concept into operation for physicians is exceedingly difficult. Individual physicians do not perform a large number of the same surgical

procedures. Therefore, the variation in the severity of illness is much more important than for hospital reimbursement. The Law of Large Numbers does not easily apply to individual physicians as to hospitals. We cannot assume the variation in severity would average out for a given doctor. The second problem is that the DRG's for physician services would not necessarily be the same as for hospitals. Therefore, new DRG groupings would have to be developed for physicians. That would lessen the potential benefit that could be gained in paying physicians on a DRG basis. When hospital and physician DRG's are different, the reimbursement system then will continue to be fragmented. Lastly, DRG reimbursement for physicians has not been tried. We have no empirical knowledge as to how well this scheme may work in operation. The DRG approach could do harm as well as good. For example, physicians would have the incentive to do as little as possible for a patient. Since we have argued that patients lack adequate medical knowledge they cannot exert a countervailing pressure to get physicians to provide proper care.

The third major policy alternative is to overhaul the health delivery system. One option under this category is to induce physicians to practice in an organized setting such as HMO's. Another option for system change is by altering the relative value schedule paid for different procedures. This regulatory measure could direct physicians away from technology-intensive procedures toward more patient-care procedures. Moreover, in the long run, it would induce more physicians to select primary care specialties rather than technical specialties.

We have sufficient information today which tells us what system changes have to be made to bring about effective control on health expenditures without sacrificing much access and quality. But these solutions all require the nation to constrain physicians' decision-making power. This can be done only through

major system changes which require strong political will. The balance of political power is such today that it would not make major reforms possible. HCFA has to consider poliy alternatives that are realistic within the political constraints.

IV. Recommendations.

A. Present Climate:

HCFA is being asked by Congress and the public to reform its physicians' payments. The immediate goal is to reduce the program's expenditures. But most effective remedies are ruled out by the political realities. As a result, we suggest the following recommendations which could make some modest improvement in Medicare reimbursement.

1. Mandatory assignment.

Currently, the physician can select assignment on a case-by-case basis to charge patients according to their ability to pay. By any objective standard, the Medicare reimbursement schedules are quite generous and reasonable. As we stated earlier, physicians have garnered a large amount of monopolistic income from patients and third-party payors. There is no justification for the Medicare program to support physicians' monopolistic income by financing it with taxpayers' money. If there were a mandatory assignment, we doubt very much that many physicians would refuse patients. Physicians undoubtedly would threaten such action when this policy is being debated, but there is little any evidence that many physicians would actually boycott Medicare beneficiaries. It is possible a few physicians would do so, but that would not be widespread. Mandatory assignment would remove one of the levers from physicians to achieve target income. This measure may reduce the total health expenditure in the U.S.

Unfortunately, it would not reduce Medicare outlays; people who benefit are the Medicare beneficiaries.

2. Encourage salary practices.

The Medicare program allows hospital-based physicians to select either fee-for-service or salary. This option has encouraged radiologists, pathologists, and teaching physicians to shift from salary to fee-for-service. As a result, the program has provided financial incentive for hospital-based physicians to proliferate their services, particularly the non-invasive procedures. This policy has removed any organizational control that hospitals had in controlling physician initiated costs. With the hospitals being reimbursed on a DRG basis, the hospitals now have the incentive to encourage physicians to limit the number of tests. But hospitals need doctors' cooperation. The Medicare program can reduce program expenditures by requiring hospital-based physicians to be salaried and by reducing payments for tests done by radiologists and pathologists who operate independent laboratories outside of hospitals.

3. Correct the relative value schedule.

The Medicare program, inadvertantly, has become an agent for medical cost inflation by institutionalizing the flawed relative value scheduled inbedded in the UCR system. The high relative values of technology-intensive procedures now have legal sanction which in turn promotes their proliferation and how often they are being done. The Medicare program can use the differential freezing method to reduce the relative values of technology-intensive procedures. The fees for these procedures can be frozen while allowing increases for cognitive procedures. There are numerous justifications for this policy which has been explained earlier in this paper. This policy would reduce Medicare cost and in

the long run, more physicians may enter into primary care.

4. Conduct demonstration projects for DRG.

DRG reimbursement for physicians has merit because it reduces fragmented billing and also a physician becomes the gatekeeper for the patient on that given episode of illness. As we have explained earlier in this report, there are some serious technical and operational problems with the DRG reimbursement method. Nonetheless, the approach has sufficient merit that HCFA should conduct research and several demonstrations to learn how feasible it is to reimburse physicians on a DRG basis. Currently we lack sufficient knowledge to either adopt DRG as a Medicare policy or reject it outright.

5. Conduct demonstration projects on Medicare preferred provider organizations.

The Federal Government has not adequately performed its role as the bulk purchaser of services for its Medicare beneficiaries. In order to counteract the strong monopolistic power possessed by physicians, the Medicare program is in a justifiable position to bargain with organized medicine at the regional level for maximum charges allowed for services rendered and for comprehensive utilization review by peers to assure the appropriateness of medical care. HCFA can fund regional negotiation boards composed mostly of public members to negotiate with physicians and hospitals. The savings generated by lower fees and lower utilization should be passed on to Medicare beneficiaries by reducing their cost-sharing. In other words, HCFA will offer Medicare beneficiaries who agree to obtain their medical care only from PPO's with reduced cost-sharing that beneficiaries would have to pay.

B. Ultimate System:

1. Establish a Single Universal System for Physician Payment

Physician payment, regardless if it's based on UCR, fee schedule, relative value scale, or salary should be consistently and uniformly applied to all third party payers and patients. The current system of paying varying fees by different payers are not only confusing to physicians and patients alike, but also encourages physicians to discriminate patients according to their insurance plan. Patients covered by programs with more effective fee controls such as Medicaid and Massachusetts Blue Shield are being discriminated by physicians.

2. Establish a New Organizational Form for Physician Services

3. Enact Total Budget for Medical Services by Area

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