Hospitals' Strategies for Orchestrating Selection of Physician Preference Items

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This article analyzes hospitals' strategies to shape physicians' behavior and counter suppliers' power in purchasing physician preference items. Two models of standardization are limitations on the range of manufacturers or products (the "formulary" model) and price ceilings for particular item categories (the "payment-cap" model), both requiring processes to define product equivalencies often with inadequate product comparison data. The formulary model is more difficult to implement because of physicians' resistance to top-down dictates. The payment-cap model is more feasible because it preserves physicians' choice while also restraining manufacturers' power. Hospitals may influence physicians' involvement through a process of orchestration that includes committing to improve clinical facilities, scheduling, and training and fostering a culture of mutual trust and respect.

Keywords: Physician preference items, standardization, supply chain, resource dependency.

THE GOALS OF RESTRAINING HEALTH CARE COSTS while maintaining quality of care and patients' safety continue to challenge health care leaders and policymakers. The supply environment is a promising arena for process improvement and better resource utilization that has not received as much systematic study as the potential savings would warrant.

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Supplies represent a point in hospital management at which major costs and expenditures are escalating: between 2003 and 2005, the average hospital's supply costs grew nearly 40 percent, from \$36 million in 2003 to more than \$50.5 million in 2005 (AHRMM 2005). Supply costs now represent as much as 31 percent of a hospital's total cost per case (Schneller and Smeltzer 2006). Gaining control of the hospital's supply chain—the flow of products and associated services to meet the needs of the hospital and those who serve patients—presents special challenges. This is because many of the most expensive materials—up to 61 percent of the total supply expenditures—are for items about which physicians have strong preferences (Schneller and Smeltzer 2006). These physician preference items (PPIs) include such devices as hip and knee implants, cardiac stents, and the mechanical devices used in spine surgery. They are so labeled because although hospitals are the actual purchasers of PPIs, it is physicians (surgeons) who determine which device to use for a particular patient and procedure. Surgeons' decisions are frequently based on factors not related to cost that may reflect their personal experience with a particular product, their assessments of a particular patient's interests, as well as their relationships with manufacturers' representatives (Ortho People 2000). Thus, there may be a disconnect between the hospital's cost containment goals and physicians' preferences.

This article explores the complex process of selecting, assessing, and purchasing costly PPIs and how the relationships among the key parties affect that process. We begin by describing the magnitude of the potential savings. Next we present a brief conceptual framework for understanding the challenges to marshaling these savings—challenges because of the power relationships among the various parties. We then present data from our interviews with health care clinical and management professionals who have firsthand experience managing the supply environment for PPIs. We explore how various strategies can alter the burden of risk for hospitals and demonstrate how hospitals may be able to shape physician-induced purchasing behavior by orchestrating rather than dictating the physicians' decisions. We end with our conclusions regarding a more productive alignment of goals between hospitals and physicians and suggestions for future research.

The Magnitude of the Problem

As we just noted, hospital supply costs are escalating dramatically, with PPIs representing a substantial share. The problem is exacerbated by

the rapidly growing demand. One example is the market for spinal implants used in spinal fusion surgery, which has grown to about \$4 billion per year (Abelson 2006a). Another example is the market for hip and knee replacements. According to the National Center for Health Statistics (NCHS), there were 234,000 total hip replacements and 478,000 total knee replacements in 2004, representing a 50 percent increase in hip replacements and a 40 percent increase in knee replacements in the five years between 2000 and 2004 (NCHS 2000, 2004). Over the next twenty-five years, the number of hip replacements is predicted to grow by 174 percent, and the number of knee implants is predicted to increase by an estimated 673 percent, to almost 3.5 million procedures by 2030 (Kurtz et al. 2006).

NCHS statistics further reveal that the rate per 10,000 population for hip and knee replacements is highest for persons sixty-five and older. This statistic, too, has risen dramatically since 2000: the rate for total hip replacement among those sixty-five and older was 25.7 in 2000 and 37.3 in 2004, and the rate for total knee replacement among those sixty-five and older was 61.2 in 2000 and 80.3 in 2004. As a result, Medicare has been and will continue to be a major payer for implant surgery: between 2003 and 2005, Medicare's total payments to hospitals for implant surgery increased 40 percent, from \$10 billion to \$14 billion (Abelson 2005).

Medicare's per-case payment basis using diagnosis-related groups (DRGs) is intended to cover all the services provided by the hospital, including the cost of devices used in surgery. But while prices for devices have been increasing, Medicare's per-case payments for some surgical admissions have been decreasing. To illustrate, manufacturers' prices for artificial knees and hips have risen an average of 8 percent per year, and the average cost of the implantable device itself can consume between 40 percent and 80 percent of the total payment a hospital receives for the operation (Abelson 2006b). At the same time, Medicare's per-case payments to hospitals for hip implant procedures (DRG 209) fell by more than 9 percent within a five-year period, and in July 2006 Medicare proposed reducing reimbursements for hip and knee replacements by 10 percent.

This dilemma is not lost on policymakers, and the Medical Payment Advisory Commission (MedPAC), established to advise Congress on issues affecting the Medicare program, has addressed the challenges of pricing for expensive items such as stents, pacemakers, and implants (MedPAC 2001, 2005). Members of MedPAC recognize that it is not

feasible for Medicare (or private health plans) to endorse a particular device, especially when therapeutic equivalents are available, as this would be seen as illegally entering the practice of medicine. Instead, MedPAC has recommended that hospitals work aggressively with their medical staffs to standardize their use of medical devices and to secure larger discounts from suppliers.

Yet, hospitals seem to differ in their ability to negotiate prices for medical devices, and the costs of similar PPIs reportedly can vary dramatically. A recent survey of one hundred hospitals revealed that the prices for the same device may range between \$2,000 and \$9,000 (Abelson 2006b). In fact, one hospital in the New York City area paid \$8,000 more than that paid by a competitor for the same artificial hip device (Abelson 2006b).

These statistics highlight the importance of the supply environment to hospital resource utilization. Gaining control of it is not a straightforward matter of hospitals' negotiating better purchasing contracts with suppliers and imposing product standardization on physicians. We next discuss the complexities of the problem.

Complexities of the Problem

Professional Power and Resource Dependency

Conflicts between professional powers and organizational control have a long history (e.g., Leicht and Fennell 1997; Scott 1982). In health care, one manifestation of professional power and autonomy (Freidson 1970) is the physicians' ability to bill separately for services provided to their hospitalized patients. Because hospitals now face ongoing cost-control pressures resulting from Medicare's prospective payment system, low Medicaid payments, and price negotiations with large purchasers, they are trying to alter the nature and degree of physicians' autonomy without excessively reducing physicians' commitment to the organization. Substantial research has focused on the impact of such managed care-driven changes, often with the aim of understanding how best to achieve mutually productive, effective, and satisfying relations between physician and hospital in an environment of cost containment (e.g., Robinson 1999; Scott et al. 2000; Shortell, Gillies, and Anderson 2000). But these studies have not produced a dominant model, in part because health care delivery is extraordinarily complex, and different issues may require different

approaches to cooperation and control between hospital and physician (e.g., Lake et al. 2003).

In trying to understand the recent shifts in the balance of power among hospitals, physicians, and other major actors, the theoretical concepts of resource dependency and countervailing power are particularly useful. *Resource dependency theory* posits that power in relationships is best understood by analyzing the resources controlled by the parties (Emerson 1962; Pfeffer and Salancik 1978). That is, the power of one actor over another depends on the relative importance of the resources that each controls. If the resources controlled by one party are essential to another party, the resulting dependence gives greater power to the controlling party. This dependence is intensified when a resource is not only important but is also considered scarce and nonsubstitutable.

The related notion of *countervailing power* suggests a similar process (Galbraith 1967). The various actors in the health care system are inherently “interdependent, yet distinct,” and key actors may be able to form significant alignments and realignments (Light 1993, 71). These alignments can be formed between the physicians and the corporations that supply medical equipment, materials, and information technology, thus both benefiting the profession and making it “dependent in uneasy ways” (Light 1993, 72). Hospitals must pursue their goal of reducing costs in a context of dependencies and power relations in ways that do not compromise quality of care, patient safety, and trust.

Differences in the Control of Key Resources in the Supply Environment

The key actors in the health care supply chain are the physicians and other health care providers, hospital managers, manufacturers and supplier representatives, and patients. Each of these actors controls important and scarce resources. We list next some of the main resources controlled by these actors. The power to control important resources is buffered by interdependencies among these actors.

Physicians control hospital admissions and the resulting flow of dollars to the hospital, so in this regard, hospitals are dependent on physicians. Physicians also largely control decisions about health care treatments, including what devices to use in orthopedic or cardiac surgery.

Suppliers and their representatives control the manufacture, supply, and distribution of PPIs. Suppliers provide physicians and hospital

support staff with specialized knowledge about their products, training in the use of new products, and even on-site technical assistance in the operating suite. Suppliers also offer physicians research opportunities and remuneration for helping develop and test various products.¹

Hospitals control the capital and human resources, such as well-equipped and staffed operating rooms, that make it possible for surgeons to do their work. Hospitals also control access to their facility, as well as the scheduling of operating rooms. In addition, hospitals control purchasing processes and the management of supply inventories.

Finally, patients themselves have a growing amount of power in the health care supply chain. Patients' preferences for particular physicians and desires for particular surgical procedures may influence decisions by both physicians and hospitals. Despite regulatory cautions, spending for direct-to-consumer (DTC) advertising for medical devices grew from almost nothing in 1996 to nearly \$50 million in 2005, and more than one-quarter of companies making medical devices report engaging in DTC campaigns (Cutting Edge Information 2006). In addition, the move toward patient spending accounts and higher health-plan deductibles have the potential to make patients more vocal in expressing their product selection preferences, often formed as a result of DTC efforts (Frost & Sullivan 2005).

Lack of Accepted Product Standards

Other industries (e.g., aeronautics and automotives) have established standards regarding the extent to which products meet particular criteria and rules for their consistent application in practice. But standards regarding product acceptability in health care are not yet firmly established for product application in the practice setting. In fact, no consistent national standards or programs to influence product choice of PPIs have emerged. Although the U.S. Food and Drug Administration (FDA) must review the safety and efficacy of new medical devices, neither the FDA nor any other agency provides national standards for product deployment. There are no criteria for determining when new products will be used instead of existing (and often less expensive) products, despite sometimes huge cost differences. For example, the price of drug-eluting stents averaged \$2,444 across a sample of U.S. hospitals, compared with the average price of bare-metal stents at \$950 (AHRMM 2005).

International experience suggests that even when standards of utilization for PPIs do exist, their implementation varies. In the United Kingdom, for instance, the National Institute for Clinical Excellence (NICE) provides guidance to clinicians on a wide range of procedures and products, yet significant variation in their usage remains. Nevertheless, physicians, like their U.S. counterparts, retain considerable autonomy regarding product choice, and many do not follow practice guidelines and protocols derived from evidence-based medicine. A recent NICE-sponsored study reported that only 66 percent of patients admitted to a hospital for hip replacement in the United Kingdom received a “benchmarked” hip prosthesis, with no increased use of recommended prostheses: “More than fifty different prostheses are being used, whilst the technology assessments indicated favorable or intermediate findings for seven, of which only four appear to be used in the NHS” (Cullum et al. 2004, 28).

Suitability of Non-PPI Supply Management Strategies

In the absence of standards for PPIs and in the face of power interdependencies among key actors in the health care environment, hospitals have become interested in experimenting with strategies to contain costs that have been successful for non-PPI supplies.

Most U.S. hospitals have tried systematically to gain control over the purchase of everyday use or “commodity” items by means of creative contracting with suppliers, either through purchasing coalitions known as group-purchasing organizations or through local contracting bodies (Burns 2002). Favorable pricing is linked to a hospital’s commitment to buy a specific volume of a product, referred to as contract compliance. While achieving contract compliance may be feasible for pharmaceuticals and commodities such as bandages and syringes, hospitals are less able to ensure contract compliance for PPIs because specialty physicians’ personal preferences for items in the same PPI category still vary widely. Thus, in order to use this strategy to manage the PPI supply, hospitals must directly address physicians’ preferences.

A second, related strategy that has been successful in non-PPI purchasing is using multidisciplinary teams to assess product equivalencies. In pharmaceutical purchasing, hospitals have tried to influence physicians’

behavior through the use of pharmaceutical and therapeutics (P&T) committees. P&T committees, which include clinicians, pharmacists, benefits managers, and hospital management, scrutinize the range of pharmaceuticals on the market by assessing their efficacy, safety, relationship to outcomes, and relative costs. The outcome of a P&T committee's deliberations is a hospital formulary that specifies which drugs and drug categories it will include and which drugs will be available only by exception.

Although the P&T committee model has been viewed as a promising approach to PPI standardization, there still are substantial differences between the assessment and utilization of pharmaceuticals and PPIs. Not only is there less research on therapeutic equivalencies for PPIs than for pharmaceuticals, but also less time is needed to bring new devices to market—typically between three and five months for medical devices, compared with two years for most pharmaceuticals (Schoonmaker 2005). It can be difficult to assess product substitutability across different manufacturers or with different features, especially when manufacturers do not readily reveal their pricing (Abelson 2005). Also, unlike drugs, it is far more difficult to change a patient to an alternative surgical implant if he or she does not respond well to the initial implant.

In summary, there is no obvious way for hospitals to lower the high costs of PPIs. Early efforts gave this task to the departments of materials management, whose charge was to keep the medical staff happy by ensuring that the physicians' preferred items would be available as needed. Now, however, hospital managers and policymakers alike recognize the need to move beyond this traditional "doctor's workshop" model.

Data and Methods of Analysis

The next section discusses several hospitals' and hospital systems' efforts to surmount these hurdles in orchestrating physicians' choices for physician preference items. We used a qualitative, interview-based research design to produce rich descriptions of the PPI selection and purchasing processes and the contexts in which they occur in different hospitals and systems (Devers 1999; Sofaer 1999). Our intention was to find patterns and configurations among the variables and to consider their relevance suggested by the resource-dependency conceptual framework.

The study design enables triangulation of the sources by drawing on the different perspectives of people in various positions involved in selecting and buying PPIs and representing different facilities within the same system and across systems (Patton 1999). Our sources of information also include written materials provided by the respondents and facilities, which we analyzed for alignment with the statements provided in interviews.

Selection of Interviewees

We used a two-stage purposive sampling method to identify potential interviewees with an interest in research on improving performance by managing supplies. We began by identifying hospital systems known to vary in their experience and satisfaction with the PPI selection and standardization process: this included two member systems of the Center for Health Management Research—a National Science Foundation Industry University Cooperative Research Center (and a source of funding for the current research)—and two additional hospital systems. These systems differed in size (the largest with thirty-two hospital members, two with eight hospitals each, and the smallest with two hospitals). The hospitals were located in major cities in the Midwest, Southwest, and West. All the facilities were nonprofit. Given our study's exploratory nature and the small number of systems, we did not incorporate market-level variables into the sampling.

After identifying the systems and facilities to include in the study, we sought to interview knowledgeable persons at different levels in the organizational and professional hierarchy who had firsthand information and experience with efforts used in their system and individual facilities. Because hospitals and systems use different models for the division of labor in their supply environments, we could not use a standardized list to select interviewees by title. Instead, we interviewed key respondents representing the hospitals' clinical and clinical-administrative staff—physician leaders² and other clinical professionals³—and representing corporate and supply chain management.⁴

We conducted interviews during 2005 with twenty-five members of the four hospital systems, representing several facilities and their corporate offices. All but two of the interviews were face-to-face meetings on-site, and the remaining two were telephone conference calls between

us and the interviewee. Most of the interviews lasted from sixty to ninety minutes and were scheduled during day-long on-site visits. We made follow-up telephone calls to clarify certain points. Both of us took extensive notes during each interview and transcribed the notes as soon as the interview was over. We then compared and merged our transcribed notes to ensure a complete final transcription for each interview.

We described the purpose of our study when we first asked for an interview, which gave our primary contacts an opportunity to gather information before the interview and find other appropriate respondents in the systems and facilities. We used a semistructured interview protocol to detail each facility's approach to buying physician preference items. This included details about product assessment, physicians' involvement, negotiations with suppliers, compliance mechanisms, and incentives. The respondents were allowed substantial opportunity to elaborate on points of greatest relevance to that particular facility. Because of the variation in hospitals' standardization strategies, we found it best to allow each interviewee's story to unfold in accordance with his or her experience.

Although we focused mainly on interviews with members of the facilities just described, we also attended meetings of two major group-purchasing organizations to obtain additional perspective from actors external to the facilities and systems themselves.

Analysis

To enhance investigator triangulation, each of us independently and then jointly analyzed the same data (Patton 1999). We reduced our interview data through a series of iterative steps. We generated codes for various conceptual categories, then sorted and displayed the data using memos and diagrams (Weitzman 1999). We then exchanged the memos and diagrams and discussed our interpretations. As we gathered more interview data, we conducted additional independent iterations, incorporating the new data into the conceptual categories and adjusting the categories when necessary until we achieved analytical convergence (Devers 1999). We shared our initial observations from the analysis with our interviewees so as to enhance the credibility and validity of the findings (Devers 1999). These interviewees included representatives of the two systems belonging to the Center for Health Management Research, whom

we asked to determine the extent to which our observations reflected their own understanding of their hospitals' standardization and value analysis.

Findings

While our interviewees largely agreed that PPI management was one of the best opportunities for hospitals to reduce their costs, they also offered a range of experiences and impressions regarding how best to proceed. In addition, although some organized health care systems may have centralized processes for buying non-PPI supplies, we found no consistent model for the PPI context even within the same facility or system.

Our analyses revealed several important and interrelated decisions that hospitals must make to standardize physician preference items: (1) how to define "standardization" and a standardization strategy, (2) how to implement the chosen strategy, and (3) what mechanisms to use to encourage cooperation with the strategy. Our interviews demonstrated that each of these decisions is affected by resource dependence–related factors that can facilitate or impede the effectiveness of standardization efforts. We next discuss these decisions.

Selecting a Standardization Strategy

The hospitals in our sample used different definitions of "standardization." The approaches that we found were designed to restrict choice in some way but differed in what they targeted for standardization and where they placed the burden for accommodating to the restricted choice.

The Formulary Model. The formulary model restricts the number of choices of manufacturers from which physician preference items are purchased or of the range of products that are bought for a given procedure. In practice, restrictions on product choices also mean restrictions on manufacturers. The formulary model resembles the standardization strategy used for pharmaceuticals within hospitals and is consistent with the supply source reduction efforts used by other industries (Chen and Paulraj 2003). The assumptions underlying this approach are (1) that a hospital's commitment to use a particular manufacturer will result in lower prices from that vendor; (2) that the chosen manufacturers will

have a sufficient range of products to meet the physicians' demands for their various patients' needs; (3) that the wide range of products currently available on the market is unnecessary because there are genuine product equivalencies; and (4) that patients' safety is enhanced when the operating team uses familiar products with which they have experience, even when individual members may rotate from one team to another.

The Payment-Cap Model. The payment-cap model does not explicitly restrict particular products or manufacturers but instead standardizes costs by restricting the price paid for products in a particular category. The principal assumption underlying the payment-cap strategy is that the manufacturers of similar products will compete to offer an equivalent product within a price ceiling established for that product's specification. Nevertheless, this strategy may result in restricting some choices of products if vendors decide not to meet a hospital's price ceiling and not to make their products available to that facility. A variation of the payment-cap model is the *reverse auction*, in which prequalified vendors are offered a short time to bid on a carefully defined product, with committed volumes going to multiple low bidders (Smeltzer and Carr 2003). One administrator in the study described the advantages of this model for physicians and hospitals: "Physicians have freedom of choice among any of the participating suppliers, and [the system] has no vested financial interest, since we pay each [successfully bidding] supplier the same rate" (supervisor, contract administration).

Both the formulary model and the payment-cap model require decisions about product price, product choice, and assessments of product equivalencies. But they locate the burden and risk of these decisions on different actors and affect the actors' relationships in different ways. Because the formulary model limits the items available to physicians, it places the greater burden on physicians to adjust to a restricted set of products. This often requires that physicians change their practice decisions to comply with the product's availability established under the formulary or make frequent requests for exceptions. In adopting this strategy, however, hospitals must rigorously assess products' equivalency with the risk that a restricted product set could compromise patients' safety and outcomes. In markets where physicians have alternative facilities to choose from, hospitals also face the risk that disgruntled surgeons will take their patients elsewhere or even band together to develop specialty facilities outside the hospital to minimize their dependence on the hospital's resources.⁵

In contrast, the payment-cap model places the greater burden on suppliers to shift their pricing strategies in order to satisfy hospitals' pricing ceilings. Thus, suppliers are restricted in setting product prices as they choose. Hospitals also must conduct sophisticated pricing negotiations with suppliers, convincing them that physicians at that hospital agree with the product assessment on which the pricing ceiling has been established and that requests for exceptions will be few. To be effective, hospitals must first persuade physicians to agree on product equivalencies. Payment caps may thus lessen the burden on physicians to shift their preferences because this strategy can preserve a wider range of choices for them.

The relative power in the relationship of hospital, physician, and vendor is therefore affected by where the burden rests for adjusting to the standardization decisions. Our interviews revealed that, even in a managed care environment, the power of the medical staff has an enduring influence on the hospital's decisions. Hospital leaders recognize their dependence on the medical staff to bring patients to the facility: "In principle, the hospital doesn't want to interfere with physician choice. This is especially important when the hospital is not a closed staff [and in markets where physicians have other options regarding where to send their patients]. It's hard to get consensus in such a system, so it's just not possible to standardize on vendors" (medical director). Another added, "Sometimes facilitating physician choice is a condition of recruitment of top doctors who insist on particular equipment" (clinical assets manager).

While the trend in hospitals we studied appears to be toward a payment-cap strategy, there remains hesitation about its wisdom: "We have abandoned the concept of one vendor and mainly standardize on price rather than product. But we still ask ourselves, 'Are there too many choices?'" (vice president, clinical integration).

Implementing the Strategy

The hospitals in our study varied widely in how they implemented their standardization strategies. We found no identifiable pattern associated with a system's characteristics and even found differences within the same facility when comparing mechanisms used in cardiology with those used in orthopedics.

Most of the facilities in our study reported using value analysis teams (VATs) to facilitate standardization processes and decision making. This

information is consistent with our interviews with representatives of one of the largest group-purchasing organizations, which indicate that the use of VATs is growing, despite the recognition that VATs present unique challenges to product equivalency processes not faced by pharmaceutical and therapeutics (P&T) committees, as described earlier. Like P&T committees, VATs are designed as a disciplined process for assessing various products and determining the “value added” by certain product features to patients’ outcomes and safety, weighed against relative costs. These assessments of comparability are then used when making contracting and other strategic decisions regarding product equivalencies. But unlike P&T committees, VATs have not become a well-institutionalized process that could be easily adopted across facilities.

As a result, we found substantial variation in how VATs are constituted and function. In some cases, the hospitals in our study used the group-purchasing organization to bring together groups of elite or influential clinicians. In other cases, the facility itself took responsibility for creating and running the VAT. The VATs’ stability differed as well: some serve as ad hoc committees convened when new products come into the market or at the end of a contract period, and others serve as standing committees formed for a particular product category.

The following description from one facility illustrates the complexities of the value-analysis process:

[Our facility] has a number of product-segment-specific committees, some chaired by a materials management person and some by a clinical department person. Products are reviewed as contracts expire or when clinical circumstances dictate. The central materials management [CMM] department is the lead for financial review and data analysis. The CMM department reviews the current usage of items in the selected product group and compares current costs to projected costs using actual volume, current cost, and contract price. We provide this information to the various committees that recommend product selections and contract commitments. Products are reviewed by the committees for “cost effectiveness.” Committees recommend products to be used as “formulary” that leads to standardization on basic products. (contract administrator)

Despite the description of a smooth-running process coordinated by members of supply management, the experience reported by those at other facilities reflects several areas of difficulty, as we discuss next.

Physician Involvement. The goal of getting physicians to feel a sense of ownership of the process of PPI standardization emerged in many of our interviews with top-level managers. As one put it, “Our goal is to develop a new partnership mentality” (vice president, supply chain). However, achieving that goal can be difficult, especially enlisting physicians’ participation in the hospital’s VAT for physician preference items:

We tried using a VAT for the operating room products, chaired by the OR manager. There were no physicians on the team; they declined, but then were insulted that they had to “get permission” to try something new. We didn’t accomplish a thing. We’re now creating two new teams that will be chaired by a clinician [the vice president for medical affairs]. We’ve invited clinical department chairs, but we’re not sure they’ll come. (clinical operations manager)

This manager lamented the catch-22 of physicians’ involvement in VATs: “Surgeons want to be involved, but they’re so busy today. You absolutely have to have physician input. Without it, you get asked ‘Have you tried it on a patient?’” Another senior leader in this facility agreed, “You can’t force docs to the table.”

This sentiment was echoed by a respondent at the corporate office in the same system: “The problem is getting physicians to participate, but without that, there is no validity to the process. Physician preference groups can be used to establish consensus, so we need the involvement of unit directors and nurses” (clinical equipment manager). Another manager added, “Physicians think all I care about is money. So it’s really important to have a clinical person involved in standardization, and I can stay in the background” (regional director, materials management).

Our data also suggest that physicians may avoid participating in the value analysis committees to express their resistance to the concept of product standardization, especially when it appears to be imposed and overseen by management. This resistance extends as well to procedures established for exceptions to the formulary. Hospitals that give the decisions about exceptions to nonclinicians report poor relationships with physicians: “If a physician says, ‘I can’t use this product [on the formulary] but need to use that one [not on the formulary], I have to take it to the chief financial officer with a clinical reason. Doctors are insulted that they ‘have to get permission’ to try something new” (clinical operations manager).

These observations reveal hospitals' dependence on physicians' participation in standardization decisions and product equivalency assessments in order to give credibility to the product assessment and decision-making process. If they are not comfortable with their hospital's approach, physicians may withhold their resource of "willing participation," thereby stalling standardization efforts.

We found that when the standardization strategy does not aim to be a rigid product formulary imposed and enforced by nonclinicians, physicians were more willing to become involved in the process. For example, a manager at one facility offered an optimistic report of its assessment team for orthopedics. In addition to the director of surgical services, the team includes several practicing physicians, nurse managers, clinical nurse specialists, the materials manager, and the cost-accounting financial representative. This facility uses a strategy that sets a payment ceiling for products and places high expectations on vendors, in terms of both price and services provided by the vendor: "Our team works well. It's a multiyear team with stable membership, and about 90 percent of our physicians show up [to meetings]. Doctors don't want someone else dictating to them how to choose. They consider this insulting. There's good intellectual honesty in the group" (director, surgical services). The key to this strategy, however, is that doctors understand that their commitment to move away from their product of choice is required if prices do not fall. Without this commitment, the hospital has little chance of reducing its dependence on suppliers.

Assessment of new technology in this facility also is coordinated by physicians, who ask, "What's new here?" and "Is this clinically worth trying?" Only after these clinical questions have been answered is the new product sent to administration to figure out its cost and feasibility. This facility also reports success in handling requests for exceptions, largely because the decisions are team-based, driven by clinicians. Interestingly, "there are very few requests for exceptions because physicians don't want to look bad in the face of their colleagues. They don't want to be labeled 'out of contract'" (director, surgical services).

Vendor Involvement. Manufacturers' representatives have long influenced physicians' selection of products, as well as pricing. Many proponents of standardization viewed the power relationships between physicians and vendors as causing a "huge breakdown in the system" (coordinator, clinical technologies assessment). The antagonism directed toward vendors can be high, as one frustrated corporate vice president stated, "My avowed goal is to get the salesman out of the

decision-making process. It's become an incestuous bucket of worms" (vice president, support services). Another senior vice president commented, "It's the only business I've ever seen where the salesman is always in the room. It's like having the fox guard the henhouse" (vice president, purchasing).

Despite frustration at vendors' influence over product selection, most of our interviewees wanted to maintain the vendors' involvement to some degree. Our interviewees recognized their dependence on manufacturers' representatives, who offer services that many physicians and hospitals find essential. As noted, vendors often train physicians and support teams in the selection and use of their products for specific patients. This may extend to providing expert advice and guidance about instrumentation and calibration during procedures in the operating room. One manager distinguished between "high-volume" physicians who are "so good they can use any implant" and lower-volume physicians who may be less confident and "thus are more closely tied to the vendor and the product" (regional director, materials management). As a result, some physicians exhibit a higher "comfort level" using products by a particular manufacturer and endorsed by a particular vendor, a practice that some clinicians and managers maintain leads to better patient outcomes. A similar sentiment was expressed by a medical director at another facility: "It's not always the same OR team, so having the sales rep in the OR can give assistance to the scrub nurse" (medical director, orthopedics).

Interviewees also pointed out that vendors facilitate the hospital's inventory management, a particularly valuable service for products with short shelf lives (such as drug-eluting stents). In many instances, vendors themselves provide inventory on a "just-in-time" basis on the day of surgery. In addition, interviewees acknowledged that vendors may provide hospitals with up-to-the-minute information on new product availability and FDA approval status.

Hospitals use several tactics to gain greater control over vendors' involvement, preserving the benefits that vendors offer while curtailing what is considered vendor intrusion into the decision-making process. These hospitals draw on their resources of contracting power and control of access to the facility. Hospitals that use a payment-cap strategy report success with a "tough love" policy for vendor pricing: "We set a price ceiling—a capitated rate—and told recalcitrant vendors 'forget it.' Ultimately, they came to the table" (director, surgical services). Another interviewee described a similar experience: "We established a price and

basically played ‘hardball.’ If a vendor would not [agree to the price ceiling], we would ‘lock them out.’ Everyone eventually came in under these terms” (vice president, supply chain). In another instance of “tough love” toward vendors, a hospital reported that it refused to pay for an unapproved product brought to the hospital by a vendor and “shopped” directly to the physician.

Another system has instituted a “gatekeeping model” that sets boundaries on vendors’ access to physicians inside the hospital, whereby vendors must receive hospital certification and have a preapproved appointment to enter the facility. “We can’t control the relationships that vendors have with physicians outside the hospital, including the ‘research opportunities’ for developing products. But we can control what happens at the hospital” (purchasing agent, PPIs).

Availability of Data. Regardless of which standardization strategy is used, many interviewees identified the critical role of accurate, integrated, and fine-grained data to support decisions about product use and equivalencies, to enable cost comparisons, and to assess patients’ outcomes. For example, information that could enhance the facility’s ability to manage value analysis efforts has characteristics that transcend most hospitals’ conventional information technology, requiring the ability to track products (by specific identification numbers), costs, and outcomes. As the interviewees pointed out, although some dedicated information systems are designed specifically for physician preference items in areas such as cardiology, the enterprise software systems that hospitals use generally do not bring together the cost and clinical data needed to orchestrate decisions regarding equivalencies.

We found widespread frustration with the barriers to obtaining appropriate data. One interviewee explained the central role of data:

There is so much practice variation, and the system doesn’t drill down to the detail of patient use. We know supplies were delivered, but we don’t have information systems that integrate the data at the point of use. Our systems aren’t talking to each other. This makes it hard to match outcomes with products. But we need this information to help increase physicians’ trust in the product decisions we make. (regional director, materials management)

Another agreed: “Physicians like numbers; that makes it believable. But we need data on clinical outcomes, too” (vice president, purchasing). A third senior manager described the data issue as a “chicken-and-egg game: physicians have to make the EBM [evidence-based medicine]

decisions, but if there's no evidence, there's no decision" (vice president, support services).

This problem apparently is a common one. While many facilities maintain a clinical effectiveness database that includes length of stay and morbidity, the data are not tied to specific products. Furthermore, our interviewees reported that "homegrown" data were essential in order to target costs and usage. "Local data are key. We need cost-per-case and cost-per-physician data. Right now, our data need a lot of manual scrubbing to get down to the patient case level. When we have good data, consensus isn't hard to achieve" (medical director).

The rapid change in products also contributes to inadequate data: "The market intelligence is not well developed. Some products change so fast that it's hard to stay on top of it. As a result, new technology assessment often takes place on an ad hoc basis" (purchasing agent, PPI). Another pointed out that the problem is exacerbated because the initial FDA approval does not include product equivalencies. Vendors also are seen as obscuring needed data for cost comparisons. As one corporate vice president remarked, "Vendors try to keep products from being linked and compared. They all want their product to be seen as unique and use it as a marketing tool. It's a constant battle to see who can add the most bells and whistles" (vice president, support services). To complicate price comparisons, some manufacturers include a price disclosure confidentiality clause in their contracts with hospitals, clauses that some hospitals in our study report resisting as a matter of contracting policy.

Our interviewees made it clear that information is an important yet scarce resource that complicates the relationships among the key actors, because none of the actors is fully in control of this resource and because of the need to rely on one another to provide different components of the data for a complete picture.

Incentives to Achieve Physicians' Cooperation

All the hospitals in our study recognized the need for identifying mechanisms that would encourage physicians to participate in and comply with standardization guidelines and goals. In many instances, this was described as a question put to physicians: "What do you want [in exchange for your help with this standardization effort]?" We analyzed these mechanisms as facilitators of participation and cooperation and included both tangible and intangible factors.

Tangible incentives are initiatives by hospitals to enhance the efficiency of physicians' work. They included investments in capital equipment, dedicated specialty surgical units with assigned staff, a greater commitment to support advanced nursing and staff training, and dedicated staff to provide pre- and postoperative patient education. A related, more comprehensive tangible approach is the strategy of moving to the "focused factory" (Herzlinger 1999, 158) or product-line model for one or more facilities within a system, where greater resources are channeled to a limited set of services in that facility, reducing intrafacility competition for resources and signaling to the participants the value of their services to the hospital.

Other tangible incentives took the form of compensation to physicians for their time, with some facilities offering physicians an honorarium for serving on the VAT committees. We noted that some of the economic incentives "reflect the physician as an entrepreneur" rather than the physician as a "socialized professional acting as the patient's agent" (Town et al. 2004, 93S). Direct financial incentives in the form of gainsharing, however, were not readily embraced as appropriate incentives (Saver 2003), especially in the current climate in which gainsharing programs continue to be approved on a case-by-case basis by the Centers for Medicare and Medicaid Services (CMS 2005). As one leader put it, "We'd rather not go there right now. We're not slamming the door, but we could go down that road and get hung for it later" (purchasing agent, PPI). Still others expressed concern that direct financial incentives like gainsharing could distort decision making.

Intangible factors were more difficult to identify, since they often reflected aspects of the hospital's culture rather than incentives available to clinicians. However, it was clear that facilities that reported high levels of cooperation among clinicians and administrators also generally reported greater success in standardization efforts and satisfaction with the outcomes. Often this cooperation was facilitated by someone serving in a liaison role of "clinical resource specialist." Such people had both clinical (most frequently nursing) and managerial experience and thus were able to speak with firsthand knowledge and perceived competence about the various parties' concerns. Interestingly, we found that clinical experience did not need to be that of a physician in order to receive respect from practicing physicians.

Furthermore, achieving high levels of cooperation was the result of behaviors demonstrating that each set of actors was considered a

legitimate partner in the decision-making process, along with behaviors that showed respect for the strengths and capabilities associated with each group. At their best, these behaviors became mutually reinforcing, as opportunities to engage cooperatively led to further cooperation. A shared history of having weathered periods of financial difficulty or leadership problems in the facility also served as an intangible incentive to cooperate in efforts to help the facility remain viable. “Memories of misfires” serve as reminders of the importance of cooperative relations today (chief of cardiology).

These intangible incentives can be analyzed as reflections of an environment of trust, where trust is the “willingness to engage with others—to cooperate—even in the absence of opportunities to monitor or control the others’ behaviors” (Montgomery 2001, 230). This condition characterizes the optimal standardization effort, since decisions about product assessment and use are not always amenable to aggressive and thorough monitoring. And as we noted, decisions are often based on incomplete information, particularly with regard to outcomes. Creating an environment of trust requires that people act in a trustworthy way, that is, demonstrating competence, integrity, and benevolence. At those facilities where the interviewees referred to mutual trust, it was clear that both management and medical staff were perceived to be competent, honest, and well meaning—the essential elements of trustworthiness. Moreover, those facilities with a shared history of working together demonstrated the reinforcing nature of trust. Conversely, facilities that reported a history of conflict between management and physicians demonstrated the difficulties of overcoming a lack of trust and the resulting poor record of cooperation.

In resource dependence terms, an environment of trust became a facility-level source of power vis-à-vis previously powerful suppliers. We encountered this situation most often in facilities with a payment-cap model of standardization.

Discussion

Summary

As business entities, hospitals recognize that when they can choose among competing products, they may have opportunities to negotiate

with vendors for better prices. With the PPI percentage of costs-per-discharge increasing, greater attention is being directed to product selection and standardization. The relationship between manufacturers and clinicians, however, has long frustrated hospitals' efforts to control supply costs. Because they have been unable to lower costs by dictating product choices to physicians, hospitals have instead become orchestrators influencing physicians' decisions.

As shown in other contexts (e.g., Dhanaraj and Parkhe 2006), orchestration is an appealing approach in the absence of a clear hierarchical authority relationship among interdependent actors. In this framework, the hospital serves as the "hub" organization linking the other participants in the system through various processes of influence, negotiation, and resource control. Orchestration, however, requires more than merely convening key parties to make decisions. As we have observed, physicians do not always come to the table willingly, and hospitals have responded with a variety of financial and nonfinancial incentives to encourage physicians' cooperation and participation. Notably, however, the hospital leaders in our study expressed a desire for guidance about creative incentives they can use.

Our interview data further reveal that the orchestrator must have a finely tuned sense of what may and may not be possible within the framework of resource dependence and countervailing power. The hospitals in our study that showed greater satisfaction with their standardization had worked with physicians to build an environment of mutual trust and respect and were committed to a common goal of cost reduction and patient safety.

Implications and Future Challenges

Today's hospitals are characterized by greater acuity of patients and intensity of technologies associated with surgical interventions. PPIs represent many of the most costly materials used, and their prices often rise with the advances in technology. The ability to align physicians' and hospitals' interests with regard to standardizing the selection and purchase of PPIs is, therefore, likely to be a principal factor distinguishing between successful hospitals and those struggling to remain viable.

Aligning interests will depend on developing standardization strategies and conducting credible product equivalencies that are based on

accurate and timely data. This remains a daunting task, as the ability of hospitals and physicians to pursue this goal is hampered by weaknesses in the existing information systems. Although more sophisticated information systems that can link products to cost, safety, and outcomes continue to be developed, their widespread adoption requires establishing standards for systematic data collection, as well as specially trained staff able to conduct evidence-based studies that incorporate cost-benefit and cost-effectiveness analyses. A promising development is the recent establishment of the Association of Healthcare Value Analysis Professionals (AHVAP) by persons (primarily nurses) involved in the VAT process in their facilities. The AHVAP's current efforts include formulating the competencies required for this important role, but these efforts remain in the nascent stages.

Whether all hospitals and systems require the full complement of in-house analytic capabilities remains an open question. On the one hand, group-purchasing organizations and consulting firms are rapidly creating an industry around value analysis and product standardization and are offering these services to hospitals in lieu of locally derived product assessments. Moreover, the role of agencies such as the FDA or AHRQ could be expanded to provide uniform standards, as well as to offer guidance for product evaluation and use that extends beyond initial approval.

On the other hand, we found the strong belief that the product equivalency/value analysis process should be locally conducted with local data. Echoing our findings, evidence from both the United Kingdom and the United States suggests that physicians believe that national standards are not a substitute for the local orchestration of product equivalencies (Leverton 2006). Thus, even if the FDA or AHRQ were to take a more active role in the value analysis and equivalencies of PPIs, uncertainty would remain about the extent to which an agency's approval of equivalencies would be widely accepted. In part, this may reflect skepticism about the speed with which such assessments would be conducted: existing studies from the United Kingdom reveal that benchmarked products were frequently obsolete and that new product entries into the market were not analyzed in a timely manner (Cullum et al. 2004).

Recognizing that many facilities and systems will continue to assess products locally, hospitals must confront the paradox of physicians' reluctance to invest time in product assessment and standardization decisions, while insisting that these processes be led by physicians. Future research

is needed to explore the continuum of creative incentives that hospitals may consider to motivate physicians' involvement and their ability to align physicians more closely with hospitals in a way that helps move power from the suppliers of costly PPIs. While it is unlikely that hospitals can match the financial rewards that suppliers offer to physicians (such as consulting fees, honoraria, and research funding), intangible incentives in the form of improved patient care and indirect financial incentives (such as investments in new technologies and capital equipment) are promising. For example, one of the appealing consequences of participating in value analysis teams is the ability to identify best practices as they relate to outcomes. That is, the value analysis process can offer an interesting mix of incentives, in which nonfinancial incentives "may have as strong or stronger impact on physician behavior than financial incentives" (Town et al. 2004, 93S). However, achieving the full potential of this intangible incentive requires more sophisticated outcomes data than are currently available.

Unexplored in this research is whether and how relationships of trust may be affected by the use of various incentives. For example, reports of supplier-offered incentives to physicians have already attracted negative media attention that threatens trust relations (Abelson 2005, 2006a). If hospitals' use of gainsharing becomes more widespread, the trust relations among various parties, including those between physicians and patients, may also be affected and deserve careful study.

Similarly, it is not yet clear how the relationships between physicians and suppliers may be affected by more aggressive standardization efforts and incentives by hospitals. Although vendors have been heavily criticized for trying to influence physicians' choices, their value in the process also is well recognized. Maintaining an appropriate balance between the costs and benefits of the physician-supplier relationship is an important area for further study.

The findings reported here can be complemented by observational studies of contract negotiations between suppliers and hospitals, interactions among members of a facility's VAT, and interactions between suppliers and physicians in the operating room as suppliers assist with the technical calibration of new devices. Another extension could investigate effects of different standardization models through a large-scale comparative design that incorporates data on market conditions, as well as system characteristics.

Regulatory Implications

This study is relevant to regulatory issues dealing with incentives for cooperation among key parties. As noted, this study was conducted at a time when hospital gainsharing with physicians had not been generally accepted as a legal option for hospitals seeking standardization (Furukawa and Ketcham 2006). As of this writing, demonstration projects have been completed, and additional projects funded by the Centers for Medicare and Medicaid Services are continuing. But there remains substantial debate (e.g., Fleming and Cunningham 2006; Goldsmith 2007) about the value of gainsharing as a long-term solution to aligning hospitals' and physicians' interests, rather than as a limited "fix" that may introduce more problems than it resolves. While such debate continues, it is unlikely that the widespread use of gainsharing will be embraced throughout the hospital industry.

A related regulatory debate concerns the financial incentives used by device manufacturers, in the form of consulting fees and honoraria, that may encourage physicians to select their products. Increasing attention by the media and policymakers suggests the possibility of regulatory efforts to constrain such incentives. Additional concerns about corporate influences on the selection of medical devices are reflected in the debates over direct-to-consumer advertising. As DTC advertising attracts more controversy, this practice may also trigger regulatory intervention. Either of these regulatory interventions could help hospitals gain physicians' cooperation in standardization efforts by weakening the commercial influence on physicians' and patients' preferences.

Conclusion

We conclude that the promise of cost savings through the standardization of physician preference items is compelling hospitals to pursue such efforts, despite the barriers that include alliances between powerful actors like physicians and suppliers and data inadequacies. The results of our study suggest that these barriers are not insurmountable. We have argued that a better understanding of resource dependencies and interdependencies can offer insight into strategies that may begin to alter the balance of power and provide opportunities for greater alliances between

physicians and hospitals. We observed that regulatory interventions also may alter the balance of power among key parties.

Endnotes

1. Financial agreements between suppliers and physicians are drawing increased scrutiny for conflicts of interest, but they remain prevalent throughout the industry (Abelson 2005, 2006a).
2. These included physicians with the titles of medical director, vice president for clinical integration, chief of cardiology, and chief of orthopedics.
3. These included non-MD respondents (usually nurses) with the titles of director of surgical services, clinical operations manager, and senior clinical consultant.
4. These included respondents with the titles of clinical technologies assessment coordinator, vice president for support services, director of materials management, clinical assets manager, vice president for purchasing and materials management, vice president for supply chain management, purchasing agent, and vice president for clinical effectiveness.
5. With the end of Medicare's moratorium in 2005 on paying specialty hospitals, this alternative increases physicians' power in their relationships with hospitals.

References

- Abelson, R. 2005. Possible Conflicts for Doctors Are Seen in Medical Devices. *New York Times*, September 22, A1.
- Abelson, R. 2006a. Whistle-Blower Suit Says Device Maker Generously Rewards Doctors. *New York Times*, January 24, C1.
- Abelson, R. 2006b. Pricing Power at Risk for Orthopedics Makers. *New York Times*, June 29, C1.
- Association for Healthcare Resources and Materials Management (AHRMM). 2005. *Performance Indicators Study on Healthcare Supply Cost Management*. Chicago.
- Burns, L.R. 2002. *The Health Care Value Chain*. San Francisco: Jossey-Bass.
- Centers for Medicare and Medicaid Services (CMS). 2005. Office of Inspector General Advisory, Opinion no. 05-06. Baltimore.
- Chen, I., and A. Paulraj. 2003. Towards a Theory of Supply Chain Management: The Constructs and Measurements. *Journal of Operations Management* 11:119–150.
- Cullum, N., D. Dawson, A. Lankshear, K. Lowson, J. Mahon, P. Raynor, T. Sheldon, I. Watt, P. West, D. Wright, and J. Wright. 2004. *The Evaluation of the Dissemination, Implementation and Impact of NICE Guidance (Final Report)*. London: National Health Service.

- Cutting Edge Information. 2006. Medical Device Product Management. Available at <http://www.cuttingedgeinfo.com/medicaldevices/index.htm#body> (accessed December 1, 2006).
- Devers, K. 1999. How Will We Know "Good" Qualitative Research When We See It? Beginning the Dialogue in Health Services Research. *Health Services Research* 34:1153–88.
- Dhanaraj, C., and A. Parkhe. 2006. Orchestrating Innovation Networks. *Academy of Management Review* 31:659–69.
- Emerson, R. 1962. Power-Dependence Relations. *American Sociological Review* 27:31–41.
- Fleming, C., and R. Cunningham. 2006. Hospitals and Physicians: Bob Berenson, Elliott Fisher and Gail Wilensky Debate Policy Proposals. *Health Affairs* blog, December 19.
- Freidson, E. 1970. *Profession of Medicine: A Study of the Sociology of Applied Knowledge*. New York: Dodd, Mead.
- Frost & Sullivan. 2005. Industry White Paper: Medical Devices, Direct-to-Consumer Marketing: Learning from Pharma While Acknowledging Industry Differences. Available at http://www.fischerhealth.com/images/news_DTCMktWhPaper05 (accessed February 4, 2007).
- Furukawa, M., and J. Ketcham. 2006. Physician Responses to Gainsharing. Paper presented at American Society of Health Economists, Madison, Wisc., June 6.
- Galbraith, J.K. 1967. *The New Industrial State*. Boston: Houghton Mifflin.
- Goldsmith, J. 2007. Physicians and Hospitals: Can They Cooperate to Control Costs? *Health Affairs* blog, January 19.
- Herzlinger, R. 1999. *Market-Driven Health Care*. New York: Perseus Books.
- Kurtz, S., E. Lau, M. Halpern, and K. Ong. 2006. Trends Show Growing Orthopedic Surgery Case Load: Will Surgeons Be Able to Keep Up? *Materials Management Magazine*, July.
- Lake, T., K. Devers, L. Brewster, and L. Casalino. 2003. Something Old, Something New: Recent Developments in Hospital-Physician Relationships. *Health Services Research* 38:471–88.
- Leicht, K., and M. Fennell. 1997. The Changing Organizational Context of Professional Work. *Annual Review of Sociology* 23:215–31.
- Leverton, I. 2006. Clinician, Supplier, and Buyer Working as One to Improve Patient Outcomes. In *Strategic Management of the Health Care Supply Chain*, edited by E. Schneller and L. Smeltzer, 229–53. San Francisco: Jossey-Bass.

- Light, D. 1993. Countervailing Power: The Changing Character of the Medical Profession in the United States. In *The Changing Medical Profession: An International Perspective*, edited by F. Hafferty and J. McKinley, 69–79. New York: Oxford University Press.
- Medical Payment Advisory Commission (MedPAC). 2001. Report to the Congress: Medicare Payment Policy. Washington, D.C.
- Medical Payment Advisory Commission (MedPAC). 2005. Report to the Congress: Physician-Owned Specialty Hospitals. Washington, D.C.
- Montgomery, K. 2001. Physician Executives: The Evolution and Impact of a Hybrid Profession. *Advances in Health Care Management* 2:215–41.
- National Center for Health Statistics (NCHS). 2000. *National Hospital Discharge Survey*. Available at www.cdc.gov/nchs/fastats/insurg.htm (accessed December 1, 2006).
- National Center for Health Statistics (NCHS). 2004. *National Hospital Discharge Survey*. Available at www.cdc.gov/nchs/fastats/insurg.htm (accessed December 1, 2006).
- Ortho People. 2000. *Direct-to-Consumer Education and Marketing in Orthopaedics: Perspectives from Surgeon and Consumer*. Available at <http://www.orthoworld.com/knowledge/pubs/surveydctc0005h.htm> (accessed June 25, 2006).
- Patton, M. 1999. Enhancing the Quality and Credibility of Qualitative Analysis. *Health Services Research* 34:1189–1224.
- Pfeffer, J., and G. Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper & Row.
- Robinson, J. 1999. *The Corporate Practice of Medicine*. Berkeley: University of California Press; New York: Milbank Memorial Fund.
- Saver, R.S. 2003. Squandering the Gain: Gainsharing and the Continuing Dilemma of Physician Financial Incentives. *Northwestern University Law Review* 98:145–238.
- Schneller, E.S., and L. Smeltzer. 2006. *Strategic Management of the Health Care Supply Chain*. San Francisco: Jossey-Bass.
- Schoonmaker, M. 2005. *The U.S. Approval Process for Medical Devices: Legislative Issues and Comparison with the Drug Model*. Congressional Research Service Report for Congress. March 23, order code RL32826. Washington, D.C.
- Scott, W.R. 1982. Managing Professional Work: Three Models of Control for Health Organizations. *Health Services Research* 17:213–40.
- Scott, W.R., M. Reuf, P. Mendel, and C.A. Caronna. 2000. *Institutional Change and Healthcare Organizations*. Chicago: University of Chicago Press.

- Shortell, S.M., R. Gillies, and D. Anderson. 2000. *Remaking Health Care in America: The Evolution of Organized Delivery Systems*. 2nd ed. San Francisco: Jossey Bass.
- Smeltzer, L., and A. Carr. 2003. Electronic Reverse Auctions: Promises, Risks, and Conditions for Success. *Industrial Marketing Management* 32:481–88.
- Sofaer, S. 1999. Qualitative Methods: What Are They and Why Use Them? *Health Services Research* 34:1101–18.
- Town, R., D. Wholey, I. Kralewski, and B. Dowd. 2004. Assessing the Influence of Incentives on Physicians and Medical Groups. *Medical Care Research and Review* 61(suppl.):80S–118S.
- Weitzman, E. 1999. Analyzing Qualitative Data with Computer Software. *Health Services Research* 34:1241–63.

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