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健保給付方式與醫師獎酬制度對醫療品質之影響—
結合田野訪談及分析性模型之研究

The Impacts of Health Insurance Payment Systems and
Physicians' Compensation Policy on Quality of Care –
A Field Study and Analytical Analysis

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中文摘要

醫療對於現今社會來說十分重要，而今醫療支出對於整個社會的負擔也相對的沉重，不管在絕對數字或佔 GNP 的比例都相當明顯。這個研究計劃是在探討醫療保險計劃中三個關鍵性的角色及其對於醫療品質的影響，分別為（1）健保局（保險公司）（2）醫療體系（主要為醫生及醫院）（3）病患（即被保險者）

我們發現不同的給付制度會誘使醫師從事不同的醫療行為。同樣的，病患在醫療的過程之前希望能和醫生訂立一最適的醫療合約以保障其權利。但是在醫療的領域中，病患通常存有知識上落差致使無法合理的訂立最適契約，與其如此，病患會尋找一中立的輔助代理人（complementary agent），協助其制定最適給付制度。因此，醫療保險公司成爲了此中立性的輔助代理人並設計出最適的給付制度中，而成本負擔也包括了醫療的提供者，因爲這些服務的提供者不僅是爲了賺取利潤，更希望能提高醫療品質。

此項研究計劃有三方面的貢獻。第一，提供了管理會計學對於醫療體系應用的模式，特別是針對代理人對於誘因的處理及合約的設計上都建立了良好的基礎。其次，建立醫療保險計劃中關鍵性角色的連結並提供立法的基礎來達到規範的功能。最後，這個研究更是拓展了會計學有關於對醫療體系的未來研究發展的另外一項領域。

關鍵詞：誘因，契約設計，健康保險，醫療品質

The Impacts of Health Insurance Payment Systems and Physicians' Compensation Policy on Quality of Care – A Field Study and Analytical Analysis

Abstract

Health has been considered the most precious good. At the same time, health care is experiencing a crisis in the form of cost explosion, both in absolute terms and as a share of GNP (gross national product), which makes it very expensive to maintain. This research deals with the incentive issues associated with the interrelationship among the three major players in the National Health Insurance Program: (1) Bureau of National Health Insurance (the insurer), (2) health care industry (as represented by physicians and their affiliated hospitals) and (3) patients (the insured), and its impacts on the quality of care delivered.

We find that different payment systems will induce physicians to behave differently in terms of how efficiently the effort level should be exerted. Also, the patient would like to strike an optimal contract with the physician prior to the treatment. But in health care, the patient's information gap will prevent him from identifying the optimal contract with any physician. Rather than trying to determine and enforce an optimal payment function himself, the patient will tend to call on a complementary agent to negotiate a favorable payment function on his behalf, which justifies the role played by the government. Finally, a payment system that is designed by a health insurer acting as the complementary agent of the insured may include cost sharing by service providers, presumably because physicians and hospitals have an interest in the success of their treatment and not only in their net income.

The contributions of the research are threefold. First, the choice of a particular line of business, the health care industry, to study its inner workings will broaden our understanding of the application of management accounting theory, especially the incentives and contract design in an agency perspective. Second, by modeling the interrelationships among the major players in the provision of health care: the Bureau of National Health Insurance (the insurer), the hospital and its physicians (health care providers) and the patient (the insured), we would be able to obtain normative results for policy-making purposes. Third, this research provides an accounting perspective on health care delivery and opens up another area of interest for future studies.

Keywords: Incentives, Contract Design, Health Insurance, Quality of Care.

Background

Health has been considered the most precious good. At the same time, health care is experiencing a crisis in the form of cost explosion, both in absolute terms and as a share of GNP (gross national product), which makes it very expensive to maintain.

On the eve of the Fourth Anniversary of our National Health Insurance Program (hereafter "the Program"), when the possibility of a NTS\$20 billion deficit looms large in 1999, it is time to wonder how successful such a program takes care of our people by investigating the interrelationship among the three major players in the Program: (1) Bureau of National Health Insurance (the insurer), (2) health care industry (as represented by physicians and their affiliated hospitals) and (3) patients (the insured), and its impacts on the quality of care delivered.

According to a survey of California doctors reported in *The New England Journal of Medicine* on November 19, 1998,¹ many doctors say the bonuses and other financial incentives that managed care organizations (HMOs)² give them for speeding up office visits and restricting care³ (for cost control purpose) compromise the quality of care. But, the survey added, when health maintenance organizations include incentives based on patient satisfaction and quality, doctors

¹ Grumbach, Osmond, Vranizan, Jaffe and Bindman (1998).

² The health maintenance organizations (HMOs) is an alternative form of provision of medical care services in the United States that becomes increasingly popular recently. See Enthoven (1980) for its operating principles.

³ These include limiting referrals of patients to specialists, limiting the use of hospitals and prescriptions and raising productivity by seeing more patients.

believe the quality does improve, along with their satisfaction.⁴

What can we say about Taiwan experience in this respect? What health insurance payment systems are adopted by the Program? Do hospitals provide the right combination of incentives to the physicians so they will be more concerned about their patients' well-beings than their own? What determinants are there in physicians' utility function? What really are hospitals' concerns? Does quality of care matter in our Program?

Purposes and Importance

The extent to which changes in individual health-related behavior affects health care expenditure is very much dependent on the physician. She performs as a gatekeeper to health care. Her choice between outpatient or inpatient treatment has grave consequences in terms of costs and quality of care involved. Our major concern, then, are the incentives that may govern a physician's decisions regarding her own services and those of other suppliers.

The physicians' incentives come from the compensation packages (i.e., contracts) offered by the hospitals, which in turn is influenced by the payment systems as stipulated in the Program. By studying both the health insurance payment systems and the compensation contracts, we are in a better position to untangle the interactions among the players in the health care system. In the end, we may be able to provide insights about how the Program should be steered clear of financial troubles while keeping an eye on the health status of our people.

⁴ It was first reported in the *New York Times* on November 19, 1998.

The purposes, then, are threefold. First, through an analytical, model building exercise, we want to decipher the sequential payment mechanism (from the insurer to the hospital and finally to the physician) and its impacts on quality of care delivered as the final product of health care industry. Second, by visiting the Bureau of National Health Insurance and at least two hospitals (one identified as a medical center and another as a regional hospital in the metropolitan Taipei area), we expect to obtain some first-hand experiences regarding the actual working mechanism of our health care system. The focus will be on the physicians' perceptions about their compensation packages and the associated incentives to deliver medical services. We also would like to see if any measure for quality of care has been developed and if it is (or can be) incorporated in physician's compensation packages. Finally, by comparing the analytical implications and suggestions with what we observe in field study, we may be able to say something about the pros and cons of the our existing health insurance program and recommend remedies for future considerations.

Literature Review

(1) On Incentive Issues

Although we cast the story in the health care industry, this is essentially an incentive issue involving multiple parties, including the insurer, the hospital, the physician and the patient. An agency relation may be present for hospital-physician and patient-physician pairs, where moral hazard is the key. The literature is abundant in this area, tracing back to, say, Wilson (1969), Spence and Zeckhauser (1971) and Ross (1973) using state-space formulation, or Mirrless (1974,

1976) and Holmstrom (1979) using parameterized distribution formulation.⁵

In another line of research, the issue of delegation comes up whereby the principal contracts a manager for the task of supervision. This is relevant here because the relationship between the insurer and the patient will no longer be viewed as the traditional principal-agent one when the moral hazard problem mentioned earlier is present in our story. Instead, the insurer will function as a complementary agent for the patient and negotiate the payment system on his behalf. In a sense, the insurer becomes a delegate for the patient. Demski and Sappington (1987), Melumad and Reichelstein (1987), and Riordan and Sappington (1987), among others, discuss the pros and cons of delegation.

Holmstrom and Milgrom (1991) analyzes a situation where the agent is in charge of several tasks, each of which may give rise to a different result. This is an exact description of what a physician, an agent in our model, is. Holmstrom and Milgrom (1987) provides a rationale for using a linear contract most often observed in "real world" incentive contracts. We also adopt a similar scheme in rewarding the physician in the model.

(2) On Health and Health Care Issues

The distinction between economics of health and economics of health care is clear. The former is mainly concerned with the valuation of health in monetary terms and provides the justification for government intervention in the form of national health insurance to maintain health of citizens. The positive side of economics of health deals with individual health behavior and provides a link to economics of health care through

⁵ See Hart and Holmstrom (1987).

individual demand and consumption of medical services.⁶

We mentioned earlier that the insurer will, in a sense, function as a complementary agent on behalf of the patient to shield him from the moral hazard problem. This is especially true when the governmental body, the Bureau of National Health Insurance, becomes the insurer. Evans (1984) and Selden (1990) provide extensive in this issue.

We do not specifically model the hospital as a productive unit. However, in debates about the economic problems of health care, the hospital plays a vital role. Evans (1971) and Breyer (1987) provide a typical treatment of a hospital cost function. Cleverley (1979) talks about the payment systems and their incentive effects. Finally, Feldstein (1977) discusses quality assurance issues in a hospital setting.

(3) On Accounting-Related Issues

Efficiency (and productivity), along with the DEA (data envelopment analysis) technique, is the main focus in the health care-related literature. Banker, Conrad and Strauss (1986), Grosskopf and Valdmanis (1987), Huang and McLaughlin (1989), Rakich, Longest and Darr (1985), Sexton, et al. (1989) and Sherman (1984) concentrate on hospital performance while Nunamaker (1983) studies nursing service efficiency. Chang and Shiao (1995) emphasizes the efficiency of nonprofit medical funds.

As is obvious, the accounting (especially management accounting) contribution in this area is limited in terms of both volume and focus.

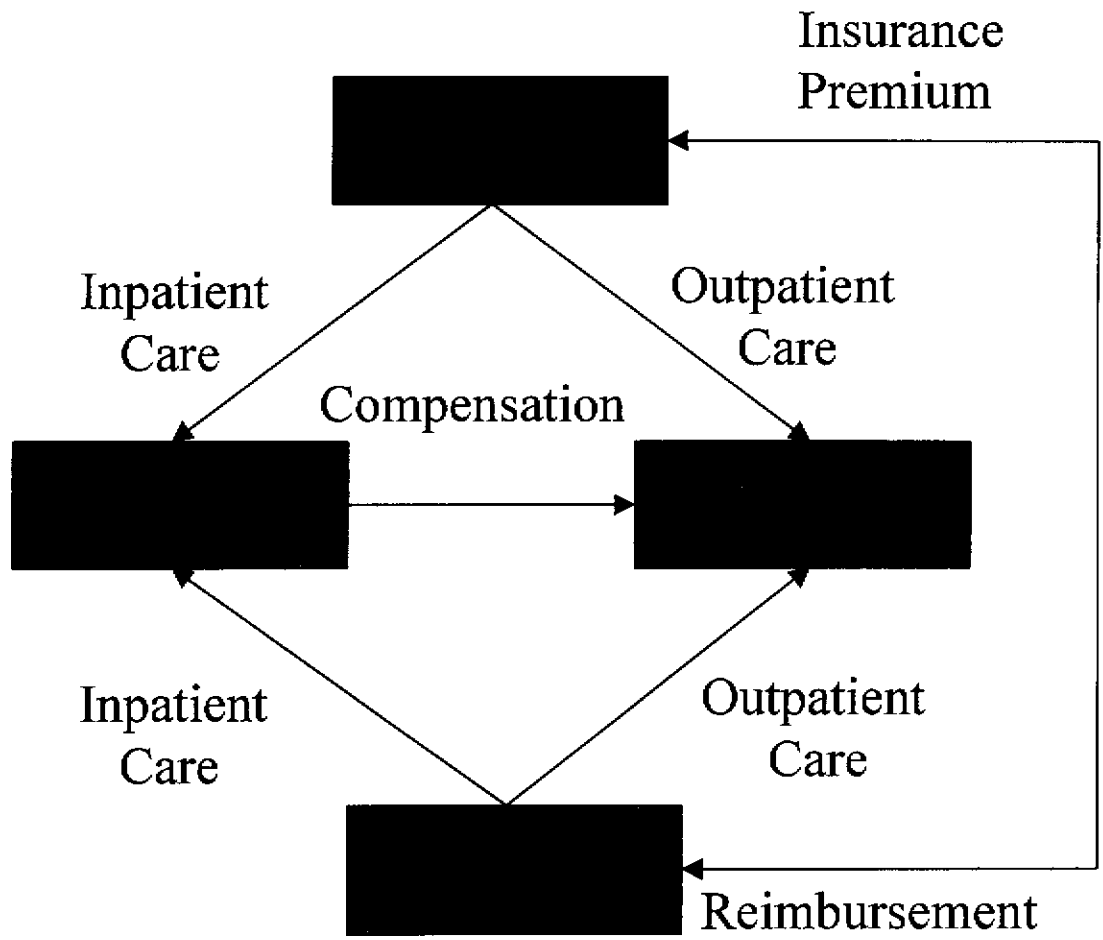
Research Methodology and Major Findings

The best way to describe the interrelationship among the players in the provision of health care is to use a payment schedule⁷ that covers the possible payment schemes, as shown in Figure 1.

⁶ See Zweifel and Breyer (1997).

⁷ It is defined as the institutional mechanism of reimbursement of health care-related expenditures.

Figure 1



The medical expenses may be paid by the patient to the hospital (in the case of inpatient care) or to the physician (in the case of outpatient care). The patient is supposed to be covered fully or partially by his health insurance and pay the insurance premium regularly. Then the insurer will reimburse the patient later on. This is known as the indemnity principle. If, on the other hand, the insurer makes the payment directly to the hospital (inpatient care) or to the physician (outpatient care), then the patient receives medical treatment without being involved in payment procedure at all. This is called benefits in kind.

Between the hospital and the physician, there is an employment relationship whereby the former pays the latter via an agreed-upon compensation package.

Based on the structure in Figure 1, we conduct the analytical analysis as follows.

We first study the physician's utility maximization problem as our base model. The following notations are used.

e : the effort level chosen by the physician.

θ : a random variable.

M : the medical service(s) provided, a function of e ; that is, $M = M(e)$, $M_e > 0$.

S : the success rate of treatment (and an indicator of quality of care), a function of M and θ ; that is, $S = S(M, \theta)$, $0 \leq S \leq 1$, where $S = 1$ means complete success, which in turn indicates the highest level of satisfaction of the patient.

$R(\cdot)$: the payment schedule as a function of the payment basis such as factors of production employed, number and kind of services

provided, number of treatments, number of treated patients, etc.
 W : the wealth of physician, determined by her income from other sources (W_0) and the reward for medical services provided, $R(\cdot)$, in an additively separable function $W = W_0 + R(\cdot)$.

U : the physician's utility function, determined by W , e and S ; that is, $U = U(W, e, S)$, $U_w > 0$, $U_e < 0$, $U_s \geq 0$.

T : the number of cases or patients, a function of S ; that is, $T = T(S)$, $T_s > 0$.

In this setup, the service(s) provided by the physicians can be multi-dimensional, treating M as a matrix. For simplicity, we assume it to be one-dimensional. The success rate S depends on the physician's care (as represented by e), but uncontrollable factors (θ) may complicate or alleviate the symptoms of the patient. The physician's utility is assumed to depend positively on her wealth and the success rate of the treatments and negatively on the effort level chosen. Maybe some physicians put their wealth considerations ahead of the patients' well-beings. The extent to which such is the case is an empirical (and ethical) question beyond our reach.

The forms of $R(\cdot)$ can be one of the following, depending upon the argument(s) in the function.

a. Payment by input

$R = he$, where h is the price paid for each unit of effort exerted.

b. Fee for service

$R = pMT$, where MT represents the amount of services provided, with unit price p .

c. Fixed payment per period (or salary)

$$R = R_0.$$

d. Fixed payment per period plus bonus

$$R = R_0 + rT \text{ or } R = R_0 + rMT,$$

where r represents incentive intensity, $0 \leq r \leq 1$. The bonus base is either the number of patients treated or the number of treatments provided.

e. Contingency fee

$R = kST$, where ST is the number of successfully treated (and therefore satisfied) patients, and k is a unit reward.

f. Number of cases or patients

$R = gT$, where g is the fixed payment for each patient treated.

The list can go on and on, but the point is that the payment schedule does affect the physician's effort level choice. That is, for the base model, the physician solves the optimization problem

(Model 1)

$$\text{Max}_e E_\theta U(W, e, S).$$

The expected value of the model is taken with respect the random variable, θ . The same convention will be adopted throughout. The following proposition can be made.

Proposition 1. Different payment systems will induce physicians to behave differently in terms of how efficiently the effort level should be exerted.

(All Proofs will be available upon request)

As is obvious, the relationship between a patient and a physician can be characterized by the canonical principal-agent framework, where the principal (the patient) engages an agent (the physician) to seek medical services on his behalf without knowing whether the services provided are indeed the best given the circumstances. In this scenario, we can model the patient's optimal problem as follows.

(Model 2)

$$\text{Max}_e E_\theta V(S - R(S))$$

subject to

$$e^* \in \arg \max_e E_\theta U(R(S)) - C(e)$$

and

$$E_\theta U(R(S)) - C(e) \geq \bar{U}.$$

Note that the patient's utility function, V , is a function of the net "monetary" outcome of the medical treatments after subtracting the payment to the physician. The physician's utility function is now separated into two parts: the benefits less the cost of effort. She will choose the effort level that is incentive compatible with the reward received, conditional upon her receiving at least the reservation utility (i.e., her opportunity cost of alternative offers). The following two propositions can be made.

Proposition 2. The patient would like to strike an optimal contract with the physician prior to the treatment. But in health care, the patient's information gap will prevent him from identifying the optimal contract with any physician.

Proposition 3. Rather than trying to determine and enforce an optimal

payment function R^* himself, the patient will tend to call on a complementary agent to negotiate a favorable payment function on his behalf.

The two propositions, taken together, are in stark contrast with the typical conclusion of an agency model, where the optimal contract is determined and enforced happily thereafter. Here, we allow the insurer, be it private or government, to be introduced in the model to play the role of the complementary agent mentioned earlier. In the case of the health maintenance organizations (HMOs), even the employer or employers-formed coalition can negotiate the health insurance contract on their employees' behalf.

When the insurer is present, the patient's optimal problem can be modified as follows.

(Model 3)

$$\text{Max}_{P(M)} E_{\rho} V_1(S) + E_{\rho} V_2(\bar{Y} - b(M^*))$$

subject to

$$M^* \in \arg \max_M E_{\rho} \Pi(M) + \alpha V_1 + \beta V_2$$

$$E_{\rho} \Pi(M^*) = 0 \text{ and}$$

$$E_{\rho} (b(M^*) - C - P(M^*)) = 0.$$

Here, the patient's objective function has two parts, the utility derived from improved health (V_1) and that derived from net income (V_2), where \bar{Y} is a fixed income level and $b(M^*)$ the insurance premium charged by the insurer. The optimal payment schedule for the physician's services, $P(M)$, is yet to be determined.

The physician chooses the services provided,⁸ considering her net compensation, $\Pi(M) = P(M) - wM$, where w represents the unit cost of her services provided, and the extent to which the patient's separable utility functions are to be internalized, where $0 \leq \alpha \leq 1$ and $0 \leq \beta \leq 1$. A physician characterized by $\alpha > 0$ is influenced by professional ethics because she makes the success of treatment (as evaluated by the patient) an argument of her own utility function. If $\beta > 0$ as well, then the physician even considers the financial consequences for the patient in her choice of treatment.

In a competitive environment, both the physician and the insurer will not earn any economic rent and are willing to participate in the contractual arrangement in the margin. Both the physician and the insurer are assumed to be risk neutral in this model.

Because the preventive nature of the health insurance, the expected values of this model are taken with respect to the *ex ante* health condition of the patient, denoted by ρ , a random variable. This is a slight departure from the conventional agency model. Explicitly, we can incorporate ρ as follows: $M^*(\rho)$, $P(M^*, \rho)$ and $b(M^*, \rho)$.

Proposition 4. A payment system that is designed by a health insurer acting as the complementary agent of the insured may include cost sharing by service providers, presumably because physicians and hospitals have an interest in the success of their treatment (i.e., $\alpha > 0$) and not only in their net income.

⁸ The effort level has been dropped for simplicity.

Models 1 through 3 are intentionally left as general as possible in order to cover a lot of ground. But we should emphasize their normative implications for policymaking purposes.

Contributions

First, the choice of a particular line of business, the health care industry, to study its inner workings will broaden our understanding of the application of management accounting theory, especially the incentives and contract design in an agency perspective.

Second, by modeling the interrelationships among the major players in the provision of health care: the Bureau of National Health Insurance (the insurer), the hospital and its physicians (health care providers) and the patient (the insured), we would be able to obtain normative results for policy-making purposes.

Third, this research provides an accounting perspective on health care delivery and opens up another area of interest for future studies.

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