INCENTIVES TO TRANSFER PATIENTS UNDER ALTERNATIVE REIMBURSEMENT MECHANISMS

By: Randall P. Ellis and Christopher J. Ruhm

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Abstract:
Alternative hospital reimbursement systems may influence the frequency and timing of patient transfers between hospitals as well as the patient's length of stay. This paper examines the characteristics of reimbursement systems that result in efficient and equitable transfers and efficient lengths of stay. Except in special cases, there is a tradeoff between achieving these three objectives. If patient benefits or receiving hospital profits are undervalued, then achieving efficient transfer decisions generally requires the reimbursement of the sending hospital to depend upon some weighted average of its own marginal costs and the costs of the receiving hospital.

Article:

1. Introduction

The reimbursement of health care providers has undergone substantial change during the past ten years. Whereas providers were previously paid primarily on the basis of the costs actually incurred for each patient, they are increasingly being given prospective payments and placed 'at risk' for the costs of providing health care services. In the United States, the most important example is the Medicare Prospective Payment Systems (PPS), in which hospitals are reimbursed for elderly and disabled patients primarily on the basis of the diagnosis-related group (DRG) in which each patient is classified upon discharge. PPS has the desirable effect of encouraging cost-consciousness on the part of hospitals; however, other undesirable incentives are introduced. Previous studies have discussed incentives to reclassify patients so as to increase the revenues generated [Carter and Ginsburg (1985)], to over-admit some patients and under-provide certain services [Ellis and McGuire (1986)], and to over-invest in capital improvements [U.S. General Accounting Office (1986)].

This paper focuses on distortions created by the reimbursement system on incentives to transfer patients between different facilities. Reimbursement incentives differ dramatically between current prospective payment and fee-for-service schemes. For example, under the latter system, U.S. physicians and hospitals are reimbursed for virtually all marginal costs and are therefore likely to make transfer decisions solely on the basis of expected benefits of the (insured) patient. Since differences in hospital costs are not taken into account, this is likely to lead to transfers that are inefficient because small increases in patient benefits may be more than offset by higher costs. Conversely, the current prospective payment system used by Medicare is likely to lead to excessive transfers of high cost patients. This occurs because the transferring hospital receives a per diem payment, which approximates the average daily cost incurred, while the receiving hospital is paid a DRG. Thus, by transferring patients whose expected total cost exceeds the DRG payment, the transferring hospital avoids anticipated losses on those patients. In a few cases (e.g. neonates), a separate (fixed) DRG is paid to both the sending and receiving hospital. This creates additional incentives for excessive transfers, since the total reimbursement is higher with a transfer than without.

The analysis presented in this paper, although specific to a health context, is relevant for a wider range of problems where the agent receiving the benefits of an activity does not pay the full costs. Examples of similar issues in other contexts include labor/management negotiations involving public sector employees, insurance company decisions on out-of-court settlements of law suits, and imperfectly indexed unemployment insurance.

In each case the costs of actions are borne by agents other than the decision-maker: taxpayers bear the burden in the public sector employer case; policyholders bear the expense of decisions made by insurance companies; and the entire economy bears the burden of unemployment insurance in the form of reduced output and increased benefit payments.

The form of hospital reimbursement for transferred patients is significant for two reasons. First, the reimbursement system may interfere with either the frequency or timing of transfers: too few or too many transfers may take place and transfers may occur earlier or later than is desirable. Second, certain health facilities have disproportionately high transfer rates and, since the cost of transfer patients differs significantly from the revenues generated by those patients, the reimbursement system can be highly inequitable. Although transferred patients (both those transferred in and those transferred out) represented only 5.2 percent of all U.S. hospital admissions covered by Medicare during 1984, transfers account for over 20 percent of all of patients in some specialty and teaching hospitals. Also, more than 20 percent of all admissions involve a transfer in fourteen DRGs.[1] Providing the correct incentives to transfer patients is thus especially important for certain facilities and certain types of patients.

This paper examines the conditions under which the reimbursement system will be both efficient and equitable. We assume that the transfer decision is influenced by a complex group of agents that include the patient and the patient's family, the patient's physician, the hospital staff and administration at the facility initially receiving the patient, and the admitting department and administration of the hospital receiving the transfer.[2] We do not focus upon the bargaining process that is likely to occur between these agents, but rather consider an abstract `composite' decision-maker whose decision function includes three arguments: benefits to the patient from treatment, profits to the hospital where the patient is initially admitted, and profits to the hospital into which the patient is (potentially) transferred. The weight attached to the three factors is allowed to vary and depends upon the relative power and interest of each agent involved in the decision.

2. The model

Suppose that there are only two hospitals: hospital one, in which a patient has already been admitted, and hospital two into which the patient may or may not be transferred. This paper focuses on the transfer decision, namely whether or not the reimbursement system encourages *too much or too little* transferring of patients and whether the payment system alters the desired *timing* of transfers. In the processes, we also consider the effect of the reimbursement system on the patient's length of stay.

2.1. Hospital costs

Let t denote the elapsed time, in days, from the patient's initial admission, and T denote to the patient's total length of stay (LOS). Throughout the paper, subscripts correspond to hospitals one and two. Hence, t_1 will be the time at which a transfer takes place from hospital one, T_1 corresponds to the patient's total LOS if treated and discharged entirely from hospital one, and T_2, corresponds to the patient's total LOS in both hospitals should there be a transfer. We use a simple model of hospital costs and assume that the daily costs in hospital i are constant at c_i per day.[3] If a transfer takes place, then transfer costs S occur, which may be both financial and non-financial in nature; these may be borne by the patient (S_p), by hospital one (S_1), or by hospital two (S_2). For simplicity we assume transfer costs by hospital two are zero (S_2=0). Using this notation, if the patient is not transferred, total costs of a patient to both hospitals are $C=C,(T_1)=c_1T_1$, while if a transfer takes place, total cost to the hospitals can be written as: $C= C_1(t_1)+ C_2(t_1, T_2)= c_1t_1+c_2(T_2 - t_1) +S_1$.

2.2. Hospital revenues

Reimbursements to hospital i depend upon the payment mechanism and are represented by the revenue function $R_i(c_i , t_i)$. Existing hospital reimbursement systems can be broadly classified into three groups:

(a) cost-based system: $R_i(c_i,t_i)=p_ic_it_i$, where p_i is the proportion of costs reimbursed;

(b) per diem system: $R_i(c_i,t_1)=d_it_i$, where d_i is the per diem reimbursement rate;

(c) pure DRG system: $R_i(c_i,t_i) = A_i$, where A_i is constant DRG payment.

All of the above reimbursement systems can be written in the form:

$$R_i(c_i\,,\, t_i) = A_i + r_i t_i\,,$$

where r_i is the marginal reimbursement per day $(\partial R_i / \partial t_i)$ and equals $p_i c_i$, d_i or 0 according to whether a cost-based, per diem, or DRG system is in place.[4] This linear form also includes reimbursement systems in which revenues are partially prospective and partially cost-based, with $0<r_i<c_i$. Ellis and McGuire (1986) have termed these 'mixed reimbursement systems' since they are intermediate between cost-based and fully prospective systems. We also allow the lump-sum payment to hospital one to vary depending upon whether or not a transfer takes place, and represent this by a fixed payment or penalty, G, to hospital one if a transfer occurs. Thus, the prospective payment received by hospital one is A_1 in the absence of a transfer and $A_1 + G$ if the patient is transferred.[5]

Using this notation, profits to each hospital in the absence of a transfer can be written as:

$$\pi_1 = A_1 + (r_1 - c_1)T_1, \quad \pi_2 = 0, \tag{1}$$

while profits to each hospital if the patient is transferred are:

$$\pi_1 = A_1 + G + (r_1 - c_1)t_1 - S_1, \quad \pi_2 = A_2 + (r_2 - c_2)(T_2 - t_1). \tag{2}$$

2.3. Patient benefits

After reaching an insurance stoploss (typically $1000) most patients bear no out-of-pocket costs for hospital care; hence we assume that patient benefits and costs are entirely in the form of benefits from treatment. Let the flow of benefits to the patient from treatment in hospital i at time t be measured in monetary terms and written as $b_i(t)$, a function that does not depend upon where the patient has previously been treated. Total patient benefits, B, are a function of t_1, the time spent in hospital one and T, the total length of stay. Total patient benefits in the absence of a transfer depend only upon T_1 and can be written as:

$$B = B_1(T_1) = \int_0^{T_1} b_1(t)\,\mathrm{d}t. \tag{3}$$

Total patient benefits when a transfer takes place are:

$$B = B_1(t_1) + B_2(t_1, T_2) = \int_0^{t_1} b_1(t)\,\mathrm{d}t + \int_{t_1}^{T_2} b_2(t)\,\mathrm{d}t - S_{\mathrm{p}}. \tag{4}$$

2.4. Decision-maker's utility function

We model a single composite decision-maker who balances the wishes of the various agents, as discussed previously, by maximizing a utility (or decision) function with three arguments: benefits to the patient, B, profits to hospital one, π, and profits to hospital two, π_2.For simplicity, we assume that the decision-maker's utility function is linear. Using the non-restrictive normalization that $\partial U/\partial \pi_1 = 1$, the decision-maker's utility function can be written in the form:

$$U(B, \pi_1, \pi_2) = \alpha B + \pi_1 + \beta \pi_2, \tag{5}$$

where $\alpha = \partial U/\partial B$ can be interpreted as the marginal rate of substitution (MRS) between benefits to the patient and profits to hospital one, and $\beta = \partial U/\partial \pi_2$ is the MRS between profits to hospital two and profits to hospital one.

We assume that the first hospital controls the transfer decision. The receiving hospital cannot refuse to accept an incoming patient, although it can sometimes bargain on the terms of accepting the transfer (this is part of the reason why hospital two's profits are included in the decision function). Even if some hospitals have refusal rights, other facilities may be required to accept transfer patients.[6]

3. Social optimum

The first-best social optimum is found by solving:

$$\max_{t_1, T} V(t_1, T) = B - C, \tag{6}$$

where $t_1 = T_1 = T$ if there is no transfer and $t_1 < T_2 = T$ if a transfer occurs. The conditions characterizing the social optimum differ according to whether or not a transfer occurs. If a transfer does *not* take place, then the first-order condition for the socially optimal level LOS in hospital one, T_1*, is:

$$b_1(T_1^*) = c_1. \tag{7}$$

If a transfer does occur, then the two first-order conditions characterizing the social optimum imply the following:

$$b_2(T_2^*) = c_2, \tag{8}$$

$$b_2(t_1^*) - b_1(t_1^*) = c_2 - c_1. \tag{9}$$

Two global conditions characterizing whether a transfer at t_1* is optimal can be written as:

$$V(t_1^*, T_2^*) \geqq V(T_1^*), \tag{10}$$

$$V(t_1^*, T_2^*) \geqq V(\tilde{t}_1, T_2^*), \quad \text{for} \quad 0 < \tilde{t} < T_2^*. \tag{11}$$

These conditions can be given the following interpretation. Whether or not the patient is transferred, the first-best optimum requires that the patient be discharged when

(1) marginal benefits from treatment equal marginal costs.

Optimal timing of a patient transfer occurs when:

(2) the difference in the marginal benefit of treatment in hospitals one and two is equal to the difference in the marginal cost,

provided that:

(3) total net benefits are greater with a transfer than without, and

(4) there is no other time $\tilde{t}$ at which the net benefits from being transferred are greater than at t_1*.

Though none of these findings is surprising, stating them explicitly proves useful when evaluating the outcomes resulting from the decision-making process under various reimbursement systems. For the remainder of the paper we assume that $V(t_1, T)$ is strictly concave. This guarantees that there is a unique t_1* satisfying (9), and that (11) will always be satisfied.[7] It is useful to note that eq. (10) holds only if:

$$\int_{t_1^*}^{T_2^*} b_2(t)\,\mathrm{d}t - \int_{t_1^*}^{T_1^*} b_1(t)\,\mathrm{d}t - S_\mathrm{p} \geqq c_2(T_2^* - t_1^*) - c_1(T_1^* - t_1^*) + S_1. \tag{12}$$

This inequality shows that transfers are socially optimal only when the increase in total patient benefits (the left-hand side) is at least as great as the change in treatment plus hospital transfer costs (the right-hand side).

4. Transfer decisions

For the decision-maker, the objective is:

$$\max_{0 > t_1 \leq T} U(B, \pi_1, \pi_2) = \alpha B + \pi_1 + \beta \pi_2. \tag{13}$$

Substituting **(1)—(4)** into (13), taking the first derivative, and simplifying yields first-order conditions characterizing the decision-maker's desired transfer time if one is to take place as:

$$\alpha[b_2(t_1^*) - b_1(t_1^*)] = (r_1 - c_1) - \beta(r_2 - c_2), \tag{14}$$

and the optimal LOS in the absence of a transfer:

$$\alpha b_1(T_1^*) = c_1 - r_1. \tag{15}$$

Assuming that the decision-making process at the second hospital can be represented by the same utility function, the LOS decision at hospital two will be characterized by a first-order condition analogous to (15):

$$\alpha b_2(T_2^*) = c_2 - r_2.^{8} \tag{16}$$

The global condition that a transfer be desired requires:

$$\alpha \left\{ \int_{t_1^*}^{T_2^*} b_2(t)\,\mathrm{d}t - \int_{t_1^*}^{T_1^*} b_1(t)\,\mathrm{d}t - S_\mathrm{p} \right\}$$

$$\geqq (r_1 - c_1)(T_1^* - t_1^*) - \beta(r_2 - c_2)(T_2^* - t_1^*) - G - \beta A_2 + S_1. \tag{17}$$

We can see the relationship between private and social optimal LOS and transfer decisions by comparing the pairs of eqs. (7) and (15); (8) and (16); (9) and (14); and (12) and (17). Socially optimal length of stays will only be obtained if:

$$r_i = (1 - \alpha)c_i, \quad \text{for} \quad i = 1, 2. \tag{18}$$

This condition is the same as that in Ellis and McGuire (1986) and implies that a 'mixed reimbursement system' with $0 < r_i < c_i$ is necessary to achieve the social optimum if $0 < \alpha < 1$. Socially optimal transfer decisions, however, require a reimbursement system characterized by:

$$[r_1 - (1 - \alpha)c_1] - [\beta r_2 - (\beta - \alpha)c_2] = 0 \tag{19}$$

and

$$[\beta r_2-(\beta-\alpha)c_2][T_2^*-t_1^*]$$

$$-[r_1-(1-\alpha)c_1][T_1^*-t_1^*]+G+\beta A_2-(1-\alpha)S_1=0. \qquad (20)$$

Using (19), eq. (20) can be simplified to:

$$[\beta r_2-(\beta-\alpha)c_2][T_2^*-T_1^*]+G+\beta A_2-(1-\alpha)S_1=0. \qquad (21)$$

Eq. (19) guarantees that the timing of the transfer, if one should take place, is appropriate, while eqs. (19) and (21) are both necessary for the frequency of transfers to be correct. Note that since A_1 is a lump-sum payment that is not contingent upon any subsequent decision, it does not enter into either expression. Given that there are four efficiency conditions and four available payment parameters (A_2, r_1, r_2 and G), one or more reimbursement systems could potentially achieve both efficient lengths of stay and levels of transfers. Next we examine the characteristics of efficient reimbursement systems in cases where the decision-maker is a perfect agent on behalf of both the patient and hospital two, and then we allow for imperfect agency.

4.1. The decision-maker as a perfect agent ($\alpha = \beta = 1$)

We call the decision-maker a 'perfect agent' when benefits to the patient, profits to hospital one, and profits to hospital two are all given equal weight in choosing treatment patterns. Thus, perfect agency requires the decision-maker to value a dollar of surplus equally, regardless of who receives it. In the present model this corresponds to $\alpha = \beta = 1$. Substituting into eqs. (18)(20), the first-best social optimum will be achieved only if $r_1 = r_2 = 0$ and $G = -A_2$. These conditions are satisfied by a pure DRG system in which the receiving hospital's lump-sum payment is entirely paid by the sending hospital. If this is not the case, total reimbursements will be higher with transfers than without, creating incentives to over-transfer. Under perfect agency, the decision-maker internalizes the incentives that result in the social optimum. Also, any reimbursement system in which total hospital payments are constant, regardless of transfer status, leads to the socially optimal provision of services.

This result has important implications for fee-for-service systems where hospitals are compensated for all costs (i.e. $r_i=c_i$). In general, such a reimbursement scheme *fails* to achieve the socially optimal level of transfers. Since profits in neither the transferring nor receiving hospital are affected by the transfer policies adopted, only patient benefits will be taken into account, creating too strong of a tendency to transfer patients into facilities where higher costs more than offset any increases in benefits. Only in the special case where costs are the same in both hospitals will the appropriate frequency and timing of transfers result.

4.2. Imperfect agency

Perfect agency is extremely unlikely. For example, if physicians stop treating their patients once transferred, the decision-making process may result in profits to the receiving hospital being under-valued relative to those of the sending hospital ($\beta < 1$). If hospital profits are important for maintaining hospital affiliations or for more direct financial reasons, there are also incentives to over-value hospital profits compared to patient benefits ($\alpha < 1$).[9] Although both α and β could vary across physicians and hospitals, we feel that $0 < \beta < \alpha < 1$ is the most likely scenario and focus on that case.

With this type of imperfect agency, there will generally be a tradeoff between achieving efficient lengths of stay and efficient patient transfers. This can be seen by noticing that $r_2 = (1 - \alpha)c_2$ is necessary for achieving an efficient LOS in hospital two, while $r_2 = (1 - \alpha/\beta)c_2$ is required for achieving efficient timing of transfers and LOS in hospital one. At least one condition will be violated when $\beta \neq 1$.

Rearranging eq. (19), one can see that the timing of transfers is optimal when $r_1 - \beta r_2 = (1 - \alpha)c_1 + (\alpha - \beta)c_2$. A wide range of reimbursement systems satisfy this condition. Consider three cases, corresponding to different marginal reimbursement systems for hospital two:

Hospital two reimbursement is on a 'pure' DRG basis:

$r_2 = 0$, requires $r_1 = (1 - \alpha)c_1 + (\alpha - \beta)c_2$. (22)

Hospital two reimbursement is on a cost basis:

$r_2 = c_2$, requires $r_1 = (1 - \alpha)c_1 + \alpha c_2$ (23)

Hospital two reimbursement is a 'mixed reimbursement system':

$r_2 = (1 - \alpha)c_2$, requires $r_1 = (1 - \alpha)c_1 + \alpha(1 - \beta)c_2$ (24)

All three reimbursement systems require that the marginal reimbursement rate for the sending hospital be a weighted sum of c_1 and c_2. The dependence of r_1 upon c_2 implies that none of the currently used reimbursement systems will simultaneously achieve efficient lengths of stay, timing, and frequency of transfers when there are two or more potential receiving hospitals with differing costs and an agency problem. In principle, there do exist reimbursement systems that depend only upon own hospital costs. These are of the form $r_1 = (1 - \alpha)c_1 + k$ and $r_2 = (1 - \alpha/\beta)c_2 + k/\beta$, where k is an arbitrary constant. These systems do not achieve optimal LOS decisions, however.

Assuming that transfers occur at the optimal time, achieving the optimal *frequency* of transfers requires that $G = -\beta A_2 + (1 - \alpha)S_1 + [(\beta - \alpha)c_2 - \beta r_2][T_2^* - T_1^*]$. Under the simplifying assumption that $T_1^* = T_2^*$, this becomes $G = \beta A_2 + (l - \alpha)S_1$. Interestingly, as β decreases, the required penalty imposed upon hospital one to obtain the optimal frequency of transfers is reduced. This occurs because payments to hospital two increase its profitability and encourage transfers to the extent that they are valued in the decision function. Holding constant the transfer penalty, the greater the lump-sum payment to hospital two, the greater the incentive to transfer patients. Similarly, when patient benefits are undervalued $(\alpha < 1)$, the penalty needs to be reduced because hospitals will have less of an incentive to transfer patients to hospitals that provide high benefits at relatively low costs per unit of benefit.[10]

4.3. Uncompensated care and 'dumping'

The model developed above extends easily to include the possibility of uncompensated care and the ensuing problem of 'dumping'. Hospitals provide unreimbursed care for indigent persons and certain categories of other patients. In terms of the above model, this is equivalent to assuming that $A_i = G = r_i = 0$. Eqs. (15) and (16) imply that length of stays will be shorter than socially optimal for uncompensated patients whenever $\alpha < 1$. According to eq. (19), the optimal *timing* of transfers can be obtained with $r_1 = 0$ only if $(1 - \alpha)c_1 = (\beta - \alpha)c_2$. As before, optimal *frequency* of transfers requires $G = -\beta A_2 + (1 - \alpha)S_1$. These conditions can be jointly fulfilled *only* with perfect agency. Socially optimal transfer decisions result with perfect agency because uncompensated care represents a lump-sum loss of reimbursements and patient benefits are appropriately offset against hospitals costs.

Conversely, with imperfect agency transfers will occur both too soon and too often. In the likely case where $0 < \beta < \alpha < 1$ and $c_1 > c_2$, $(1 - \alpha)c_1$ exceeds $(\beta - \alpha)c_2$. From eq. (14) it follows that hospital one has incentives to quickly transfer patients for which they receive no compensation. The only way transfers could occur at the optimal time is if $\beta > \alpha$ and $c_2/c_1 = (1 - \alpha)/(\beta - \alpha)$. In this special case the added concern for hospital two's profits prevents early transfers to the high cost facility; but transfers continue to occur too frequently. Because hospital one's profits are overvalued, optimal frequency requires a transfer penalty of $G = -\beta A_2 + (1 - \alpha)S_1$. With uncompensated care, $G=0$, resulting in a penalty that is inadequate to prevent 'dumping'.

5. Equity implications

We now consider the equity of reimbursements across hospitals. We consider the reimbursement system to be 'fair' when expected payments equal expected costs for each patient group.[11] Suppose that treatment costs (c_1 and c_2) and patient LOS fluctuate across patients and the distribution of patients varies by hospital type. Given that r_1 and r_2 are determined by the efficient transfer and LOS considerations discussed above, the system will be fair if A_1 and A_2 are chosen such that:

$$A_1=E[(c_1-r_1)T_1] \text{ and } A_2 = E[(c_2-r_2)(T_2-t_1)], \qquad (25)$$

where E[•] is the expectations operator. If patients that are transferred into a hospital have systematically higher costs or lengths of stay than patients that are not transferred, then A_1 will be less than A_2.

With A_1 and A_2 set according to (25), payments will equal expected costs both for patients transferred into the hospital and patients not transferred, but expected profits may still be non-zero for patients that are transferred out. If r_1 and r_2 are set according to one of eqs. (22)—(24), and G is set efficiently, according to eq. (20), then expected profits from patients that are transferred out (π_o) can be written as:

$$\pi_o=E[A_1 +(r_1-c_1)t_1+G-S_1]$$

$$=E[A_1+(r_1-c_1)t_1-\beta A_2- \alpha S_1]. \qquad (26)$$

Whether profits arising from patients that are transferred out are positive or negative depends upon the relative magnitudes of all of the parameters shown in (26). Since π_o is generally less than zero, we have a potential efficiency/equity tradeoff that needs to be considered when choosing the reimbursement system.

6. Policy implications and summary

This paper examines the effect of changes in the medical reimbursement system on the efficiency and equity of hospital transfer decisions. If decision-makers are perfect agents — in the sense of equally valuing patient benefits with sending and receiving hospital profits — reimbursement systems that maintain a constant total payments (regardless of transfer status) will be efficient. Thus, in this case, prospective payment will be efficient while fee-for-service will not.[12]

With imperfect agency, which we believe is more likely, the optimal reimbursement system is more complicated and generally requires that reimbursement to the hospital sending the patient to depend upon some weighted average of both its own marginal costs and the costs of the receiving hospital. If two or more hospitals with different costs may receive transferred patients, reimbursement systems of the type currently used (i.e. fee-for-service, PPS, and mixed systems) do not permit reimbursement of the sending hospital in such a way as to result in socially optimal transfer decisions. The distortion is likely to be fairly small, however, if the sending and receiving hospitals have similar costs.

This paper suggests two other mitigating factors which may prevent achieving efficient transfer outcomes. First, with imperfect agency, there is likely to be a tradeoff between obtaining efficient transfers and efficient length of stay decisions. For example, a scheme which leads to appropriate LOS generally results in too many transfers because the marginal reimbursement does not take into account the sending hospital's ability to transfer high cost patients. Second, equity considerations may prevent implementing reimbursement systems which yield socially optimal transfers. In particular, if sicker (more costly, longer LOS) patients are more likely to be transferred, some adjustments in the reimbursement system may be required to offset the potential losses of hospitals receiving a disproportionate share of transfers. Eliminating this loss through adjustments in lump-sum payments is possible, but this approach yields inefficient transfers and creates financial losses for hospitals transferring patients. We also note that the existence of uncompensated care will lead to patient 'dumping' except where decision-makers are perfect agents.

Explicit recognition of the endogenous nature of the transfer decision has more general implications for the redesign of existing reimbursement systems. First, given that the current DRG system compensates hospitals differently for transferred and non-transferred patients, hospitals may have incentives to keep inaccurate records about the source and disposition of patients. Second, the current system reimburses at different rates for different types of hospitals. For example, university teaching hospitals receive a higher rate than community (non-teaching) facilities. One justification for this is that university teaching hospitals treat transfer patients with greater average severity of illness. Unfortunately, the current reimbursement system provides the wrong incentives because these hospitals have incentives to shift their patient mix to cases with less severity, in order to increase profits. A system that bases reimbursements on patient characteristics rather than hospital type is likely to avoid these adverse incentives, although obvious care must be taken in designing the system to prevent other undesirable incentives.

Finally, we suspect that this analysis generalizes to other situations where the welfare of third parties is affected by the actions of decision-makers. By sufficiently constraining the incentive structure, outcomes optimal from the standpoint of the third party may be feasible. Yet when multiple objectives enter into the social welfare functions, some tradeoff between these objectives may be required. For example, public sector employers have an incentive to over-compensate their employees since these costs are borne by 'third party' tax payers. Although it is possible to mitigate this problem (e.g. by imposing rigid salary scales), this cure may create other adverse incentives (such as reducing incentives to work hard).

Notes:

1These numbers are obtained from a 5 percent random sample of all Medicare discharges during calendar year 1984 provided by the Health Care Financing Administration. DRGs 9, 11, 12, 104, 105, 106, 107, 109, 124, 126, 409, 436, 462, and 466 all have greater than 20 percent of all admissions involving a transfer, with over in 3000 cases in each DRG nationwide.

2The degree of influence of each type of agent undoubtedly depends upon the particular institution considered, the condition of the patient, the individual physician involved, and so on. This decision process has been modeled in several different ways in the literature. For example, Ellis and McGuire (1986) assume the physician is the sole decision-maker, Dranove (1987) and Foster (1985) consider the case where a pure profit-maximizing hospital is the only agent involved in the patient care decision, and Custer et al. (1986) allow for bargaining between the medical staff and hospital administration.

[3]1n doing so, we are also assuming that hospitals are minimizing costs, so that marginal costs *c*, are independent of the reimbursement system.

[4]The cost-based system approximates the traditional fee-for-service system where hospitals are reimbursed on the basis of charges that are supposed to reflect actual patient costs incurred. The pure DRG system is a somewhat simplified version of the existing PPS system. The main simplification is that we ignore 'outlier' payments for high cost and long length of stay patients.

[5]Under the current PPS systems, *G* is generally negative, since a hospital transferring a patient is paid on a per diem basis up until the DRG payment is reached.

[6]For example, publicly funded hospitals or facilities with authorization to obtain specialized capital equipment or use experimental procedures may be required to accept certain types of patients. Sloan and Valvona (1987) present evidence that teaching and public hospitals have been the recipients of more transferred Medicare patients since the implementation of PPS, while investor-owned hospitals are receiving fewer individuals and transferring more frequently.

7A sufficient but not necessary condition for (11) always to be satisfied is $db_1(t)/dt < db_2(t)/dt < 0$ for all t, i.e. that benefits per day in the first hospital decline faster than in the second hospital at all times t.

[8]If a varies across hospitals, decision-makers at the sending hospital would need to take this heterogeneity into account in their transfer decision. For example, if a is lower in the receiving institution (they place a lower relative value on patient benefits), hospital one would be less likely to transfer the patient because LOS would be shorter with than without the transfer and total patient benefits would be reduced.

[9]On the other hand, if physicians continue to care for patients after a single hospitalization, greater importance could be attached to patient benefits relative to hospital profits ($\alpha > 1$). This case is examined in footnote 10 below.

[10] For the case where $0 < \beta < 1 < \alpha$, the decision-maker attaches too much importance to patient benefits relative to hospital profits. Eqs. (18)—(21) continue to characterize efficient reimbursement systems: however, it is likely that r_1 and r_2 may need to be negative to be efficient. Since charging (rather than rewarding) hospitals for providing more services is likely to be administratively infeasible (hospitals would wish to conceal services provided) a fully prospective payment system with $r_1 = r_2 = 0$ may be the best outcome attainable.

11More generally, equity requires equality of expected profits. The average profit level, however, could be positive or negative.

[12]In the absence of transactions costs, efficient outcomes could also be obtained by providing a lump-sum payment to the hospital first admitting a patient and making that hospital fully responsible for subsequent treatment [see Coase (1960)]. We do not believe that the necessary assumptions for the Coase theorem will be met in the case of transfers, however, because of bargaining costs, information costs, and moral hazard problems which are likely to result (in the absence of costly monitoring) once the receiving hospital has been guaranteed payment. Furthermore, if some hospitals are legally prevented from refusing patients, the bargaining process will degenerate. Even absent these problems, the Coase solution ignores issues of risk and fairness.

References

Carter, G. and P.B. Ginsburg, 1985, The Medicare case mix index increase: Medical practice changes, aging and DRG creep, R-3292-HCFA The Rand Corporation, Santa Monica, CA.
Coase, R.H., 1960, The problem of social cost, Journal of Law and Economics 3, 1-44.
Custer, W.S., J.W. Moser, R.A. Musacchio and R.J. Willke, 1986, Hospital and physician behavior under Medicare's prospective payment system: Theory and evidence (unpublished manuscript), Center for Health Policy Research, American Medical Association, Chicago, IL, unpublished manuscript.
Dranove, D., 1987, Rate setting by DRG and hospital specialization, University of Chicago, unpublished manuscript.
Ellis, R.P. and T.G. McGuire, 1986, Provider behavior under prospective reimbursement: Cost sharing and supply, Journal of Health Economics 5, 129-152.
Foster, R.N., 1985, Cost shifting under cost reimbursement and prospective payment, Journal of Health Economics 4, 261-271.
Sloan, F.A. and J. Valvona, 1987, Case shifting and the Medicare prospective payment system, Department of Economics, Vanderbilt University, unpublished manuscript.
U.S. General Accounting Office, 1986, Medicare: Alternatives for paying hospital capital costs. GAO/HRD-86-93.