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EFFICIENCY OF PREPAID GROUP PRACTICE: ALLOCATION OF PHYSICIAN WORK EFFORT BETWEEN OFFICE AND HOSPITAL

by

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1. Introduction

Existing theoretical models of hospital and physician behavior incompletely specify the interaction which occurs between the hospital and the physician. Our hypothesis is that these interactions are an important source of inefficiency within the present health care system. The institutional structure of a private office and voluntary hospital under which a majority of physicians currently work may lead physicians to misallocate their work effort between their offices and their hospitals. This inefficiency is institutionally caused and as such it can be improved by the design and adoption of substitute institutions with more rational incentive structures. Prepaid group practice is such an alternative to the present private practice-voluntary hospital mode of health care and, as this paper seeks to show, it may be able to lessen that misallocation of physician work effort which is caused by the current institutions.

The substance of this paper formally specifies and compares three models of health care delivery. Each model corresponds to a different institutional arrangement and each explicitly incorporates the physician's decision concerning his allocation of time between his office and the hospital. The first model corresponds to the present private practice-voluntary hospital (PPVH) mode of health care, the second corresponds to an ideal prepaid group practice (PGP) which owns its own hospital, and the third corresponds to a PGP which does not own its own hospital. The three models seek to describe the essential aspects of the incentive structures that the different arrangements present the practicing physician. The models constructed in this paper are to a degree a synthesis of the models of hospital behavior which Lee [7], Pauly and Redisch [15], and Feldstein [5] have previously constructed.

The motivation for this paper comes in part from the econometric literature indicating that the production of health services is inefficient under the PPVH mode of delivery. For example, Reinhardt [16] and Smith, Golladay, and Miller [17] both conclude that physicians use too little auxiliary personnel in their offices. Boaz [1] and Feldstein [3] estimate that voluntary and public health agencies substantially underutilize physicians and overutilize other personnel in their production processes. Lee [7] provides a theoretical justification for this underutilization of physician services by pointing out that physicians regard the voluntary hospital as a "free workshop." On the other hand their private offices are not free: physicians are responsible for paying all office expenses out of their professional fees. Naturally physicians tend to delegate as much of their patient care as possible to the free facility. In contrast to the measured inefficiency of PPVH is the apparaent efficiency of PGPs, particularly in reducing hospital costs per capita. See, for example the papers of Donabedian [2] and Greenlick [6].

Our goal in this paper is to strengthen the theoretical understanding of the possible causes for this efficiency differential. Its focus is the price incentive which PGP gives physicians to properly allocate their work between office and hospital. The incentive, which has been discussed briefly by Pauly [13], is distinct from the three most commonly suggested causes for PGP's apparent efficiency: (1) economies of scale resulting from the multispecialty group organization of PGP, (2) provision of preventive care to prepayment plan members, and (3) elimination of the incentive which hospitalization insurance provides consumers to request hospitalization when the required procedure could be done at lower cost in the physician's office. This last cause is the problem of moral hazard as defined by Pauly [12], [14]. Hospitalization insurance under PPVH reduces the net price of hospital care and consequently makes hospital care relative to ambulatory care relatively attractive to the consumer. PGP eliminates this moral hazard problem by providing the consumer with both ambulatory and hospital coverage, but creates a new moral hazard problem by reducing the net price of ambulatory care to zero or almost zero.[1]

This paper's limitations are best stated at the outset. First, the effect which consumer's preferences have on the utilization of care is left out of the models. This means that the moral hazard problem which PGP creates with respect to ambulatory care is ignored. Second, the models are all short-run models. They do not in any way specify how hospitals make expansion decisions which have the long term effect of changing the environment in which physicians make their work effort decisions. Nevertheless short run models are a necessary first step because construction of long run models must be based on adequate short run models. Third, the models are purely theoretical. No estimation of their parameters has yet been done.

2. Basic Relationships

All the models contained in this paper will focus on the production of care by a single "representative" physician. For simplicity, health care is assumed to be a homogeneous unidimensional commodity. The physician can produce health care either in his office or in the hospital. His production capabilities are defined by two production functions F and G:

$$Q_C = F(N, L_C) \tag{1}$$

$$Q_H = G(M, L_H) \tag{2}$$

where Q_C is the quantity of care per week he produces in his office, Q_H is the

[1]Mechanic [9] argues three ways that a moral hazard problem with respect to ambulatory care is less serious than a moral hazard problem with respect to hospital care. First, ambulatory care is much less costly to produce than hospital care which may mean that the total dollar loss is less in the case of ambulatory care. Second, overuse of ambulatory care is likely to be risky for the patient especially when surgery is involved. Third, excessive ambulatory care visits can be turned to advantage by using them for health education activities.

quantity of care per week he produces in the hospital, N is the number of hours per week he works in his office, M is the number of hours per week he works in the hospital, and L_C and L_H are the quantities of auxiliary inputs per week which assist him in his office and the hospital respectively. L_C and L_H represent both labor and capital inputs. The functions F and G are assumed to be everywhere differentiable.

This formulation of health care production posits that health care of a constant quality level can be produced interchangeably in the hospital or in the physician's office.[2] This is certainly not true; some procedures can only be done in a hospital. This, however, is not a serious weakness because this paper is focusing on the physician's discretionary allocation of time between his office and the hospital.

In each model that is presented below the goal of the physician is to maximize his utility function U:

$$U = U(I,W,v) \tag{3}$$

where I is his income W is the number of hours he works per week, and v is a variable which represents his professional standards concerning how he thinks he should practice medicine. The function U is assumed to be everywhere twice differentiable. The first partial derivatives of U are:

$$\frac{\partial U}{\partial I} > 0,\ \frac{\partial U}{\partial W} < 0,\ \text{and}\ \frac{\partial U}{\partial v} > 0. \tag{4}$$

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[2] This formulation may appear to ignore the tender loving care component of medical care which is of undoubted, though difficult to measure, importance in determining the therapeutic outcome of health care. Nevertheless, the posited production functions relate the quantity of inputs required to produce a particular quantity of health care. Throughout the quality level is held constant. If the inputs are modified to the extent that the tender loving care component is reduced to such a degree that the treatment's efficacy is compromised, then the quality level has changed. Therefore that set of inputs is not capable of producing the original quantity of care.

The second partial derivatives are:

$$\frac{\partial^2 U}{\partial I^2} < 0, \; \frac{\partial^2 U}{\partial W^2} < 0, \text{ and } \frac{\partial^2 U}{\partial v^2} < 0. \tag{5}$$

The role of I and W in the physician's utility function is traditional; the role of v, however, needs explanation.

Each physician has preferences concerning how he thinks health care is best produced. For example, he believes that he must do certain tasks himself in order to guarantee an acceptable level of quality. On the other hand he is eager to delegate those tasks which he finds unskilled and boring. Similarly he thinks certain types of cases should be treated in a hospital. The variable v represents how closely he is conforming to these standards. Let v be a differentiable concave function of the three variables

$$r_1 = L_C/N \tag{6}$$

$$r_2 = L_H/M, \text{ and} \tag{7}$$

$$r_3 = Q_C/Q_H \tag{8}$$

and assume that v reaches a maximum at some point $(\bar{r}_1, \bar{r}_2, \bar{r}_3)$ where $\bar{r}_1, \bar{r}_2, \bar{r}_3 > 0$. Thus $v = v(r_1, r_2, r_3)$. The point $(\bar{r}_1, \bar{r}_2, \bar{r}_3)$ represents the physician's standard of a perfectly conducted medical practice. For example, $\bar{r}_3$ represents to him the ideal split of his health care production between the hospital and his office. Notice that within the context of this paper's models the triplet (r_1, r_2, r_3) completely describes the manner in which the physician is conducting his practice.

The function v is a description of the physician's flexibility in choosing treatment modes or, conversely, it is a measure of his resistance to change. Figures one and two illustrate the behavior of v for a flexible physician and an inflexible physician respectively. Assume that the two physicians have identical utility functions except for their v functions: v_1 for the flexible physician and v_2 for the inflexible physician. Also assume that both physicians have the

Figure 1: Flexible Physician

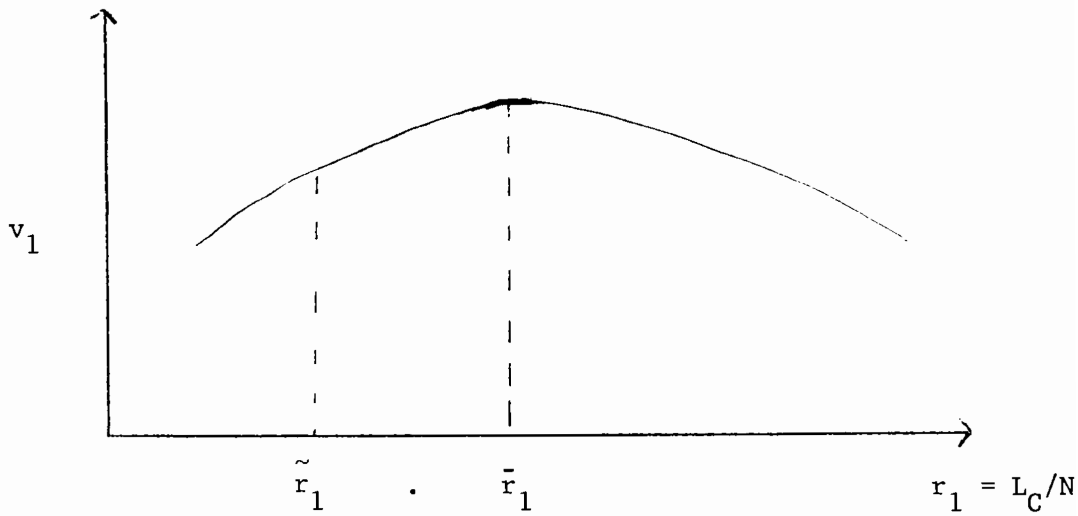
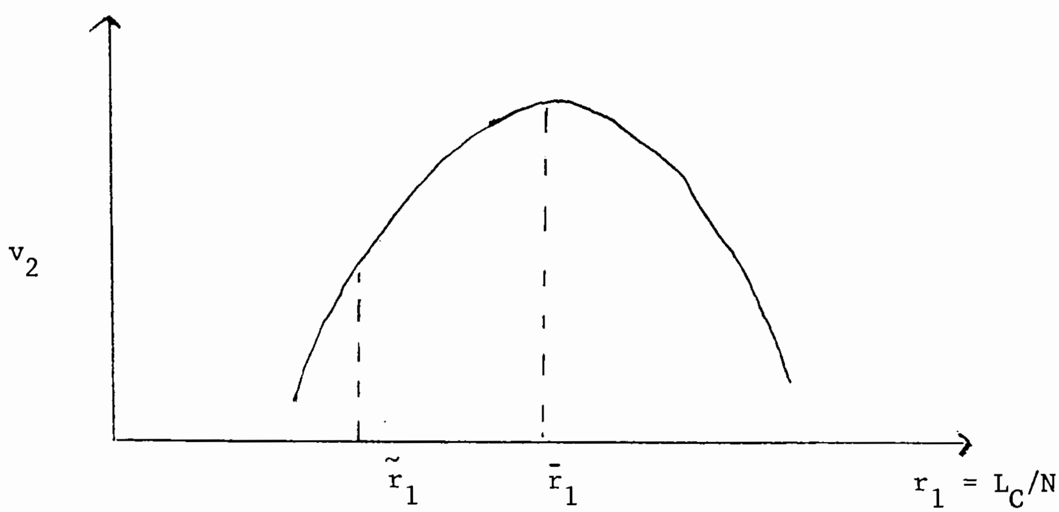


Figure 2: Inflexible Physician



same subjective standard of a perfect practice, i.e, v_1 and v_2 both reach their maximum at the point $(\bar{r}_1, \bar{r}_2, \bar{r}_3)$. Finally assume that $v_1 (\bar{r}_1, \bar{r}_2, \bar{r}_3)$ $= v_2(\bar{r}_1, \bar{r}_2, \bar{r}_3)$.

Now, for the purposes of illustration, hold r_2 and r_3 constant at $\bar{r}_2$ and $\bar{r}_3$ respectively and focus on the comparative behavior of v_1 and v_2 when r_1 varies. As Figure 1 shows, changing r_1 from $\bar{r}_1$ causes a relatively small decrease in the value of v_1. In contrast, the same change, as Figure 2 shows, causes a relatively large decrease in v_2. Because both physicians are assumed to have identical utility functions the change in r_1 from $\bar{r}_1$ to $\tilde{r}_1$ will, as a result of v_2 decreasing more than v_1, cause the inflexible physician to suffer a greater utility loss than the flexible physician.[3] Operationally this means that in order to keep both physicians at a constant utility level the inflexible physician must be compensated for the change from $\bar{r}_1$ to $\tilde{r}_1$ with more additional income (or leisure) than does the flexible physician.

This completes the formulation of the common functional elements of the three models which the next three sections will present. The relationships presented so far focus on the technical production relations F and G and on the physician's preference structure. The latter focus is chosen because the physician plays such a key role in health delivery. He holds a veto power over innovation in the structure of health care delivery. Provided government does not impose medical change onto the health delivery system, then no matter how technically efficient a particular mode of delivery is, and no matter how acceptable it is to the consumer, it will not be adopted if it is personally unattractive to most physicians.

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[3]By the assumptions in (4) and (5) U(•) is concave and monotonic in v_1 and v_2. Therefore, since both v_1 and v_2 are assumed concave with respect to r_1, r_2, and r_3, U(•) is concave with respect to r_1, r_2, and r_3. This means that as r_1, r_2, and r_3 deviates from $\bar{r}_1$, $\bar{r}_2$, and $\bar{r}_3$ the physician's utility decreases.

3. Model I: Private Practice-Voluntary Hospital Model

Model I is the baseline against which the other two models will be compared. It is meant to capture certain essential characteristics of the PPVH institutional structure in which the average physician currently functions. Following Feldstein [4] and Newhouse [10] the model assumes that the prices which a physician charges for his professional services are institutionally determined at a level such that excess demand exists. His problem is simply to decide how many hours to work and how much auxiliary help to use. He is constrained only by accounting identities, hospital capacity, and hospital policy. Consumer demand is not a constraint. Thus his problem is to

$$\text{maximize } U(I,W,v) \tag{9}$$

subject to

$$Q_C = F(N, L_C) \tag{10}$$

$$Q_H = G(M, L_H) \tag{11}$$

$$L_H \leq kM \tag{12}$$

$$Q_H \leq \bar{Q}_H \tag{13}$$

$$W = M + N \tag{14}$$

$$r_1 = L_C/N, \ r_2 = L_H/M, \ r_3 = Q_C/Q_H \tag{15}$$

$$v = v(r_1, r_2, r_3) \tag{16}$$

$$I = p_C Q_C + p_H Q_H - w_C L_C, \tag{17}$$

$$M \geq 0, \ N \geq 0, \ L_C \geq 0, \ L_H \geq 0, \ 168 \geq W. \tag{18}$$

Equations (10), (11), (15), and (16) have been previously introduced. Inequalities (12) and (13) represent the hospital's capacity limitations with respect to auxiliary aid available per bed and number of beds available per physician. The hospital exogenously determines values for the variables k and $\bar{Q}_H$. Coefficient k is determined by such things as the number and skill level of the nursing staff and the sophistication of the equipment available for the physician's use. The capacity limitation $\bar{Q}_H$ may in part be enforced by the hospital's utilization review committee. Equations (14) and (17) are accounting identities. Equation (17) formally states that the voluntary hospital is a free workshop for the physician: his net income is his gross fees minus his office expenses. His fee schedule, p_C and p_H, and the wage rate for office aid, w_C, are exogenously determined. Inequalities (18) enforce non-negativity on the physician's four decision variables, M, N, L_C, and L_H and state the physical restriction on his capacity to work.

The physician's maximization results in his choice of values for his four control variables.[4] Label these values M^A, N^A, L_C^A, and L_H^A. Plugging these values into the technological relations, accounting identities, and his utility function gives values for the other variables of interest in the system. Label these values Q_H^A, Q_C^A, and U^A. The total of amount of care produced by the physician is $Q^A = Q_H^A + Q_C^A$. The total cost to society of producing this care is

$$T^A = p_O Q_C^A + p_H Q_H^A + w_H L_H^A \tag{19}$$

where w_H is the exogenously determined wage rate for hospital auxiliary aid. The triplet (Q^A, U^A, T^A) summarizes the effectiveness the PPVH mode of delivery. It states total output, utility level of the physician, and total cost.

If another set of institutional arrangements is to be judged superior, then it must be able to produce Q^A of health care at (a) a cost less than T^A while (b) providing the physician with a utility level of at least U^A. If test (a) is not satisfied, then the alternative institution is comparatively inefficient. If test (b) is not satisfied, then coercion, with all its attendant ill effects, will have to be used to force physicians to adopt the new institution.

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[4]This maximum exists because all our functions are continuous and the feasible region is compact.

4. Model II: Ideal Prepaid Group Practice

This second model attempts to describe an essential aspect of all true group practice prepayment plans: the physician has a stake in the minimizing of total costs. Let the physician be a member of a prepaid group practice which owns its own hospital. He is paid a salary and he also receives bonus (or penalties) depending on how he conducts his practice. His problem is to

$$\text{maximize } U = U(I,W,v) \tag{20}$$

subject to

$$Q_C = F(N,L_C) \tag{21}$$

$$L_C \leq j^* N, \tag{22}$$

$$Q_H = G(M,L_H) \tag{23}$$

$$L_H \leq k^* M \tag{24}$$

$$Q_H \leq \bar{Q}^* \tag{25}$$

$$W = M + N, \tag{26}$$

$$r_1 = L_C/N,\ r_2 = L_H/M,\ r_3 = Q_C/Q_H \tag{27}$$

$$v = v(r_1,r_2,r_3) \tag{28}$$

$$I = S^* + b_C^* Q_C + b_H^* Q_H, \tag{29}$$

$$M \geq 0,\ N \geq 0,\ L_0 \geq 0,\ L_H \geq 0,\ W \leq 168. \tag{30}$$

The physician's problem is the same as in Model I except for three changes: inequality (22) is added, equation (29) is changed, and six variables have been starred. The starred variables are variables over which the PGP has control. Inequality (22) states that the PGP may constrain the amount of auxiliary aid which the physician uses in his office. The model does not place a lower bound on either L_H or L_0 because a PGP can only make auxiliary aid available to a physician; it can not make him use it.

Equation (29) states that the PGP pays the physician a salary plus bonuses -- or penalties -- according to how much health care he produces.[5] An equivalent formulation of (29) is

$$I = S^{**} + b_C^*(Q_C - Q_C^E) + b_H^*(Q_H - Q_H^E) \tag{31}$$

where $S^{**} = S + b_C Q_C^E + b_H^* Q_H^E$. S** is interpreted as the physician's target income for his expected levels of service Q_C^E and Q_H^E.

Given values for the starred variables, the physician's maximization results in his choice of values for his four control values. Label these values M^B, N^B, L_C^B and L_H^B. From these may be derived the values of the other interesting variables in the system. Label these values Q_C^B, Q_H^B, $Q^B = Q_C^B + Q_H^B$, and U^B. These values are all implicit functions of the starred variables:

$$M^B = m(j^*, k^*, \bar{Q}^*, S^*, b_C^*, b_H^*), \tag{32}$$

$$N^B = n(j^*, k^*, \bar{Q}^*, S^*, b_C^*, B_H^*), \tag{33}$$

etc. Consequently, by varying the values of its control variables -- the six starred variables -- the PGP can control the physician's choice of his control variables.

Therefore the design of an optimal PGP consists of solving the following

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5 Existing group practices such as Kaiser-Permanente do not calculate physician bonus payments - $b_C^* Q_C + b_H^* Q_H$ in equation (29) - on an individual basis. The medical group as a whole receives a bonus payment for its performance as a group. This bonus is then divided in equal shares among the medical group's member physicians. Thus, as Newhouse [11] and Pauly [13] have pointed out, the incentive effect on the individual physician of (29) is increasingly diluted as the medical group becomes larger. The medical group, however, can offset this dilution by rewarding the unusually productive physician with a relatively high base salary S*. Also see footnote ten.

problem:

$$\text{minimize } T = I + w_C L_C + w_H L_H \tag{34}$$

subject to

$$U^B \geq U^A \tag{35}$$

$$Q^B \geq Q^A, \tag{36}$$

$$j^* \geq 0,\ k^* \geq 0,\ \bar{Q}^* \geq 0, \text{ and } S^*,\ b_C^*,\ b_H^* \text{ unrestricted} \tag{37}$$

where U^B, Q^B, I, L_C, and L_H are implicit functions of the six starred variables. Inequality (37) makes certain that the PGP will be acceptable to physicians currently practicing under PPVH.

The PGP's minimization results in its selection of optimal values for its six control variables.[6] These in turn determine the physician's choice of values for his four control variables. Finally values for the three summary variables can be calculated. Label these values: (Q^B, U^B, T^B). This triplet summarizes the performance of Model II.

5. Model III: Prepaid Group Practice without Owned Hospital

Model II describes an ideal PGP where hospital and office care are perfectly integrated both technologically and financially. Even the Kaiser-Permanente Health plans do not achieve this level of integration. In their case the medical groups providing the physician services and the foundation which owns and runs the Kaiser hospitals are separate legal and financial entities. Even less

[6]The control variables j^* and k^* can be bounded from above by arbitrarily large numbers $\bar{j}$ and $\bar{k}$ respectively. The numbers $\bar{j}$ and $\bar{k}$ must be chosen so that if $j^* = \bar{j}$ and $k^* = \bar{k}$, then constraints (22) and (24) are not binding in the physician's maximization problem. By similar arguments b_H^*, and b_C^* can be bounded from above and below. If these bounds on j^*, k^*, b_H^*, and b_C^* are added as constraints to the prepayment plan's minimization problem, then the feasible region is compact. Therefore, since such bounds can always be found and since all the functions are continuous, a solution to the overall problem exists.

integration is evident in many of the new prepaid group practices which are being sponsored by Blue Cross plans in several states.[7] These new plans do not own their own hospital facilities.

This means that Model II must be restated with fewer variables endogenously determined by the prepayment plan's optimization and more variables exogenously determined by the voluntary hospital with which the plan is affiliated. The physician's maximization problem is unchanged:

$$\text{maximize } U = U(I,W,v) \tag{38}$$

subject to:

$$Q_C = F(N,L_C) \tag{39}$$

$$L_C \leq j^* N \tag{40}$$

$$Q_H = G(M,L_H) \tag{41}$$

$$L_H \leq kM \tag{42}$$

$$Q_H \leq \bar{Q} \tag{43}$$

$$W = M + N \tag{44}$$

$$r_1 = L_C/N,\ r_2 = L_H/M,\ r_3 = Q_C/Q_H \tag{45}$$

$$v = v(r_1,r_2,r_3) \tag{46}$$

$$I = S^* + b_C^* Q_C + b_H^* Q_H \tag{47}$$

$$M \geq 0,\ N \geq 0,\ L_C \geq 0,\ L_H \geq 0,\ W \leq 168. \tag{48}$$

Since the PGP no longer owns the hospital it is not in a position to constrain the physician's behavior in the hospital. Parameters k and $\bar{Q}$ are now exogenously determined by the hospital. The physician's optimization results in his choice of values for his control variables. Label these and the derived values of the systems's other variables: M^C, N^C, L_C^C, Q_C^C, Q_H^C, Q^C, and U^C. All these values are implicitly functions of the starred variables.

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[7] For example, Compcare in Wisconsin and Cocare in Illinois.

The problem of the PGP is now to

$$\text{minimize } T = I + w_C L_C + w_H L_H \tag{49}$$

subject to

$$Q^C \geq Q^A, \tag{50}$$

$$U^C \geq U^A, \text{ and} \tag{51}$$

$$j^* \geq 0 \text{ and } S^*, b_C^*, b_H^* \text{ unrestricted.} \tag{52}$$

The PGP's maximization results in its selection optimal values for its four control variables.[8] From these and the associated optimal values from the physician's maximization three summary variables can be calculated. Label these values: (Q^C, U^C, T^C).

6. Comparison of Model I, II, and III

Each of these models represent different levels of control of physician behavior. In model I virtually the only explicit external controls are inequalities (12) and (13): $L_H \leq kM$ and $Q_H \leq \bar{Q}_H$. These two constraints, however, are unlikely to be severely constraining on the physician because of competition for physicians which exists between hospitals under PPVH. How attractive a physician finds a hospital will, within this paper's context, vary directly with the magnitude of k and $\bar{Q}_H$. In their efforts to attract and retain quality physician's hospitals will try to increase k and $\bar{Q}_H$ to the limit of their financial resources. The net result, as Lee [6] has pointed out, will be hospitals which are uneconomically plush "workshops" for the free use of the staff physicians.

In model II the ideal PGP has substantial control over the physician by manipulating the starred variables j^*, k^*, $\bar{Q}^*$, S^*, b_C^*, and b_H^*. It is free to manipulate these variables to achieve minimum cost delivery of quantity Q^A of care subject to $U^B \geq U^A$ because in a PGP environment, unlike a PPVH environment,

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[8] This maximum exists for the same reason that a maximum exists for model II.

competition does not lead to a weakening of the constraints on the physician. A PGP competes for physicians with the PPVH sector of health delivery by satisfying the constraint $U^B \geq U^A$. As long as it satisfies this constraint, then it can manipulate the starred variables at will without losing its medical staff to the PPVH sector. The same argument applies to model III except that the PGP which does not own its own hospital has fewer starred variables to manipulate than does a PGP which owns its own hospital.

The question now is whether the PGP can function at a lower cost than the PPVH. To see this we must do a constraint by constraint comparison of models I and II. First, constraints (10), (11), (14), (15), (16) and (18) are definitional in nature and appear as (21), (23), (26), (27), (28) and (30) respectively in model II. If k^* is set equal to k and $\bar{Q}^*$ to $\bar{Q}_H$, (24) and (25) become the same as (12) and (13). Letting $S^* = -w_C L_C$, $b_C^* = p_C$, and $b_H^* = p_H$, (17) and (29) are identical. The only other constraint in model II on the physician is (22) and by choosing j^* large enough this is no longer a binding constraint. Therefore in model II if the starred parameters are set to the above values, then the pair (Q^A, U^A) is a feasible and optimal solution to the physician's utility maximization subproblem. Therefore the model I solution (Q^A, U^A) is a feasible solution in constraints (35), (36), and (37) of model II. Since the objective in (34) through (37) is to minimize cost, the optimal solution for model II has to have a cost less than or equal to the cost of any other feasible solution. Therefore the total cost of the optimal solution for model II must be less than or equal to the total cost of the optimal solution to model I, i.e. PGP is at least as efficient as PPVH.

The same process can be repeated to show that the solution to model I is feasible in model III and the solution of model III is feasible in model II. This means that, within the context of these models, a properly designed PGP that owns its own hospital is at least as efficient as a PGP that does not own its own hospital. Similarly, a properly designed PGP which does not own its own hospital is at least as efficient as PPVH.

7. Conclusions

This paper's main result is that PGPs may, but will not necessarily, induce physicians to allocate their work effort more efficiently than does PPVH. This result poses the one remaining question: how likely is it that a physician under PPVH will be equally as efficient as he is within a PGP. This section's purpose is to examine the likelihood of such equality.

Two qualitative cases need consideration. The first case concerns the physician who has relatively weak preferences concerning the manner in which he practices medicine, i.e. the function $v(r_1,r_2,r_3)$ is relatively flat. Such a physician, being flexible in his approach to his work, will be quite responsive to the price incentives of whatever environment within which he decides to practice. Under PPVH he will recognize that to him the hospital is a free resource, that his office is an expensive resource, and, as a consequence, he will tend to overuse the hospital.

Only two circumstances may prevent such overuse. First, the price ratio p_H/p_C could be enough less than unity to make the physician's net income for an hour of hospital work less than that for an hour of office work. This possibility, however, is inconsistent with even cursory experience with physician's rate schedules. Second, the hospital might directly constrain the physician from overusing its facilities by setting low values for k and $\bar{Q}$ in constraints (12) and (13).[9] One means which the hospital could use to enforce unusually low values of k and $\bar{Q}$ would be a very tough utilization review

[9] A poor hospital may set k and $\bar{Q}$ at low levels because of financial limitations.

committee. This, however, is an unlikely policy for a hospital to adopt because, as the previous section argued, hospitals compete among themselves for physicians by offering attractive working conditions in the form of large values for k and $\bar{Q}$. Therefore, in summary, PPVH is quite likely to have a structure that induces the physician with flexible work habits to overuse the hospital and underuse his office.

The same physician is likely to behave differently and, from society's viewpoint, better within an optimally designed PGP. Since he is flexible in his work habits the modification in his income constraint will induce him to adjust his allocation of time between office and hospital to those values which maximize his utility within the changed environment of a PGP.[10] His adjustment of his work pattern will have the beneficial overall effect reducing the total cost of providing any given quantity of care.

The second qualitative case concerns the physician who is not flexible in his work habits, i.e. $v(r_1,r_2,r_3)$ has a great deal of curvature. Such a physician will not respond very much, if at all, to the price incentives of the environment in which he is practicing. He will always pick values for r_1,r_2, and r_3 which lie very close to the point $(\bar{r}_1,\bar{r}_2,\bar{r}_3)$ that describes his most preferred organization of his medical practice. His choice of r_1,r_2, and r_3 may happen to represent from society's viewpoint an efficient organization of his practice, but such an occurrence would be accidental and would be unlikely to persist over time because

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[10] A managerial explanation of how the modification of the income constraint changes individual physician behavior is possible. The physician who switches from PPVH to PGP may not think about the changed incentive system deeply enough to cause a spontaneous change in his behavior. Nevertheless the management of the PGP's medical group may make the maximization calculations for him and direct him to change his methods of practice. This management direction will be effective if the physician is, as assumed above, flexible in his work habits and if he does not resent managerial direction. Mahoney [7] points out that the latter condition may often be unfulfilled because of the strong individualsim of the American physician.

he will not respond rationally to changing prices and technology.

Consequently, changing the institutional environment of the inflexible physician from PPVH to PGP will not be an effective means of reducing the total costs associated with his health care production. An incentive solution is impossible. Coercion is the only means of getting such physicians to practice medicine in a more economical manner. This coercion most likely would take the form of tightening the controls on hospital utilization, i.e. reducing the values of k, $\bar{Q}_H$, k^*, and $\bar{Q}_H^*$. The result of such a tightening of controls would be twofold: a lowering of health care costs and a lowering of physician utility levels.

Therefore, in conclusion, the establishment of optimally designed PGPs is likely to be an effective means of reducing health care costs only to the extent that a majority of physicians are flexible in their work habits. Inflexible physicians will refuse to join PGPs that are effective in reducing health care costs because joining will result in a utility loss for them. If, on the other hand, PGPs are designed to be attractive to the inflexible physician, then the reduction in total cost will be minimal or non-existant. It is only the flexible physician who will find attractive those PGPs which are designed to be effective in reducing health care costs.

References

[1] Boaz, R. F., "Manpower Utilization by Subsidized Family Planning Clinics: An Economic Criterion for Determining the Professional Skillmix," Journal of Human Resources, 7 (1972), 191-207.

[2] Donabedian, A., "An Evaluation of Prepaid Group Practice," Inquiry, 6 (1969), 17-27.

[3] Feldstein, M. S., Economic Analysis for Health Services Efficiency, Chicago: Markham, 1968.

[4] Feldstein, M. S., "The Rising Price of Physician's Services," Review of Economics and Statistics, 52 (1970), 121-33.

[5] Feldstein, M. S., "Hospital Cost Inflation: A Study of Nonprofit Price Dynamics," American Economic Review, 61 (1971), 853-72.

[6] Greenlick, M. R., "The Impact of Prepaid Group Practice on American Medical Care: A Critical Evaluation," Annals of the American Academy of Political and Social Science, 399 (1972), 100-13.

[7] Lee, M. L., "A Conspicuous Production Theory of Hospital Behavior," Southern Economic Journal, 38 (1971), 48-58.

[8] Mahoney, A. R., "Factors Affecting Physicians' Choice of Group or Independent Practice," Inquiry, 10 (1973), 9-18.

[9] Mechanic, David, "Problems in the Future Organization of Medical Practice," in Public Expectations and Health Care: Essays on the Changing Organization of Health Services, (New York: Wiley-Interscience, 1972), 279-302.

[10] Newhouse, J. P., "A Model of Physician Pricing," Southern Economic Journal, 37 (1970), 174-83.

[11] Newhouse, J. P., "The Economics of Group Practice," Journal of Human Resources, 8 (1973), 37-56.