

**PAYMENT SYSTEM DESIGN, VERTICAL INTEGRATION ,  
AND AN EFFICIENT CONTINUUM OF CARE**

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## **PAYMENT SYSTEM DESIGN, VERTICAL INTEGRATION , AND AN EFFICIENT CONTINUUM OF CARE**

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### **I. INTRODUCTION**

Many health care patients receive sequential care from a series of vertically-related providers, such as hospitals, physicians, nursing facilities, and home health agencies. Several strategies have emerged to address long-standing concerns about efficient coordination along this continuum of care. Industry participants have increasingly turned towards vertical integration as a solution to the coordination problem, but this solution raises concerns about the impact of vertical integration on industry competition. Private purchasers have implemented managed care and contracted with health maintenance organizations. Medicare has initiated a two-pronged approach, implementing prospective payment for nursing facilities and exploring the impacts of bundled payment systems, in which one provider assumes responsibility for an episode of care with the option to subcontract with vertically-related providers.

This paper discusses the implications of an abstract game-theoretic model developed to address three questions: 1) Are Medicare transfer patients treated with efficient combinations of hospital care and follow-up nursing facility care before

returning home? 2) Does hospital ownership of the nursing facility enhance or diminish the efficiency with which these two types of services are combined? 3) How do the Medicare hospital and nursing facility payment systems affect both efficiency and incentives for vertical integration?

These issues are becoming increasingly important as nursing facility care accounts for an increasing proportion of inpatient care, and as vertical integration increases among hospitals and nursing facilities. National Health Expenditure data indicates that expenditures for nursing facility care climbed from 17% of expenditures for hospital care in 1980 to 23% in 2000. HCFA actuarial analysis predicts that this trend will continue, and expenditures for nursing facility care will be 25% of expenditures for hospital care in 2010. As a result of the concurrent trend toward vertical integration, 75% of hospitals now own nursing facilities (Welch, 1998: 80). Medicare has initiated a study to address the potential tradeoff between efficiency and anti-competitive behavior of vertically integrated providers. The study asks whether hospital-based skilled nursing facilities provide more efficient post-acute care than freestanding facilities, and whether hospitals skim less intense cases from their own post-acute care units and transfer more severely ill cases to freestanding facilities.

While market forces are expected to induce individual providers to produce medical care with efficient resource utilization within individual institutions, it is not clear that competitive forces will push vertically-related providers to combine their services efficiently. The widely-recognized potential for substitution between the services provided at different stages of the continuum of care may create opportunities for hospitals to profit by providing inefficiently high or low levels of care before

transferring patients to nursing facilities. Depending on the design details, payment systems may or may not induce hospitals to provide an efficient care intensity to transfer patients. We explore the relationships between payment system design, efficient coordination, and vertical integration in this paper, using a game-theoretic model of strategic interaction from Banks, Parker, and Wendel (2001). In doing so, we focus on the example of strategic interaction between hospitals and nursing facilities in the treatment of patients with acute medical conditions that require initial hospital treatment and follow-up recovery before returning home. The results may be extended to other providers in the continuum of care, such as home health care providers.

Because patient transfers from hospitals to nursing facilities are not accompanied by monetary transactions between the two institutions, nursing facilities can only influence hospital care intensity through indirect measures. Robinson (1996) advocates permitting hospitals to pay nursing facilities to both maintain excess capacity and provide patient care. Medicare is, instead, addressing the problem of inducing efficient episodes of care via payment system incentives.

The Health Care Financing Administration (HCFA) is pursuing two types of payment system reform. Prospective payment for two components of post-acute care, nursing facilities and home health providers, has been initiated as mandated in the 1997 Balanced Budget Act. In addition, HCFA is assessing demonstration programs to study the impact of bundled payment systems, in which one institution would assume responsibility for an entire episode of patient care. The responsible institution would receive payment from Medicare, with the option of subcontracting portions of the care to other providers. HCFA has initiated demonstration programs to assess the impacts of

bundled payment for specific diagnoses, including hospital and related physician services during episodes of heart bypass surgery, and total and partial hip and knee replacement. Medicare concluded that the demonstration program involving heart bypass surgery indicated that bundled payment can generate savings without imposing adverse impacts on quality. HCFA's chief administrator, Bruce Vladeck, summarized the results in a 1997 speech, "The major benefit of this all-inclusive negotiated bundled payment methodology, which includes outliers and re-admissions, is that it provides an incentive for physicians and hospital staff to work together in an active, cooperative effort to improve quality, streamline patient care and control unnecessary costs" (Vladek, 1997). Similarly, Welch (1998) advocates both prospective and bundled payments to induce efficient provision of hospital-nursing episodes of care.

The game-theoretic model described in this paper indicates that implementing prospective payment for nursing facilities, without bundled payment, will not induce efficient coordination of hospital and nursing facility services and, consequently, it will not eliminate the profit incentive for vertical integration. Further, the model indicates that the impacts of bundled payment on coordination efficiency, vertical integration incentives, and vertical efficiency are highly sensitive to the mechanism for determining payments made by the hospital to the nursing facility. Bundled payment will only induce efficient combinations of hospital and nursing facility services if Medicare sets a fee-for-service (FFS) price for the subcontracted nursing facility portion of the care.

## II. THE MODEL FRAMEWORK

Our model focuses on the interaction between a large hospital and the local-area nursing facilities that provide episodes of care for Medicare transfer patients. The model allows assessment of the system-wide impacts of decisions predicted for each provider and implications of those decisions for efficiency, incentives for vertical integration and impacts of vertical integration on efficiency. Because this model is described more fully in Banks, Parker, and Wendel (2001), the BPW model is not presented here in its mathematical detail. Rather, we describe the model's assumptions and results to facilitate consideration of the policy implications. The BPW model is a game-theoretic model that abstracts from real-world detail in order to focus on key interactions that shape the impact of payment system design on coordination efficiency and vertical integration incentives.

### Key model assumptions

1. In this model, each patient is admitted to the hospital for acute care. The hospital transfers the patient to a nursing facility when a nursing facility is willing to accept the patient. The nursing facility provides care until the patient meets established discharge criteria. When these criteria are satisfied, the patient returns home.
2. While some types of care can be only provided by the hospital or by a nursing facility, other services could be provided in both settings. Physical therapy or patient education, for example, can be provided in varying degrees by both the hospital and the nursing facility. For these substitutable services, hospital care intensity can substitute for nursing facility care intensity. If the hospital provides more physical therapy, each newly-transferred patient will be stronger and require

less therapy during the nursing facility stay. Lee, Randall, and Merrill (1996) summarized the recent literature, citing consistent evidence that providers have been substituting post-acute care for hospital care.

3. Discharge criteria limit nursing facility ability to respond to the introduction of prospective payment by discharging patients “quicker and sicker”. Discharge criteria, that define clinical indicators of patient medical stability and physical ability to return home, are established by organizations such as Interqual (a business unit of McKesson HBOC Inc.). This assumption, that the patient’s discharge health status is defined by externally-determined criteria, abstracts from concerns about the total amount of care provided before patients return home. It allows our analysis to focus instead a given level of health care provided during an episode of hospital-nursing facility care, and on the efficiency with which vertically-related providers produce that given level of quality. Production efficiency is essential for long-term cost control, and HCFA’s current payment system initiatives are targeted to induce this type of vertically-coordinated efficiency.
4. Both hospitals and nursing facilities are assumed to be able to choose the number of patients they treat and the intensity of service provided to each patient. The hospital, however, must be able to transfer each of its patients after initial treatment to a willing nursing facility, to complete treatment. Nursing facility leverage over hospital treatment intensity decisions therefore stems, in this model, from the short supply of nursing facility beds. This chronic shortage is evidenced by the high nursing facility occupancy rate, which averaged 87% during 1995 (United States

Bureau of the Census, 1998: 122, 129). Why don't entrepreneurs respond to the bed shortage by expanding nursing facility bed capacity? The answer may lie partly in Certificate of Need (CON) requirements and construction moratoria that restrict nursing facility entry in many jurisdictions. Empirical evidence indicates that CON regulation has effectively limited nursing facility growth (Nyman, 1989; Gertler, 1989). In addition, entrepreneurs may not enter the industry if the payment system succeeds in setting price equal to average total cost, thus limiting potential profits available to new entrants. While hospitals would prefer increased flexibility to transfer patients to nursing facility beds, the missing monetary-transaction market for transfer patients limits hospital ability to increase nursing facility profitability or increase the supply of beds, except through vertical integration. Empirical evidence published by Holahan, et al. (1989) and Weissert and Cready (1989) indicates that hospitals that own nursing facilities experienced fewer discharge delays, which is consistent with the entry restriction hypothesis if hospital-owned nursing facilities preferentially admit patients treated at the parent hospital.

5. Both hospitals and nursing facilities are assumed to maximize profits, since profit-maximization (or loss-minimization) is important to the survival of even non-profit entities. Both are assumed to face rising marginal costs of service, with no intrinsic gains from vertical integration.

Based on these assumptions, the model clearly abstracts from many realities of the health care industry. Most important, perhaps, is the abstraction that patients are identical.

Also, the assumptions of the model rule out the possibility that services will be

overprovided. This phenomenon, which prompted the 1984 conversion from FFS reimbursement for hospitals to prospective payment, has been widely studied and discussed. We focus here, instead, on a separate issue: will vertically-related providers combine their services efficiently to minimize the cost of producing a given level of quality?

### Strategic Interactions Within the Model

The intensity of nursing facility care required for each patient to meet discharge criteria depends on the intensity of care provided by the transferring hospital. The hospital can therefore influence nursing facility willingness to accept its transferees by adjusting its intensity of care. This strategic interaction between the hospital and the nursing facilities determines whether the services will be combined efficiently and whether vertical integration will be profitable or efficient.

The hospital's treatment intensity decision is *strategic* in this model because the hospital considers the nursing facilities' response to its decision before choosing its optimal treatment intensity. The impact of the hospital treatment intensity decision on the number of patients nursing facilities will accept is denoted, in game theory models, as the nursing facility reaction function. This reaction function essentially presents to the hospital a set of possible combinations of treatment intensity and number of beds available for transfer patients. This set of possible combinations defines the hospital tradeoffs: if the hospital chooses to reduce cost by providing less intense treatment, nursing facilities will be less willing to accept its transfer patients. Because the hospital considers the nursing facility reaction function before making a decision, these decisions

are interdependent and both providers' decisions are influenced by both the hospital payment system and the nursing facility payment system.

### **III. ASSESSING THE MODEL: CAN IT PREDICT THE PAST?**

Before predicting the future, a model should first be tested against the past. If the model's implications are consistent with recent phenomena, then it may be useful for assessing the likely outcomes of new policy initiatives. We begin, therefore, by considering the pre-1984 FFS payment system, and examine the model's predictions of the impacts of shifting to the post-1984 prospective hospital payment system. The results are consistent with observations noted in the health care economics literature, regarding bed shortages, incentives for vertical integration, and ongoing concerns about efficiency.

When both hospitals and nursing facilities are reimbursed FFS payments, the predictions of the BPW model are straightforward. Both hospitals and nursing facilities will provide care to each patient at the intensity that equates marginal revenue with marginal cost. The resulting care intensity decisions are not likely to be efficient, since the fees are determined by third-party payers and are not likely to reflect the patient's marginal value of treatment. Neither can it be said that a given level of care is being produced at minimum cost, since the externally-determined relative prices are not likely to reflect the marginal effect of each type of service on patient health. The model indicates that the independent choices of hospitals and nursing facilities maximize their joint profits, and thus FFS payment for both types of providers would not provide an incentive for vertical integration. See Table 1 for a summary of model cases; FFS reimbursement for both types of providers is noted in the table as case 1.

Medicare initiated prospective payment for hospitals in 1984. What impacts does the model predict? First, the hospital could increase its profits by reducing the intensity of care provided to each patient, and transferring them “quicker and sicker”, with the tradeoff that nursing facilities would respond by admitting fewer patients. The hospital’s strategy would create or intensify a shortage of nursing facility beds, in the sense that the hospital would prefer to place more patients, given the intensity of hospital care. The bed shortage is an intrinsic, though undesirable, effect of the hospital’s choice. The model further implies that the hospital’s care intensity decision is not independent of Medicare’s nursing facility payment rates. For example, increasing the payments made to nursing facilities would encourage the hospital to reduce its care intensity even further, since it expects that higher payments would induce nursing facilities to admit more patients needed more intensive care.

In this instance, the hospital’s profit-maximizing choice does not maximize joint profits; hence vertical integration between hospitals and nursing facilities is now a profitable strategy. The vertically integrated provider does not, however, combine hospital and nursing services efficiently. Hospital care intensity will be inefficiently low, with the resulting hospital profits used to subsidize nursing facility losses. Because the vertically integrated provider is shifting its treatment from the sector receiving prospective reimbursement to the sector receiving FFS payment, its increased profits come at the expense of the third-party payer. See case 2 in Table 1.

Consistent with the model’s predictions, Robinson provides empirical evidence that Medicare’s shift away from FFS reimbursement for hospital care induced hospitals to integrate vertically into the nursing facility business. He concludes: “Hospitals with

larger fractions of their patients covered by Medicare were significantly more likely to integrate vertically into nursing home services than were hospitals with proportionately fewer Medicare patients. And the effect grew over time as the administered pricing system was fully phased in” (Robinson, 1996: 371). This result is also consistent with evidence presented by Ahern, et al. (1996) that hospital-owned Health Maintenance Organizations (HMO’s) use more hospital resources than HMO’s owned by non-hospital entities, suggesting that actual or “virtual” vertical integration may affect the input mix. Anecdotal evidence and policy concern, that integrated providers substitute nursing facility services for hospital services excessively, is reflected in Medicare’s study to determine whether hospitals engage in such behavior.

Analysis of cases 1 and 2 indicates that the model may be useful for assessing the impacts of two new policy initiatives: the recently implemented prospective payment system for nursing facility care, and proposals for bundled payment. It also suggests the fundamental complexity of payment system design. The shift from FFS to prospective reimbursement for hospitals was intended to induce more efficient hospital operations. While the payment system redesign did push hospitals toward greater internal efficiency, it probably also spurred two unintended negative trends: more inefficient combination of hospital and nursing facility care for transfer patients, and increasing vertical integration.

#### **IV. IMPACTS OF PROSPECTIVE PAYMENT FOR NURSING FACILITIES**

Will implementation of prospective payment for nursing facilities improve coordination efficiency and eliminate the payment system-induced incentive for vertical integration? The BPW model predicts that such a system will reduce, but not eliminate the payment

system-based incentive for inefficient vertical coordination. The shift from FFS to prospective payment for nursing facilities fundamentally alters the nursing facility reaction function, therefore changing the strategic interaction between the hospital and the nursing facilities. Under FFS, the nursing facility was indifferent between admitting more patients and providing more intensive care for each patient. Under prospective payment, however, the nursing facility is more reluctant to admit patients from a low care-intensity hospital. As a result, the hospital is not able to strategically take advantage of the nursing facility as much as before, and the vertical coordination inefficiency declines. It is not eliminated, however, and vertical integration is still profitable. With both hospitals and nursing facilities subject to prospective reimbursement, vertical integration induces the joint firm to combine the two types of care efficiently. See case 3 in Table 1.

## **V. IMPACTS OF BUNDLED PAYMENT**

Under bundled payments, the hospital would receive reimbursement for the patient's entire episode of care, and would be free to subcontract with a nursing facility for portions of the patient's care. Buczko (1995) argues that substitution possibilities between hospitals and nursing facilities suggest bundled payments as a strategy to induce greater coordination efficiency. Lee, Randall, and Merrill (1996) agree, though they note that bundled payments may create a perverse incentive for the hospital to readmit patients after inappropriately short nursing facility stays, in order to begin a new episode of care and thus receive another payment.

The model suggests that the impacts of bundled payment on vertical coordination efficiency and vertical integration incentives are highly sensitive to the mechanism for determining the subcontract rate at which the hospital would reimburse the nursing facility. Cases 4-6 in Table 1 outline three such mechanisms: the nursing facility reimbursement rate is market-determined (case 4), Medicare sets a FFS rate (case 5), or Medicare sets a prospective rate (case 6).

#### Case 4: Bundled payment with market-determined subcontract rate

If the subcontract rate is market-determined, the hospital has the potential to act as a profit-maximizing monopsonist, while nursing facilities would be price-takers. Under these conditions, the BPW model suggests that bundled payment would not induce vertical coordination efficiency. In contrast to the current system, in which hospital care intensity is inefficiently low, the hospital now finds it profitable to provide an inefficiently high care intensity. This strategy is profitable because the increase in hospital care intensity both induces the nursing facility to admit more patients and reduces the price needed to cover the cost of nursing facility treatment. Bundled payment thus has the potential to create a new type of inefficiency, in which nursing facilities complain that hospitals over-treat patients and under-pay the nursing facilities.

#### Case 5: Bundled payment with a FFS subcontract rate set by Medicare

If Medicare sets a FFS subcontract price, the BPW model predicts efficient vertical coordination, no profit incentive for vertical integration, and efficient coordination of care by vertically integrated providers. Because the hospital does not control the price, it no longer has any incentive to over-treat patients. The hospital will equate joint marginal cost with the bundled payment set by Medicare, and treat each patient with an efficient combination of hospital and nursing facility care. According to this model, bundled payment with a FFS subcontract price set by Medicare would eliminate the profit incentive for vertical integration. Welch (1998) expresses concern that a bundled payment system could make it difficult for freestanding nursing facilities to compete with those tied to hospitals. The BPW model does not address this type of competitive issue directly, but it does suggest that the source of the freestanding facilities' competitive disadvantage might be less efficient vertical coordination. In this case, it is not clear that policy should discourage vertical integration.

#### Case 6: Bundled payment with a prospective subcontract rate set by Medicare

When Medicare sets a prospective subcontract rate, the hospital once again has an incentive to strategically choose an inefficiently low intensity of care. Nursing facilities respond by reducing the number of patients they will admit. The combination of hospital and nursing facility services is inefficient and vertical integration is profitable. Vertically integrated providers provide do, however, coordinate services efficiently.

## **VI. POLICY IMPLICATIONS**

As third party payer, Medicare is like a parent of teenagers, with great responsibility but little control over the outcomes. Medicare can only affect vertical coordination efficiency and vertical integration incentives via careful design of the incentive system embodied in its payment system. Designing such systems requires careful analysis of the goals and constraints of each participant and the structure of interactions among participants. Empirical examination of impacts of individual payment system innovations, such as prospective payment for nursing facilities and bundled payment may be enriched by abstract modeling that sacrifices realistic detail in order to focus on strategic interactions. Our analysis has four major implications for health care policy design.

First, our analysis suggests that prospective payment for nursing facilities, which may be valuable in inducing nursing facilities to increase internal efficiency, may block the effectiveness of a bundled payment system. Bundled payment, according to this model, only induces efficient vertical coordination when Medicare sets a FFS subcontract rate.

Second, our analysis suggests that vertical integration issues must be carefully considered. Because vertical coordination is only one objective in payment system design, it may be valuable to note that this model indicates that vertically integrated providers coordinate hospital and nursing facility care efficiently in cases 3-6. Thus, integrated providers coordinate care efficiently when both hospitals and nursing facilities receive prospective reimbursement. They also coordinate care efficiently under bundled payment, regardless of the mechanism for determining the subcontract rate. While the

BPW model does not address the issues raised by patient heterogeneity, it is likely that these issues provide additional efficiency advantages to vertically integrated providers. If vertically integrated providers enjoy greater vertical coordination efficiencies than independent providers, the results of empirical studies regarding patient placement in hospital-affiliated and non-affiliated nursing facilities must be interpreted with care. If vertically integrated providers coordinate care more efficiently than non-affiliated providers, care must be taken to distinguish between empirical observation of efficient coordination and empirical observation of anti-competitive behavior.

Third, the BPW model results point to the key role of nursing facility capacity constraints in defining efficient coordination. Mitigation or elimination of the nursing facility shortage would both restructure the strategic interaction between the hospital and the nursing facilities and redefine the “efficient” intensity of hospital care.

Finally, the model suggests that hospital and nursing facilities will jointly produce efficient episodes of care in only a limited number of cases. The current system of prospective payment for both hospitals and nursing facilities, in the context of this model, will not induce efficient vertical coordination among independent providers. Further, it will not eliminate the incentive for vertical integration, although it will induce vertically integrated providers to coordinate care efficiently. Bundling payments will also induce efficient production by vertically-integrated firms. Achieving efficiency without vertical integration, according to the abstract model developed in this paper, would require a bundled payment system in which Medicare sets a FFS subcontract rate for nursing facility services.

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**TABLE 1: Payment System Impacts on Efficiency and Vertical Integration**

<b>Payment system design</b>	<b>Do independent hospitals and nursing facilities combine services efficiently?</b>	<b>Is vertical integration more profitable?</b>	<b>Does the vertically integrated firm combine services efficiently?</b>
<b>Pre-1984</b>			
1. Fee-for-service payment for both providers	Yes	No	Yes
<b>1984-1999</b>			
2. Prospective payment for hospital, fee-for-service for nursing facility	No (Hospital care intensity inefficiently low)	Yes	No (Hospital care intensity inefficiently low)
<b>Current System</b>			
3. Prospective payment for both providers	No (Hospital care intensity still inefficiently low)	Yes	Yes
<b>Potential systems with bundled payment</b>			
4. Bundled payment (Nursing facility rate is market-determined)	No (Hospital care intensity inefficiently high)	Yes	Yes
5. Bundled payment (Medicare sets FFS rate for nursing facility care)	Yes	No	Yes
6. Bundled payment (Medicare sets prospective rate for nursing facility care)	No (Hospital care intensity inefficiently low)	Yes	Yes