Physician Contracting with Health Plans:
A Survey of the Literature

Martin Gaynor
Carnegie Mellon University

Tami Mark
The MEDSTAT Group, Inc.

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1. Introduction

During the 1980s and 1990s, health care markets in the United States have been dominated by two major trends: tremendous growth in managed care and, most recently, a strong movement toward consolidation, both horizontally and vertically (Gaynor and Haas-Wilson, 1999). Both of these developments are characterized by changes in the nature of contracts between physicians and health plans. In this paper we review trends in physician contracting with health plans and other financial intermediaries, describe the characteristics of physician contracts, and review the theoretical and empirical literature on the effect of contractual form on physician practice patterns.

Physician contracting with health plans and other financial intermediaries raises a number of questions. How has physician contracting affected physicians' practices, such as their work load and income? How has physician contracting affected patient care, such as the amount of time physicians spend with patients and medical outcomes? Does physician/health plan contracting affect the price of health care? Because health care resource utilization is controlled in large measure by physicians, and because physicians are the cornerstone of managed care organizations, understanding contracting between health plans and physicians, and how contracts influence physicians' behavior is also essential for understanding the potential effects of managed care and for predicting its long run viability. Further, information about the relationship between physicians and intermediaries can inform the debate over policies aimed at regulating these relationships.

In the next section, we provide some information on trends in the health care market affecting physician practices, such as the growth of managed care, recent trends toward consolidation in health care markets, and new legislature affecting physician contracts. Section 3 characterizes different types of health plans, managed care arrangements, and physician contracting. Section 4 discusses the incentives presented to physicians by different forms of contracts and reviews empirical evidence on this point.

2. Recent Trends in U.S. Health Care Markets

Until the 1980s, most insurance was reimbursement insurance, first predominantly provided by Blue Cross and Blue Shield, and later also by commercial carriers. Under these traditional insurance contracts, a consumer (or more accurately, an employer) pays a premium[1] and after paying a deductible, is reimbursed a predetermined percentage of covered expenses, usually 80 percent.[2,3] This traditional insurance contract is characterized by fee-for-service (FFS henceforth)

[1]Note that even if the employer pays the premium, a worker will indirectly share part of the expense through reduced wages. Recent evidence suggests that insurance expenses are shifted almost entirely onto workers through reduced wages.

[2]Although this kind of traditional insurance is often called indemnity insurance, it is more accurately labeled reimbursement insurance. Under indemnity insurance a consumer is *indemnified* against a loss. If the loss occurs, payment is made, regardless of whether repairs are undertaken. For example, automobile insurance will make a dollar payment for damage caused by an accident. The consumer can then undertake repairs or not. Medical insurance, by contrast, does not indemnify consumers against a loss due to illness, it reimburses them for treatment (repair) expenses associated with the illness.

reimbursement for physicians. In some cases consumers pay the physician's bill and are reimbursed directly by the insurer for the covered amount of the total. A more typical case is for the physician to submit a bill directly to the insurer. In this case, the contract between the physician and the insurer specifies that the insurer will reimburse the physician a predetermined usual, customary, and reasonable (UCR) rate as a fee, and that the insurer has the right to disallow a claim, either because of coverage restrictions or limits, or inappropriateness of treatment. No other restrictions on the physician apply. Under "pure" reimbursement insurance physicians are reimbursed on a fee-for-service basis, with little oversight or involvement on the part of the plan, and consumers are free to receive care from any provider. The growth of myriad forms of managed care organizations during the 1980s and 1990s, stemming largely from employers' concerns about medical costs, dramatically altered this arrangement (Miller and Luft, 1994).

In 1980, 9.1 million persons (about 5 percent of all Americans) were enrolled in health maintenance organizations (HMOs), most of which were so-called closed staff or group-model HMOs--where the physicians practiced in large organizations or multispecialty group settings (Weiner and de Lissovoy, 1993). By 1998, HMOs had over 78.8 million enrollees, or over 30 percent of the total U.S. population (Interstudy, 1999). Most growth occurred not in staff and group-model HMOs, but through the creation of newer forms of managed care organizations, such as Independent Practice Associations (IPAs). An IPA is an HMO that primarily contracts directly with physicians in independent practices; and/or contracts with one or more associations of physicians in independent practice. Approximately 40 percent of total HMO enrollment in 1998 was in IPA-model HMOs (Interstudy, 1999). Other forms of managed care, such as PPOs, have been growing as well and by 1998 less than 15% of active employees covered in employer-sponsored health plans were enrolled in traditional indemnity insurance (Mercer/Foster Higgins National Survey of Employer-Sponsored Health Plans, 1998).

The term managed care has been applied to a wide range of associations among physicians, hospitals, and other health care providers. While the term managed care is used in a variety of ways, it essentially denotes explicit efforts by insurers to influence utilization through their relationships with providers. This clearly includes alternative health plans such as HMOs, IPAs, PPOs, and their variants. It also includes traditional reimbursement insurers' amendments to the traditional physician FFS payment contract.

Managed care organizations have grown by employing or contracting with physicians. At present, most physicians are involved in managed care. Eighty-three percent of physicians had a contract with at least one managed care organization in 1995 (i.e., IPA, HMO, or PPO), up from 61 percent in 1990 (Emmons and Simon, 1996). Thirty-nine percent reported a contract with an IPA, sixty-four percent with an HMO, and sixty-nine percent reported a contract with a PPO (Emmons and Simon, 1996). For most patient care physicians who have contracts, revenue from HMOs or

[3]Insurance contracts are usually more complex than this. The copayment rate may vary by type of service (it is often higher for mental health or substance abuse treatment), there may be a stop-loss limiting the consumer's total out-of-pocket expenses, insurance companies may limit the percentage reimbursement to a particular fee (usual, customary, and reasonable) with the consumer being fully responsible for any excess above that, there is usually a lifetime limit on total reimbursements, and there may be extensive restrictions or exclusions in coverage.

PPOs alone represented, on average, 33 percent of total revenue in 1995, up from 28 percent in 1990 (Emmons and Simon, 1996). Another study reports approximately one-third of physicians participating in alternative health plans (HMOs, PPOs, IPAs) in 1984 (Rosenbach et al, 1988). Those who participated received on average 28.6 percent of their net income from alternative health plans.

The extent of physician/health plan contracting varies by physician specialty and region of the country. Emmons and Simon (1996) report that physicians specializing in emergency medicine and psychiatry have the lowest rates of contracting with HMOs, IPAs, or PPOs, while medical and surgical subspecialties have the highest rates (physicians employed by staff model HMOs are excluded). They also indicate that the prevalence of contracting between physicians and insurance plans varies by region. In 1995, IPA contracting in the New England and Pacific states was estimated to be nearly double that in the West North Central and East South Central states. In addition, rural physicians are much less likely than urban physicians to have contracts with health plans. Rosenbach et al.(1988) report that primary care physicians and the medical and surgical specialties are most likely to participate, while radiologists, anesthesiologists, pathologists, and psychiatrists are the least likely. They also find a participation rate for urban physicians which is 2.6 times higher than that for rural physicians, and the highest regional participation rates in the West and North Central regions, with the lowest in the Northeast and South regions.

Physician practices have been changing in other ways as well. Today, very few physicians in solo practice remain. Only one-fourth of physicians were in solo practice in 1995, down from over a third in 1991 (Emmons and Kletke, 1996). Further, the size of medical practices has been increasing. Physicians in medical groups are more likely to have contracts with HMOs than are solo physicians and the likelihood of contracting with a managed care organization increases with group size (Emmons and Simon, 1996).

A third important, and relatively recent, trend in health care markets is the dizzying pace of alliance and network formation, mergers, and acquisitions (Gaynor and Haas-Wilson, 1999). While there is no systematic information as of yet about these changes, there does seem to be a clear trend toward consolidation. One such trend is in physician practices. New physician practice management companies have sprung into being and are achieving rapid growth by purchasing private physician practices (Jaklevic, 1995) Phy-Cor, Inc. and Pacific Physician Services are two such corporations, expanding at a rate of 30 percent per year (Anders, 1993). MedPartners, the largest physician practice management company in the United States in 1998, grew from 190 physicians to 7,914 physicians between 1994 and 1996 (Robinson, 1998). These firms provide capital, managed care expertise, economies of scale, and marketing services. Typically, physician practice management firms own the physical facilities of a physician practice, employs the nonphysician staff, and manages the business operations of the clinics or IPAs (Robinson, 1998).An important role filled by these firms is to market the physician practices to managed care organizations. In some cases, these networks are themselves being bought by insurers or managed care organizations (Lipin, 1995). As a result of this consolidation, physicians with established practices are relinquishing their managerial role due to increased administrative requirements (Anders, 1993; Freudenheim, 1993).

Consolidation is also occurring in hospital markets and insurance markets. In Worcester, Massachusetts, for example, the number of hospitals dropped from seven independent hospitals in 1979 to four in 1992, three of which were affiliated with health systems (Shactman, 1994). The number of hospitals in Minneapolis/St. Paul dropped from 24 independent hospitals in 1981 to 19 hospitals belonging to 3 health networks by 1992 (Shactman, 1994). Overall, in 1998, there were 198 hospital merger deals involving 687 hospital facilities (Bellandi, 1999).

Further, mergers and acquisitions between managed care organizations themselves are leading to consolidation and increasing size of managed care organizations (Anders and Winslow, 1995). California's HMOs have declined from 25 less than a decade ago, to about 15 HMOs in 1995 (Anders and Winslow, 1995). Between 1987 and 1997, enrollment in large HMOs (those with more than 200,000 members) increased from 32.6 % to 57.6 % of the industry (Interstudy, 1998).

Legislation regarding physician contracts

Contracts between financial intermediaries and physicians must be crafted within the confines of Federal and state laws. As managed care proliferates, Federal and state governments are passing legislation to regulate managed care contracts with physicians (Cooper and Green, 1991). Perhaps the most important (and contentious) type of legislation for the health plan/physician contracting environment are "*Any Willing Provider*" or "*Any Willing Physician* " laws. These laws dictate that any provider or physician willing to accept a plan's terms and who practices within the plan's geographic service area may apply and must be accepted into a health plan's network. Typically, these laws only apply to plans that contract with physicians and not to HMOs that hire physicians as employees. As of October, 1994, three states had enacted any willing physician laws (Texas, Utah and Virginia), but none applied to HMOs (GHAA, October, 1994). Ten states had enacted broader any willing provider laws (Florida, Georgia, Idaho, Illinois, Indiana, Kentucky, Utah, Virginia, Washington and Wyoming). Any willing provider laws offer physicians some protection against being cut off from their patient base. Physicians and others also make the case for any willing provider laws on the grounds that patients should be free to choose their own physician. In contrast, health plans perceive any willing provider laws as curbing their ability to manage costs by selecting the most efficient physicians, and by de-selecting physicians that are not managing care in a manner consistent with their goals (Hudson, 1994).

3. Physician/Health Plan Contracting: A Description

In this section we describe the basic types of financial and administrative relationships that health plans establish with physicians. Because the market for health care in the United States is so diverse and dynamic, it is important to begin this background section with a definition of terms. We use the term *health plan*, or *health benefit intermediary*, to mean an organization that contracts with employers or government sponsors to offer its health plans to potential enrollees and acts a conduit between the employer or government entity and providers (Weiner and de Lissovoy, 1993;

Miller and Luft, 1994). A health benefit intermediary can be an HMO, insurance carrier, third-party administrator, or independent provider organization.[4]

In general, health plans may influence physician's practices through both financial incentives and administrative controls. In this section we describe common forms of financial arrangements and administrative structures that are established between health plans and physicians.

Typically, three forms of payment arrangements between health plans and physicians are distinguished: 1) fee-for-service, 2) capitation, and 3) salary. Under, *fee-for-service* payment, physicians may bill the insurance carrier for the service provided and are retrospectively reimbursed for the charges billed on a per service basis. Alternatively, patients may pay physicians directly and then submit the claim to their insurance plan. Under *discounted fee-for-service*, the health plan negotiates a discount from a given base, such as usual and customary fees or charges, or establishes a predetermined list of prices per service with the physician, such as Medicare's Relative Value Scale (RVS). The plan then reimburses the physician retrospectively according to the agreed upon price.

In contrast, under *capitation*, a physician or a physician group receives a fixed predetermined payment in exchange for a commitment to provide a particular set of services to a defined population of plan members, based upon their medical need. The capitated amount may apply to only primary care services, to all physician services, or to all health care services. Under capitation, physicians are at risk for expenses that are higher than the capitated amount, and will benefit if expenses are lower than expected. *Salaried* physicians are employees of the health plan. Barring any other financial incentives, salaried physicians' incomes remain constant regardless of the amount of care provided.

Health plans often establish other financial incentives in addition to a "basic" or predominant form of compensation. These include various types of revenue-sharing plans, bonus incentives, and financial penalties (Hillman et al, 1989). Some managed care organizations base primary care physicians' compensation on the plans' expenditures on specialists or expenditures on specialists and inpatient treatment. If the plans' expenditures on specialty and inpatient care are less than expected, primary care physicians who act as gatekeepers may receive a bonus payment (surplus sharing). Alternatively, part of a physician's compensation may be withheld against a deficit in the pool allocated for specialty and hospital care (a "withhold"). In addition, plans may pay physicians bonuses based on certain performance standards such profitability or expenditures. These financial incentives may apply to individual physicians or to a group of physicians.

To protect physicians from excessive financial risk arising from capitation, health plans may also establish a stop-loss plan, which sets a dollar ceiling on a physician's financial liability for services provided to the plan's enrollees. Similarly, health plans may exempt physicians from the

[4] Although the focus of this report is on physician/health plan contracting, it is useful to note that some large employers are contracting directly with organizations of physicians and hospitals (known as Physician Hospital Organizations or PHOs) and by-passing the services of intermediaries (Johnsson, 1992).

costs incurred for enrollees with certain diagnoses that are likely to require services outside the norms for the physicians' specialties (General Accounting Office, 1988).

Arrangements between managed care plans and physicians are also typically characterized by administrative controls. When physicians are employees of a health plan, a variety of factors--such as the plan's corporate culture, promotions, perks, and performance reviews by peers and superiors--may be brought to bear to influence physician behavior. When physicians are independent contractors for health plans, administrative controls may be more limited, and may include post-payment review of practice patterns, such as through physician profiles, prepayment review, such as utilization review, and selective contracting.

Another way to characterize the relationship between a physician and a health plan is by the contracts' relative importance to the physician's practice. Physicians may receive most or all of their income from a health plan, for example, in the case of salaried physicians employed by staff-model HMOs. Alternatively, physicians may contract with various types of health insurance plans each of which have different types of payment structures ranging from fee-for-service, to discounted fee-for-service, to capitation. One might anticipate that the degree to which a particular managed care plan can influence a physicians' practice depends on the extent to which the physicians' patient base comes from that plan. Physicians with a small percentage of their income derived from managed care organizations may be less willing to cooperate with administrative controls and less responsive to financial incentives than those that derive a large portion of their income from patients in managed care organizations.

Health plans can sometimes increase their leverage over physicians by developing contracting relationships that prevent physicians from participating in any other managed care organization (called "exclusivity clauses"). In a similar vein, some contracts include "Most Favored Nation" pricing that requires a physician to reduce the level of his or her billings to the managed care plan, if contracting for a lower level of fees with another plan (Jensen, 1991). For a review of some of the antitrust issues that arise with respect to such clauses see Gaynor and Haas-Wilson (1999).

Managed care organizations may contract with various forms of physician organizations. Contracts may exist between a single physician in a solo practice or between a physician group. Groups may be single-specialty or multiple specialty groups. Groups may also differ in their degree of physical integration. Groups may consist of physicians that operate separate practices but are organized as a legal entity for contracting purposes (e.g., an independent practice association); they may comprise physicians who practice in separate offices but share administrative services and contract collectively (sometimes called a group practice without walls), or groups may be physically and administratively integrated. The organization of a physician group, such as its size, internal administrative controls, and financial structure, has the potential to mediate the effect of a health plan's contract. For example, a health plan may contract with a physician group on a capitated basis, but some physicians within the group may be paid on a salaried basis by the group. Similarly, the importance of a "withhold" may be substantially diminished if it is spread across a large group.

4. The Economics of Physician Contracts

A. Theoretical/Conceptual Issues

1. Introduction

The previous two sections have documented the extent and growth of managed care, physician contracting, the relevant legal environment and defined the types of physician contracting currently in existence. In this subsection we discuss the theoretical impacts of the different forms of physician contracting. In the next subsection we discuss the empirical evidence on the impacts of forms of physician contracting.

The framework we will use for analyzing physician/health plan contracting is *agency theory* (see, e.g., Arrow, 1985; Hart and Holmström, 1987). We will say an *agency relationship* exists between insurers and physicians. Agency relationships are defined by three necessary conditions (see the box at right). First, there is *comparative advantage* between the two parties for the performance of some task. That means that one party is comparatively better at performing the task than the other. Take the case of physicians and insurers. There are two tasks to perform: practicing medicine and underwriting and administering insurance. A trained physician could potentially both practice medicine and underwrite and administer insurance, but he is comparatively better at the practice of medicine than is the insurer, thus he concentrates on that activity. The argument is similar for the insurer. The implication of the comparative advantage is specialization. Further, if the insurer needs medical treatments to be available to purchasers of his insurance plan, he will contract with the physician to provide these services. The individual performing the task for another party is called the *agent*. The individual hiring the agent is called the *principal*.

The second necessary condition for an agency relationship to exist is *divergent objectives*. This means that the objectives of the insurer and the physician differ. For example, the insurer may care about quality of care and cost. Physicians may care about quality of care as well, but they also care about their income. Since the two parties care about different things, it will not generally be true that the same actions will maximize the objectives of both the principal and the agent. Thus the implication of divergent objectives is that there is a conflict between the two parties.

The third necessary condition is *asymmetric information*. Comparative advantage and divergent objectives don't in and of themselves create a problem. If there is perfect information then the principal knows everything (or alternatively, all the relevant information), including exactly what the agent does. In this case, the principal can simply write a *forcing contract* for the agent, i.e., one that pays him a competitive wage if the desired action is taken, and nothing if it is not. There is unlikely to be perfect information, however. What is more likely is that there is imperfect information, and that the agent is better informed about matters relevant to task performance than is the principal. This is called *asymmetric information*. The implication of asymmetric information is that the principal doesn't know exactly what the agent is doing, nor does he know all the other factors determining performance, so it is not possible to directly observe

whether the agent has taken the desired action, nor is it possible to infer it with certainty. Thus, the principal can only infer the agent's action in probability.

Taken together, these three conditions create a relationship between principal and agent where the agent has incentives to shirk at any task and the principal cannot precisely detect that shirking. Further, if the agent is risk averse, it will not be optimal for the principal to fully penalize him for shortfalls in observable outcomes, since they may not be the result of the agent shirking, but rather due to random shocks. This means that a contract which is optimal given the information structure will not be fully based on observable outcomes (Ross, 1973).

For example, suppose that a physician sees patients and produces health outcomes and costs with his own effort, which the insurer cannot observe. However, the actual health outcomes and costs are also the product of patient severity of illness, which is randomly distributed in the population and not observable to the insurer. Thus a poor outcome or high cost might be the result of low effort by the physician or of the patient being severely ill. The insurer is unable to discern which is the source of the poor outcome.

What does the optimal contract look like in this situation? That first depends on whether the relationship between the physician and insurer is temporary or ongoing. First let us consider a temporary one-shot relationship. Agency theory (Holmström, 1979) tells us that the optimal contract: 1) should be increasing in the observable outcome if the probability that the physician exerted the optimal amount of effort is increasing in the observed outcome (health or cost); but 2) should not be based purely on the observable outcome if the agent is risk averse. This implies that fixed payments like salary or capitation are not optimal payment contracts.[5] It also implies that holding physicians entirely individually responsible for adverse events is not optimal.[6]

An ongoing, or repeated, relationship alters the information structure and therefore alters the optimal contract between physician and insurer. An ongoing relationship offers repeated observations on the outcome, as opposed to only one observation in a temporary relationship. This offers more precise (statistical) information about the agent's actions than in the temporary relationship. Indeed, if the relationship lasts forever (is repeated an infinite number of times), the perfect information contract becomes feasible (Rubenstein and Yaari, 1983; Radner, 1985; Fudenberg et al, forthcoming). This will be optimal in this situation if agents do not discount the future too much. This result does not necessarily hold if the relationship is repeated, but limited. Thus, ongoing, long-term relationships are beneficial. Their byproduct is the production of more information, which allows the writing of contracts with better incentives.

In the framework above, information acquisition is passive. Insurers acquire information about physicians by observing outcomes, and the more chances they have to observe a physician's outcomes the more information they have about his actions. Information acquisition can also be

[5]If the levels of fixed payments are adjusted based on outcomes, or if patient demand is responsive to outcomes, this need not be true.

[6]There is recent evidence showing that physicians are risk averse with respect to compensation (Gaynor and Gertler, 1995).

active. As mentioned in Section 3 above, insurers engage in a number of activities to actively gather information about providers: e.g., physician profiling and utilization review. We will refer to any active information gathering as *monitoring*. As indicated above, additional information will improve contracting, which will improve performance. Thus, monitoring is clearly valuable. However, it is also costly. Consequently in an expanded agency model with monitoring, there will be an optimal level of monitoring of the agent's activities. That optimal level will be where the gains in performance due to the additional information acquired through additional monitoring are just balanced by the additional costs. Thus, it is unlikely that monitoring will be perfect.

The need for strong incentives diminishes as more information is acquired from monitoring. As mentioned initially, if information (monitoring) is perfect, there is no need for incentives. Insurers offer take-it-or-leave-it contracts: they simply tell physicians what to do, and if they don't they receive no payment (Gal-Or, forthcoming). This is clearly not a realistic case, but it illustrates the point that there is a tradeoff between monitoring and incentives. The more monitoring is chosen the less reliance there will be on incentives. This indeed, does seem to be the strategy being followed by many managed care plans, which use a combination of financial incentives and administrative controls in their contracts with physicians (Hillman et al, 1989; Hillman, 1991).

2. Theoretical Studies of Physician Contracting

In this section we review the theoretical literature on physician-insurer agency and payment systems. Many papers have considered physician response to the form of the compensation contract, generally focusing on fee-for-service versus capitation reimbursement (see Newhouse, 1992 and Ellis and McGuire, 1993 for reviews).[7] Some papers which have considered this problem with a single insurer are Ellis and McGuire (1990), Selden (1990), Blomqvist (1991), and Ma and McGuire (1994).

Ellis and McGuire (1990) consider a model of bargaining between patient and physician. There is no asymmetric information between the patient and physician, although physicians are modeled as patients' agents by placing a weight on the patient's preferences as part of their own utility. Patient-physician pairs are assumed fixed, so market equilibrium is not considered. The forms of physician payment considered are fixed prepayment and cost-based reimbursement. The major finding is that an optimal payment for health care will lead to conflict between patient and physician. Insurance for the patient carries with it moral hazard. The optimal payment for the physician will lead him to provide less than the patient's insured demand, hence the conflict. They also find that supply-side policies are optimal for controlling costs and that pure cost-based reimbursement to providers is never optimal. The optimal payment will often be a blend of prepayment and cost-based reimbursement.

[7]There are many papers that have considered optimal fee schedules for physicians (i.e., price regulation), taking fee-for-service compensation contracts as given. See Glazer and McGuire (1993), Frech (1991), and Wedig et al (1989) for theoretical treatments. Most of the empirical work has examined the effects of changes in public programs' physician fees. See also Mitchell and Cromwell (1982). Sloan (1982) and Lee (1991) are papers which examine physician response to private insurance companies' reimbursement policies.

Selden (1990) derives the third party payer's optimal provider reimbursement where treatment may be influenced by the provider. Selden explicitly considers capitation versus cost-based reimbursement. Quantity is determined by a function that has the patient's and physician's objective functions as arguments. The optimal payment system is a mix of capitation and cost-based reimbursement, similar to Ellis and McGuire (1990). Here also there is no explicit modeling of the patient-physician agency relationship nor of the insurer-physician agency relationship.

Blomqvist (1991) considers a problem in which the patient knows whether they are ill or not, but they do not know the exact nature of the illness. Physicians can observe the exact nature of the illness, and insurers cannot observe if the patient is actually ill. Under a fee-for-service payment contract from the insurer, the physician will always have an incentive to supply too much. If patients pay only a small fraction of the cost, they do not necessarily act as a sufficient check on this behavior. There is a welfare loss due to this opportunistic behavior, which is essentially a welfare loss due to moral hazard. If physicians would reveal the true nature of the patients' illness to the insurer, then it would be possible to write contingent contracts against the state of health (e.g., these could take the form of indemnity insurance in which the insured is paid a prespecified dollar amount for each state of nature). However, these contracts are not possible, since patients and physicians always have an incentive to misrepresent the patient's state of health as worse than it truly is. Blomqvist assumes that HMO type contracts in which doctors are employees of the insurer solve the physician-insurer agency problem, but the patient-physician problem remains. However, physician behavior is not explicitly modeled nor is it shown that the strategies analyzed are a best response.

Ma and McGuire (1994) consider the optimal insurance and payment system in a game between a single physician and a patient. Doctors choose the effort they put into producing health for the patient, and patients choose the quantity of treatment. The doctor's effort is observable to the patient, but not *verifiable*, thus it is *non-contractible*.[8] Physicians can only be paid on the basis of verifiable activities, e.g., the quantity of treatments. When the insurer has perfect information, and when the physician's and patient's choices are complements in the production of health, the form of physician payment can solve the non-contractibility problem completely. In this case this involves paying the physician some fee over their marginal cost. If the physician's and patient's choices are substitutes, the second-best may not be achieved, but physician ethics in the form of a minimal patient health level can improve matters. In this case, a higher patient copayment rate is called for. This will cause patients to demand less quantity, thereby forcing physicians to supply more effort to meet the minimal health level.

These papers all focus on optimal payment methods for health providers. They do not, however, explicitly model asymmetric information problems between the insurer and physician. Neither do they consider market equilibrium.

[8] *Non-verifiable* refers to something which cannot be verified to a third party. Consequently, even if something is observable to both parties, if it is non-verifiable, any contract based on it cannot be enforced, hence it is *non-contractible*.

Other theoretical approaches to this problem could yield important insights. It is important to emphasize the problem of asymmetric information in contracting. The optimal contracting literature (Hart and Holmström, 1987) suggests it should be possible for insurers to write better contracts with physicians than pure reimbursement insurance.

Gal-Or (1993) is a recent paper that uses contracting theory to analyze the agency relationship between an insurer and provider. She shows that the optimal contract will be a combination of a fixed rate and a share of costs. Further, the levels of the fixed rate and cost share will vary with the reported severity of a case. In order to induce truthful reporting of severity by providers it is necessary that the fixed rate be a non-increasing function of reported severity and that the cost share be a non-decreasing function of severity. Insurers' objective functions are a weighted sum of consumers' and providers' surpluses. When consumers' welfare is more important the provider will optimally be reimbursed a larger share of costs, and vice versa. If cost sharing is not employed (e.g., capitation reimbursement), the threat of losses from malpractice can improve outcomes, but will in general be inferior to a combination of cost sharing and a fixed rate. Competition in the insurance and provider markets is not modeled explicitly.

A more recent paper by Gal-Or (forthcoming) considers optimal payments to physicians by insurers when the insurer may have information obtained through monitoring such as utilization review. As indicated previously, when the insurer has full information they simply force physicians to use the desired treatment. If the insurer has only partial information from monitoring, then minimal acceptable standards will be established, and incentive payments will be used in combination with them. The resulting outcomes will be better than those which would occur if no monitoring information were available.

Considering the agency problem between physicians and insurers in a market equilibrium model may lead to important results. Consider contracting between physicians and insurers in markets with multiple insurers. Suppose there exists an optimal contract between an insurer and a physician. Will this optimal contract be offered by insurers? If there are many insurers, competition for physicians may force insurers to offer more generous contracts that are non-optimal. This will be tempered by competition in the insurance market itself, as well as by competition in the market for physician services. There should be important differences across medical specialties. Presumably markets for general practitioners are more competitive than the markets for the services of pediatric oncologists.

However, there is an additional issue associated with optimal contracting with multiple insurers. Many insurers report that physician response to incentives is weak or nonexistent because they don't command a large enough proportion of the physician's caseload. What this may suggest is that as the diversity of insurance plans in a physician's patient population increases, the cost to the physician of determining each patient's insurer and the incentives in that contract prior to diagnosis or treatment may be too high. Given the tremendous advances in information technology, it seems hard to believe that these information costs are particularly large for any computerized physician's office. Further, it should be the practices with the largest, most diverse (in terms of insurance contracts) patient populations for which computerization is most useful, if the incentives in insurers'

contracts are strong enough to be important. We are not aware of any research on this topic. Since the evidence is anecdotal, some careful systematic empirical research is necessary to first establish whether there is convincing evidence of the existence of this phenomenon. If this phenomenon exists, theoretical explorations into the form of optimal contracts in this situation would be useful.

Considering dynamic aspects of the relationship between physicians and insurers may also be important. Insurers presumably learn about physician behavior over time. They also observe the behavior of other physicians. Trigger strategies may be available which would punish a physician when some aspect(s) of his claims deviate by too much from some standard. The "double agency" problem proposed by Blomqvist could be considered as a problem of common agency (Bernheim and Whinston, 1986).

Monitoring as a choice for the insurer, and its impact on the form of physician-insurer contract, is an important factor to be incorporated into theoretical models. We are aware of only one paper (Gal-Or, forthcoming) which considers monitoring at all, albeit as exogenous information. The accounting literature on agency relationships often focuses on monitoring and would undoubtedly yield useful insights (Baiman and Demski, 1980; Baiman, 1982).

Certainly there are strategic aspects to the problem as well. Groups of physicians may contract with insurers collectively as a way to increase market power. The case of provider organized PPOs (preferred provider organizations) has been extensively discussed (see Leffler, 1983; Dranove, Satterthwaite, and Sindelar, 1986; Frech, 1986). Leffler (1983) discusses a case in which such a contract can be anticompetitive in the context of the *Maricopa* case in which physicians agreed to a price ceiling. Greaney and Sindelar (1987) discuss how such contracts may provide opportunities for anticompetitive behavior. Vistnes (1992) formally models such contracts using the concept of network goods. He finds that these associations can increase the market power of the firms in them. Pauly (1988) considers the effects of insurer market power on the medical care market. He shows that insurers with market power can enforce prices to providers that are welfare reducing. Gaynor and Ma (1996) consider exclusive deals between insurers and providers. They show that exclusive deals are not anticompetitive, in the sense of raising price above marginal cost, but they do reduce consumer welfare by restricting choice of providers.

B. Empirical Evidence on Physician Contracting with Health Plans

1. Factors Determining the Decision to Contract

A few papers have empirically investigated factors which influence a physician's decision to have a contractual relationship with a health plan. Rosenbach, Harrow, and Hurdle (1988) report on results using data from the Physicians' Practice Costs and Income Survey (PPCIS), conducted in 1984. In the survey physicians were asked about their reasons for participating in managed care plans (i.e. prepaid group practices, independent practice associations, and preferred provider associations). Three-fourths of all participants in managed care plans said they joined a managed care plan to maintain or increase their patient load. This was the most common response to the question. Slightly fewer than one-half of managed care participants said they joined to have a more

regular source of income and caseload and thirty-nine percent said they joined because of a philosophical commitment. Eighteen percent said they joined because of increased competition. Other reasons were cited as well, but by less than ten percent of participants.

These results are consistent with subsequent findings from the 1992 Socioeconomic Monitoring System (SMS) survey, conducted by the AMA. The SMS survey asked physicians to rate the competitiveness of their practice environment as either "very competitive", "somewhat competitive" or "not at all competitive." Physicians who rated their environment competitive were more likely to have contracts with HMOs, IPAs or PPOs than physicians who rated their environment not competitive (Gillis and Emmons, 1993).

Rosenbach, Harrow, and Hurdle also report on physicians' reasons for not participating in managed care. The PPCIS asked physicians who were not participating in managed care plans why they were not participating and whether there was a managed care plan in their area. Nearly one-half of nonparticipants said there was no managed care plan in the area. Of the remaining non-participants, three-fourths chose not to participate because they did not want to give up their independence. In addition, concerns over quality were cited by 71 percent of the physicians. Sixty-two percent also said they did not join because they were busy enough in their current practice, and 52 percent had other reasons for not joining.

Freund and Allen (1985) report on factors that influenced physicians in the Research Triangle area (Chapel Hill, Durham, and Raleigh) of North Carolina to join a primary care network type of IPA. Those physicians who had less experience, lower incomes, fewer visits, or were new in the community were more likely to join. Concerns with paperwork, low fees, and negative impacts of cost control efforts on quality of care were very important factors for those physicians who did not join.

These studies collectively are consistent in finding economic factors as being crucial determinants of a physician's decision to contract with a managed care plan. Quality concerns, paperwork, and independence appear to mitigate against affiliation.

2. Empirical Evidence on Contractual Form and Physician Behavior

Up until recently, relatively few studies have examined the effect of managed care contracts on physician behavior. In what follows, we survey the empirical literature on contractual form within physician groups, within HMOs and fee-for-service plans, and generally for a given group of physicians. By and large, the evidence reviewed here indicates that the form of the contract established between a physician and a financial intermediary can have a significant impact on medical care utilization. More specifically, studies suggest that capitation will decrease utilization, while fee-for-service payment, and bonuses based on utilization, will increase utilization.

Contracting Within Medical Groups

Over 50 percent of American physicians actively engaged in patient care are members of medical group practices. Further, that proportion has been growing over time, with the most of the recent growth occurring in small and large groups, rather than medium sized ones (Marder and Zuckerman, 1985). One explanation for the growth in small and large groups is the technology of monitoring. In small groups, monitoring is informal and inexpensive. If there are fixed costs to monitoring (e.g., cost of a manager, information system), then there may be a critical group size necessary to cover these fixed costs. Thus, small groups and groups of at least the critical size would be the most viable.

In a typical medical group practice there is some sharing of revenues and costs. Decisions about pricing and the hiring of inputs are made collectively (Held and Reinhardt, 1979; Kralewski et al, 1985). In addition, there may be some internal administrative controls. Nonetheless, there is a great deal of variation in the internal organization of these firms. Some share income equally, some allocate it on a pure productivity basis; some are small and some are large; some have extensive internal controls and monitoring, some have none; some have a hierarchical structure while others are completely horizontal. A few studies have examined contracting among physicians within these organizations.

Gaynor (1989) specifies and tests a theory of competition within the firm. He shows that pure productivity compensation may lead to excessive competition within the firm if physicians compete with each other over patients. Thus the optimal contract is not pure fee-for-service, but some combination of fee-for-service and revenue sharing. Gaynor and Pauly (1990) show that physicians are strongly responsive to financial incentives. They find that physicians with compensation contracts based on their individual productivity produce over 31 percent more office visits than those who have no such incentive. Further, groups that have more than 50 percent of their revenues from prepayment (i.e., from HMOs) have compensation contracts that are based significantly less on individual physician performance. They find no independent effect of HMO participation on physician productivity. This resonates empirically with the suggestion made previously that managed care may involve less use of financial incentives and more use of direct controls, although this paper contains evidence on only the first point.

Evidence also indicates that physicians are significantly risk averse with regard to their compensation. Gaynor and Gertler (1995) show that compensation contracts within physician groups trade off moral hazard for risk spreading. Physicians in more risk averse groups adopt compensation contracts with more revenue sharing, such that the most risk averse sacrifice approximately 10 percent in income relative to the least risk averse.

Lee (1990) considers groups' use of payment schemes and internal administrative controls, in particular, the impact of HMO and PPO contracting on internal organization. He shows that internal controls are adopted to reduce opportunism. Further, participation in managed care plans affects the internal structure of these groups. HMO share (the percent of revenues from HMO contracts) has a negative and significant impact on the probability the group uses compensation based on individual physician productivity, consistent with the results of Gaynor and Pauly (1990). HMO and PPO share collectively have positive impacts on the use of various types of

administrative controls (productivity standard, monitoring preventive services, use of a colorectal cancer screening protocol, the distribution of clinical algorithms, i.e., guidelines, the presence of a quality assurance procedure, monitoring of physician costs, monitoring of hospital use). This evidence is consistent with the more extensive use of administrative controls being associated with managed care organizations, and there being a tradeoff between financial incentives and monitoring.

Contracting Within Health Plans

Previous reviews of studies comparing utilization rates in HMOs to those in fee-for-service plans conclude that HMO enrollees have lower hospitalization rates than persons with fee-for-service plans and equal or higher rates of outpatient visits (Miller and Luft, 1994). A recent example of this research is the Medical Outcomes Study (Kravitz, et al., 1992). The Medical Outcomes Study compared outcomes and utilization in three types of physicians organizations--HMOs, multispecialty groups, small single specialty group and solo practices--and among patients insured on either a fee-for-service or prepaid basis. One analysis of the Medical Outcomes Study data revealed that, after adjusting for patient mix, patients in fee-for-service plans treated by solo practice/single-specialty groups had 41 percent more hospitalizations than patients treated in HMOs (Greenfield et al., 1992). Other analyses showed that the average number of mental health visits was 35-40 percent lower for depressed patients in prepaid plans as compared to those in fee-for-service plans (Sturm et al., 1995).

HMOs employ a number of strategies that could explain why their utilization rates differ from fee-for-service plans. HMOs impose more administrative restrictions on providers and patients, and offer richer benefit packages. HMOs also often establish different compensation contracts with physicians, such as greater use of capitated payment. Using regression analysis of data from a survey of HMOs, Hillman, Pauly, and Kerstein (1989) studied the effect of different compensation arrangements on utilization within HMOs. They found that patients in HMOs that paid primary care physicians on a capitated or salary-basis had lower rates of hospitalization than patients in HMOs that used fee-for-service payment. Further, they found that HMOs that placed primary care physicians at financial risk as individuals, or imposed penalties for deficits in the HMO's hospital fund beyond the loss of withheld funds, had fewer outpatient visits per enrollee. In contrast, neither general withholds nor bonuses had any impact on utilization. The study provides evidence that contracting differences explain part of the variation across plan types; however, the study did not have information on administrative controls within HMOs, physician and patient characteristics, or the HMOs' benefit packages.

Other studies have compared the practice patterns of physicians in fee-for-service plans to those in HMOs. A study by Stearns, Wolfe, and Kindig (1992) highlights the importance of understanding the, sometimes complex, incentives facing all of the physicians in the plan rather than just primary care providers. Stearns and colleagues examined the response to a change in the reimbursement mechanism by a group of physicians who participated in a fee-for-service plan and then formed an IPA. Under the fee-for-service plan the primary care physician group received a capitation payment for each enrollee, and the physicians received fee-for-service

payments for each visit. Under the IPA, for each signee, the primary provider's group received a fixed capitation payment. If a surplus for the HMO was left at the end of the year, it was to first go to primary care physicians by increasing the capitation per patient, and second, to the specialists, who would be paid at an increased percentage of their usual fees. The hospital had a third claim on any surplus.

Analyses of data for a group of continuous enrollees showed that the change in physician payment mechanism was associated with a reduction in hospitalizations but increases in the length of hospital stay and total number of ambulatory care visits (particularly referral visits to specialists). Stearns and colleagues surmise that the increase in ambulatory visits and hospital length of stay may be a result of primary care physicians only being capitated for primary care services and specialists still being paid fee-for-service. Although the study is limited to one physician practice, the same patients and same physicians were followed across payment systems, thereby reducing the threat of patient and/or physician selection bias. Moreover, the benefit packages in the two plans were very similar.

Another way to overcome the difficulty of explaining variation across complex systems, albeit at the loss of some generalizability, is by focusing on specific diagnoses and procedures. In this vein, Epstein, Begg, and McNeil (1986) found that internists in five large fee-for-service groups were more likely to perform four common diagnostic tests on patients with uncomplicated hypertension than their counterparts in prepaid groups. In three of the five fee-for-service group practices, physicians' remuneration was based in part on a fixed "salary" (or portion of net revenues) and in part on individual billings for diagnostic tests and visits. In the two of the five fee-for-service practices, physicians were reimbursed by dividing net income equally among the group members. Physicians in the two prepaid group practices were paid a salary. Physicians in one prepaid group practice were also eligible for a plan-wide bonus.

Epstein and colleagues found that use of the two high-profit tests--electrocardiography and chest radiography--was 30 percent higher in the fee-for-service practices; however, only the difference for electrocardiography approached statistical significance. Neither use of blood counts nor urinalysis, nor the average testing charges, were significantly different across settings. Comparisons were adjusted for the physicians' year of medical school graduation, and patients' mean age, gender, number of medications received, diastolic blood pressure, and duration of hypertension. Because visit rates were higher in the HMOs than in the fee-for-service practices, it was unlikely that visit rates explained the higher testing in the fee-for-service practices.

Some studies have also focused on the differences in practice for physicians who treat both fee-for-service and managed care patients, thus the physician acts as their own control. Murray and colleagues (1992) examined the number of tests and total charges over a 12-month period for 165 patients who were diagnosed as hypertensive and were treated at two primary care outpatient clinics staffed by 23 full-time faculty. Patients were either paid on a fee-for-service basis or on a prepaid basis. Statistical comparisons showed that physicians ordered one third fewer tests for patients whose insurer paid the clinic on a per capita basis and that the total

charges for care during the 12-month period for patients reimbursed on a per capita basis were half those of fee-for-service patients.

Clancy and Hillner (1989) studied 17 physicians enrolled in an IPA who treated FFS and HMO patients concurrently. They found that patients in the HMO underwent fewer tests than did patients in the FFS system, as well as fewer discretionary tests, but received the same proportion of preventive services. This was true even after controlling for the age and sex of the patient.

Other Studies of Physician Contracting

Several studies have examined the effect of financial incentives on physician behavior generally. A small randomized control trial by Hickson, Altemeier and Perrin (1987) found that physicians randomized to a fee-for-service payment system scheduled and attended more visits per patient enrolled to them than physicians paid a salary. The study was performed in the Vanderbilt pediatric residents' community clinic. Study subjects were pediatric residents who worked in the clinic between September 1983 and June 1984: ten second-year and eight third-year residents were placed into nine pairs, each matched for year of training and the day of the week that their clinics were held. Each pair was randomized into one individual who received $2 per patient visit (fee-for-service group) and another who received $20 per month (salary group). Payments were designed, using data collected before the study, such that total reimbursement between groups would be approximately equal.

The study showed that patients assigned to the fee-for-service physicians had 22 percent more per capita visits than patients assigned to salaried physicians, the difference being due, almost entirely to a greater number of well-child visits. Children assigned to fee-for-service physicians had more visits in excess of American Academy of Pediatrics' guidelines, and missed fewer recommended visits. This suggests that the fee-for-service doctors may have been engaging in overprescribing, while the salaried doctors may have been undertreating.

Similarly dramatic results were reported by Hemenway and colleagues (1990) who studied the effect of a payment change on services provided by fifteen physicians employed by a chain of walk-in ambulatory care centers. Until 1985, physicians working for the ambulatory care centers were paid a flat rate of $28 per hour. In the middle of 1985, a payment system involving bonus incentives was instituted, according to which physicians would receive either a flat fee or a percentage of the gross monthly charges they generated, which ever was higher. After the bonus system was instituted, laboratory tests per patient visit increased by 23 percent, x-ray films per visit increased by 16 percent, the average number of patient visits per month rose by 12 percent, and total charges per month grew by 20 percent (inflation adjusted). The increases were significantly greater than increases experienced nationally (e.g., nationally, visits increased by 3.7 percent).

Another before and after study, conducted by Hughes and Yule (1992) in the United Kingdom, also found a significant increase in utilization following the implementation of a bonus system. In 1990 the United Kingdom's per-time fee system for cervical cytology services

was replaced with “target payments” whereby general practitioners were paid a lump sum if they achieved 50 percent coverage for cervical smears among the eligible women on their practice list, with a higher sum if they reach 80 percent coverage. The new system of target payments was associated with a rise of almost 50 percent in smear tests performed by general practitioners in the year following the implementation of the payment change.

Some recent studies have employed general information on physician activities and contracting with HMOs to try to draw inferences about the impact of managed care on physician behavior. Simon et al. (1997) examine whether managed care affects the provision of managed care. Using data from a the AMA's annual random sample of physicians for 1995, they find that primary care physicians with a managed care contract provide more primary care than those who do not. Interestingly, the effect is the opposite for specialists: those without managed care contracts spend more time delivering primary care than those who do have managed care contracts. Simon, Dranove, and White. (1997) use state-level data to examine the impact of managed care growth on changes in physician incomes over the period 1985 to 1993. They find that incomes of primary care physicians rose more rapidly in states with higher managed care growth, while the relative incomes of hospital based physicians (radiologists, anesthesiologists, and pathologists) and physicians practicing in medical or surgical subspecialties experienced lower growth. Hadley and Mitchell (1997) use data from 1991 from the Young Physician Survey on physicians aged 45 and under to estimate the impact of HMO penetration on hours worked, number of patients treated, and physician satisfaction. They find that a doubling of the proportion of the population enrolled in HMOs would reduce annual hours by 4 percent, reduce the number of patients seen by almost 14 percent, and lead to a relative odds of reporting dissatisfaction of 1.2. Baker et al. (1996) use data from both the AMA's annual survey for 1991 and data from the Young Physician Survey for both 1987 and 1991. They find that the percent of revenue derived from managed care has a significant negative impact on physician total hours, patient care hours, and patient visits.

Finally, Ferrall, Gregory, and Tholl (1998) is a recent examination of the impact of physician payment method on labor supply by Canadian physicians. Using data from a survey of Canadian physicians, Ferrall et al. simultaneously estimated equations for group size, payment method (fee-for-service vs. salaried), hours per week of patient care, and total weekly work hours. They find that fee-for-service payment leads to 11 more hours per week seeing patients, and 1 to 2 more total hours per week, controlling for the simultaneous determination of whether a physician is primarily reimbursed by fee-for-service.

5. Summary and Conclusions

The growth in managed care may be the most important phenomenon characterizing the changing structure of markets for health care in the 1980s and 1990s. Managed care is in part identified by contracting with physicians. Consequently, understanding the potential impacts of these contracts is crucial to understanding the likely impacts of managed care on health care delivery in the United States.

Research has lagged behind the rapid pace of developments in these markets. Nonetheless, there are small, but significant theoretical and empirical literatures which are generally informative. Theory indicates that incentives should matter, that risk aversion should cause less than full use of incentives, and that financial incentives and monitoring (administrative controls) will be used as (partial) substitutes. The empirical evidence (from more various studies using different data sets) is consistent with these points. What is necessary at present is more detailed empirical study of the specific impacts of managed care on physician behavior and the determinants of physician contracting with managed care plans.

References

Anders, George, 1993, "McDonald's Methods Come to Medicine as Chains Acquire Physicians' Practices," *The Wall Street Journal*, August 24, 1993.

Anders, George and Ron Winslow, 1995, "The HMO Trend: Big, Bigger, Biggest," *The Wall Street Journal*.

Arrow, Kenneth J., 1985, "The Economics of Agency," in John Pratt and Richard J. Zeckhauser, eds., *Principals and Agents*, Cambridge, MA: Harvard Business School.

Baiman, Stanley, 1982, "Agency Research in Managerial Accounting: A Survey," *Journal of Accounting Literature*, 1, 154-213.

Baiman, Stanley, and Joel Demski, 1980, "Economically Optimal Performance Evaluation and Control Systems," *Journal of Accounting Research*, 18(Supplement), 184-220.

Baker, Loren, Christopher Ferrall, Martin Gaynor, and Tami Mark, 1996, "Managed Care Contracts and Physician Behavior," unpublished manuscript, Carnegie Mellon University.

Bellandi, D. A Year of More and Less. Number of Hospital Deals Drop, but More Facilities Change Hands. Modern Health Care. January 11, 1999.

Bernheim, B. Douglas and Michael D. Whinston, 1986, "Common Agency," *Econometrica*, 54, 4, 923-942.

Blomqvist, Åke, 1991, "The Doctor as Double Agent: Information Asymmetry, Health Insurance, and Medical Care," *Journal of Health Economics*, 10,4, 411-432.

Callahan, Edward J. and Klea D. Bertakis, 1993, "A Comparison of Physician-Patient Interaction at Fee-for-Service and HMO Sites," *Family Practice Research Journal*, 13, 2, 171-178.

Clancy, C.M. and B.E. Hillner. 1989. Physicians as Gatekeepers: The Impact of Financial Incentives. Archives of Internal Medicine 149 (April): 917 - 920.

Congressional Budget Office, 1995, "The Effects of Managed Care and Managed Competition," Memorandum, February, 1995.

Cooper, Paul P., and Kylanne Green, 1991, "The Impact of State Laws on Managed Care," *Health Affairs*, Winter, 161-169.

Dranove, William, Satterthwaite, Mark, and Jody Sindelar, 1986, "The Effect of Injecting Price Competition into the Hospital Market: the Case of Preferred Provider Organizations," *Inquiry*, 23, 419-431.

Ellis, Randall P. and Thomas G. McGuire, 1993, "Supply-Side and Demand-Side Cost Sharing in Health Care," *Journal of Economic Perspectives*, Fall, 7, 4, 135-151.

Ellis, Randall P. and Thomas G. McGuire, 1990, "Optimal Payment Systems for Health Services," *Journal of Health Economics*, December, 9, 4, 375-396.

Emmons, David W. and Phillip R. Kletke, 1996, "Physician Practice Size, 1991-1995," unpublished manuscript, American Medical Association, forthcoming in Ronald Conners (ed.) *Organization and Management of Physician Services*, American Hospital Publishing, Inc.

Emmons, David W. and Carol J. Simon, 1996, "Managed Care: Evolving Contractual Arrangements,"in Martin L. Gonzalez, ed., *Socioeconomic Characteristics of Medical Practice 1996*, Chicago: American Medical Association.

Epstein, Arnold M., Begg, Colin B., and Barbara J. McNeil, 1986, "The Use of Ambulatory Testing in Prepaid and Fee-for-Service Group Practices," *New England Journal of Medicine*, April 24, 314 (17):1089-1094.

Ferrall, Christopher, Allan W., Gregory, and William G. Tholl, 1998, "Endogenous Work Hours and Practice Patterns of Canadian Physicians," *Canadian Journal of Economics*, 31, 1.

Frech, H.E. III, 1986, "Preferred Provider Organizations and Health Care Competition," in *Private and Public Health Insurance: Research and Policy*, H.E. Frech III, ed., Cambridge, MA: Ballinger Publishing Co.

Frech, H.E. III, 1991, *Regulating Doctors' Fees: Competition, Benefits, and Controls Under Medicare*, Washington, D.C.: AEI Press.

Freudenheim, Milt, 1993, "Physicians Are Selling Practices to Companies as Changes Loom," *The New York Times*, September 1, 1993.

Freund, Deborah A, and Kathryn S. Allen, 1985, "Factors Affecting Physicians' Choice to Practice in a Fee-for-Service Setting Versus and Individual Practice Association," *Medical Care*, 23,6, 799-808.

Fudenberg, Drew, Holmström, Bengt, and Paul Milgrom, "Short-Term and Long-Term Agency Relationships," *Journal of Economic Theory*, forthcoming.

Gal-Or, Esther, " forthcoming, Optimal Reimbursement and Malpractice Sharing Rules in Health Care Markets," manuscript, *Journal of Regulatory Economics*.

Gal-Or, Esther, 1993, "Asymmetry of Information and Optimal Reimbursement Rules in Health Care Markets," unpublished manuscript, Pittsburgh: University of Pittsburgh.

Gaynor, Martin, 1989, "Competition Within the Firm: Theory Plus Some Evidence from Medical Group Practice," *Rand Journal of Economics*, Spring, 29,1, 59-76.

Gaynor, Martin and Mark V. Pauly, 1990, "Compensation and Productivity in Partnerships: Evidence From Medical Group Practice," *Journal of Political Economy*, 98, 544-573.

Gaynor, Martin and Paul J. Gertler, 1995, "Moral Hazard and Risk Spreading in Medical Partnerships," *Rand Journal of Economics*, Winter, 26, 4, 591-613.

Gaynor, Martin and Albert Ching-to Ma, 1996, "Insurance, Vertical Restraints and Competition," unpublished manuscript, Pittsburgh: Carnegie Mellon University.

Gaynor, Martin and Deborah Haas-Wilson, 1999, *Journal of Economic Perspectives*, Winter, 13, 1, 141-164.

General Accounting Office, 1988, *Medicare. Physician Incentive Payments by Prepaid Health Plans Could Lower Quality of Care*, GAO\HRD-89-29. December, 1988.

Gillis, Kurt D. and David W. Emmons, 1993, "Physician Involvement with Alternative Delivery Systems," in *Socioeconomic Characteristics of Medical Practice, 1993*, Martin L. Gonzalez, ed., Chicago: American Medical Association.

Glaser, William, 1993, "Why Managed Competition Cannot be Enacted," *Health Affairs*, Fall, 1993, 277-278.

Glazer, Jacob and Thomas G. McGuire, 1993, "Should Physicians Be Permitted to 'Balance Bill' Patients?" *Journal of Human Resources*, 12, 3, 239-258.

Greaney, Thomas L. and Jody L. Sindelar, 1987, "The Anticompetitive Effects of Preferred Provider Organizations," *Inquiry*, Winter, 24,4, 384-391.

Greenfield S, Nelson EC, Zubkoff M et al. Variations in Resource Utilization Among Medical Specialties and Systems of Care: Results From the Medical Outcomes Study. *Journal of the American Medical Associations*, 1992: 267: 1624-1630.

Group Health Association of America, 1994, "Any Willing Provider Laws by Type," unpublished document, October 4, 1994.

Hadley, Jack and Jean M. Mitchell, 1997, "Effects of HMO Market Penetration on Physicians' Work Effort and Satisfaction," *Health Affairs*, November/December, 16, 6, 99-111.

Hart, Oliver and Bengt Holmström, 1987, "The Theory of Contracts," in *Advances in Economic Theory, Fifth World Congress*, Truman Bewley, ed., Cambridge, UK: Cambridge University Press.

Havlicek, Penny L., American Medical Association. Survey and Data Resources, 1992, *Medical Groups in the United States: A Survey of Practice Characteristics*, Chicago, IL: American Medical Association.

Held, Philip J. and Uwe E. Reinhardt, 1979, *Analysis of Economic Performance in Medical Group Practices,* Project Report 79-05, Princeton, N.J.: Mathematica Policy Research, Inc.

Hemenway, David, Killen, Alice, Cashman, Suzanne B., Parks, Cindy Lou, and William J. Bicknell, 1990, "Physicians' Responses to Financial Incentives: Evidence from a For-Profit Ambulatory Care Center," *New England Journal of Medicine,* April 12, 322(15):1059-1063.

Hester, James A., Wouters, Annemarie, and Norman Wright, 1987, "Evaluation of a Preferred Provider Organization," *The Milbank Quarterly*, 65, 575-613.

Hickson, G.B., Altemeier, W.A., and J.M. Perrin, 1987, "Physician Reimbursement by Salary of Fee-For-Service: Effect on Physician Practice Behavior in a Randomized Prospective Study," *Pediatrics*, 80,3, 344-350.

Hillman A.L., Pauly M.V., Kerstein J.J., 1989, "How do Financial Incentives Affect Physicians' Clinical Decisions and the Financial Performance of Health Maintenance Organizations," New England Journal of Medicine, 321, 2, 86-92.

Hillman, Alan L., 1991, "Managing the Physician: Rules Versus Incentives," *Health Affairs*, Winter, 138-146.

Holmström, Bengt, 1979, "Moral Hazard and Observability," *The Bell Journal of Economics,* 10, 1, 74-91.

Holmström, Bengt, 1987, "Incentive Compensation: Practical Design from a Theory Point of View," in Nalbantian, Haig, ed., *Incentives, Cooperation, and Risk Sharing: Economic and Psychological Perspectives on Employment Contracts, Totowa, N.J.: Rowman and Littlefield.*

Hudson, T., 1994, "State Laws: A Stumbling Block for Systems Integration?" *Hospitals & Health Networks*" April 20, 40-45.

Hughes, David and Brian Yule, 1992, "The Effect of Per-Item Fees on the Behaviour of General Practitioners," *Journal of Health Economics,* 11, 413-437.

InterStudy, 1999, The InterStudy Competitive Edge, Part II: The HMO Industry Report 9.1, St. Paul, MN: Interstudy Publications.

InterStudy, 1998, The InterStudy Competitive Edge, Part II: The HMO Industry Report 8.2, St. Paul, MN: Interstudy Publications.

Jaklevic, Mary Chris. 1995. "Doc Practice Management Set to Explode" *Hospitals*. August 14: 26 - 31.

Jensen, Harold L., 1991, "The Impact of Managed Care on Physicians," *Quality Assurance and Utilization Review*, 6,4, 109-114.

Johnsson, Julie, 1992, "Direct Contracting: Employers Look to Hospital-Physician Partnerships to Control Costs," *Hospitals*, February 20, 1992, 56-60.

Kassirer, Jerome P., 1994, "The Use and Abuse of Practice Profiles," *New England Journal of Medicine*, 330, 9, 634-636.

Kralewski, John E., Pitt, Laura, and Deborah Shatin, 1985, "Structural Characteristics of Medical Group Practices," *Administrative Science Quarterly*, 30, 34-45.

Kravitz, R.L., Greenfield, S., Rogers W., Manning, W., Zubkoff, M., Nelson, E.C., Tarlov, A.R., and Ware, J.E. 1992. Differences in the Mix of Patients Among Medical Specialties and Systems of Care. Results From the Medical Outcomes Sudy. *Journal of the American Medical Association*, 267(12): 1617-1623.

Lee, Robert H., 1990, "Monitoring Physicians: A Bargaining Model of Medical Group Practice," *Journal of Health Economics*, 9,4, 463-481.

Lee, Robert H., 1991, "Insurance and Medical List Prices," *Journal of Human Resources*, 24,4, 689-708.

Leffler, Keith B., 1983, "*Arizona V. Maricopa County Medical Society*: Maximum-Price Agreements in Markets with Insured Buyers," *Supreme Court Economic Review*, 2, 187-211.

Lipin, Steven, 1995, "California Blue Shield Bids $4.5 Billion for WellPoint," *The Wall Street Journal*, March 27, 1995.

Ma, Ching-to Albert and Thomas G. McGuire, 1994, "Noncontractible Inputs and Health Insurance-Payment Systems," unpublished manuscript, Boston: Department of Economics, Boston University.

Marder, William D. and Stephen Zuckerman, 1985, "Competition and Medical Groups: A Survivor Analysis," *Journal of Health Economics*, 10, 4, 385-410.

Mercer/Foster Higgins National Survey of Employer-Sponsored Health Plans, 1998.

Miller, Robert H., and Harold S. Luft, 1994, ""Managed Care Plans: Characteristics, Growth, and Premium Performance," *Annual Review of Public Health*, 15,437-459.

Mitchell, Janet B. and Jerry Cromwell, 1982, "Physician Behavior Under the Medicare Assignment Option," *Journal of Health Economics*, 1, 245-264.

Murray, J.P., S. Greenfield, S.H. Kaplan, and E.M. Yano, 1992, AmbulatoryTesting For Capitation and Fee-for-service Patients in the Same PracticeSetting: Relationships to Outcomes. Medical Care 30 (March): 252 - 261.

Newhouse, Joseph P., 1992, "Pricing and Imperfections in the Medical Care Marketplace," in *Health Economics Worldwide*, H.E. Frech III and Peter Zweifel, eds., Dordrecht: Kluwer Academic Publishers.

Pauly, Mark V., 1988, "Market and Power Monopsony, and Health Insurance Markets," *Journal of Health Economics*• 7, 2, 111-128.

Quint, Michael, 1995, "Health Plans Are Forcing Change In the Method for Paying Doctors," *The New York Times*, February 9, 1995.

Radner, Roy, 1985, "Repeated Principal-Agent Games with Discounting," *Econometrica*, 53, 1173-1198.

Robinson, James C. Consolidation of Medical Group Practices into Physician Practice Organizations. JAMA January 14, 1998--Vol. 279(2)" 144 - 149.

Rosenbach Margo L., Harrow, Brooke S., Hurdle, Sylvia, 1988, "Physician Participation in Alternative Health Plans," *Health Care Financing Review*, 9, 4, 63 - 79.

Ross, Steven, 1973, "The Economic Theory of Agency: The Principal's Problem," *American Economic Review*, 63, 134-139.

Rubinstein, Ariel and Menachem Yaari, 1983, "Repeated Insurance Contracts and Moral Hazard," *Journal of Economic Theory*, 30, 74-97.

Selden, Thomas P., 1990, "A Model of Capitation," *Journal of Health Economics*, 9, 4, 397-410.

Shactman, David, "Market Concentration, Antitrust, and Public Policy in the Health Care Industry," manuscript, Council on the Economic Impact of Health Care Reform, Washington, D.C., November 1994.

Simon, Carol J., William D. White, Sandy Gamliel, and Phillip R. Kletke, 1997, "The Provision of Primary Care: Does Managed Care Make a Difference?" *Health Affairs*, November/December, 16, 6, 89-98.

Simon, Carol J., David D. Dranove and William D. White, 1997, "The Impact of Managed Care on the Physician Marketplace," *Public Health Reports*, May/June, 112, 222-230.

Sloan, Frank A., 1982, "Effects of Health Insurance on Physicians' Fees," *Journal of Human Resources*, 17, 14, 533-557.

Starr, Paul, 1982, *The Social Transformation of American Medicine*, New York: Basic Books, Inc.

Stearns, Sally C., Wolfe, Barbara L., and David A. Kindig, 1992, "Physician Responses to Fee-for-Service and Capitation Payment," *Inquiry*, Winter, 29:416-425.

Sturm Roland, Jackson Catherine A., Meredith LS, Yip Winnie, Manning Willard G., Rogers William H., Wells Kenneth B., 1995, Mental Health Care Utilization in Prepaid and Fee-for-service Plans Among Depressed Patients in the Medical Outcomes Study. Health Services Research, 3092): 319-40.

Stimmel, Barry, 1990, "The Study and Practice of Medicine in the Twenty-First Century: Ask Not for Whom the Bell Tolls," *The Mount Sinai Journal of Medicine*, 57,1, 11-24.

Vistnes, Gregory, 1992, "Strategic Alliances, Cliques, and Competition in Markets with Network Goods," unpublished paper, Washington, D.C.: Antitrust Division, U.S. Department of Justice.

Wedig, Gerard, Mitchell, Janet B., and Jerry Cromwell, 1989, "Can Optimal Physician Behavior Be Obtained Using Price Controls?" *Journal of Health Politics*, Policy and Law, 14, 3, 601-620.

Weiner, Jonathan P and Gregory de Lissovoy, 1993, "Razing the Tower of Babel: A Taxonomy for Managed Care and Health Insurance Plans," *Journal of Health Politics, Policy, and Law*, 19,1, 75 - 103.

Welch, W. Pete, Hillman, Alan L., and Mark V. Pauly, 1990, "Toward New Typologies for HMOs," *The Milbank Quarterly*, 68, 221-243.

Winslow, Ron, and Edward Felsenthal, 1993, "Losing Patients: Physicians Fight Back as Insurers Cut them From Health Networks," *The Wall Street Journal*, December 30, 1993.