Assessing the Influence of Incentives on Physicians and Medical Groups

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This article describes issues that should be considered in the development of a theory or theories about incentives from which testable hypotheses could be derived. Economic, psychological, and organizational theories are described, and issues that should be considered in hypothesis generation are presented. Psychological factors influencing incentives include decision framing, regret, heuristics, and reinforcements. Organizational factors influencing incentives include bundling of services or people, matching of incentive structure with work organization, and the incompletely contained hierarchical nesting of incentives. Finally, the dynamics of incentive change are considered, with a focus on describing the conditions under which physicians and physician organizations respond to incentive changes.

Keywords: *financial incentives; contracting; physician organizations*

In his pathbreaking article, Arrow (1963) noted that the market for physician services differs from neoclassical assumptions and that economic theory regarding the existence and optimality of a market equilibrium did not apply. In Arrow's view, the primary reason underlying the physician exceptionalism

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from the analysis of standard (in 1963) economic theory is information asymmetry—consumers of health care (or their insurers) cannot easily discern the necessity or quality of care they receive from their physician. This informational asymmetry implies that simply compensating physicians by paying them the value of the services they render is hard as the value of the service is often difficult to ascertain. Some method of physician compensation must be devised (physicians are unlikely to work for free), and the market system cannot guarantee that the one that emerges in competition will not have a profound and adverse impact on the health care delivery system.

How should incentives be structured to obtain optimal physician performance in medical groups practices, to provide the optimal amount of effort directed toward the right activities? In some countries, such as the United States, there has been strong interest in the effect of financial incentives, while in other countries, nonfinancial incentives, such as the United Kingdom's policy of removing physician autonomy as a consequence of poor performance (Smith 2002), have received significant attention. In either case, there is strong interest in answering the behavioral question "What is the effect of incentives on the performance of physicians in medical groups?" so that the normative question of "How should medical groups be incentivized to obtain optimal performance?" can be addressed. Answering the behavioral question is a nontrivial exercise. Not only does it require solving significant theoretical problems, because theory is necessary to guide model specification, but it requires understanding and integrating economic, psychological, and organizational perspectives.

Integrating economic, psychological, and organizational approaches is one of the most difficult challenges encountered when attempting to assess the effects of incentives on the costs and quality of care in medical group practices. This challenge occurs for a number of reasons, including imprecise conceptual definitions of organizations and incentives; the breadth of economic, psychological, and organizational research on incentives; the diversity of incentive arrangements across medical groups; and the sensitivity of incentive effects to organizational and professional contexts. This article addresses these issues in four sections. First, we describe the issues that guided this review of the research on incentives. Second, we outline the approach economists have taken to theorizing about incentives and the resulting insights it has yielded. Third, we describe the implications of psychological and organizational approaches for theorizing about incentives. Finally, we examine the conditions under which changes in incentives will result in organizational and performance change.

Our goal is to describe issues raised by economic, psychological, and organizational theories about incentives and suggest ways to develop, test, and

calibrate theories of incentive effects. Throughout this article, we list many issues that the literature has highlighted as relevant for understanding incentives and that we believe should be considered (either explicitly or implicitly) in incentives research. We follow this approach for three reasons. First, as we hope to make clear in this review, there is a diverse range of issues associated with incentives, and much work must be done to integrate these issues into a theory or theories of incentives. Second, we use the term *issue* rather than *hypothesis* because the observations are based on a broad review of the incentives research in economics, psychology, and sociology. We feel that the term *hypothesis* should be reserved for testing theories and should be derived from explicit theories. Third, the effect of incentives is likely to be contingent on institutional details. Without the knowledge of these details, hypotheses risk being superficial. Rather than take this risk, we suggest issues that need to be addressed to develop testable theories of incentives.

NEW CONTRIBUTION

This article reviews economic, psychological, and organizational theories as they relate to incentives. We combine economic approaches, which are prevalent in health services research, with psychological and organizational approaches. There is a strain in the economic literature that has long been interested in the implications of the assumption of imperfect rationality on economic behavior. Recently, this line of research has begun to focus on the psychological findings on framing, risk, regret, fairness, and procrastination on economic outcomes.[1] However, to the best of our knowledge, this literature has not yet addressed the optimal payment structure in a context that can be used to examine physician payments, nor have these issues been integrated into health services research on incentives. At the psychological and organizational levels, we extend current work in health services research by considering the effects of the structure of reinforcement, bundling of services or people for compensation purposes, incentive transmission through incompletely contained hierarchical nests, and the determinants of incentive structure change. We hope our work here suggests some important issues that health services researchers may consider incorporating into their future analyses.

CHALLENGES IN DEVELOPING RESEARCH ON INCENTIVES

This section describes four challenges to research on incentives that guided this article's review. The challenges are the following: (1) conceptual precision in defining what incentives are and are not; (2) integrating economic,

psychological, and organizational theories; (3) studying incentives in real-world situations; and (4) taking into account the strong professional context for incentives in health care.

The first challenge in studying incentives is defining what incentives are and are not. The use of imprecise or overly broad conceptual definitions for what incentives are and are not results in confusion, conflicting, and noncumulative research. To address this problem, in this article, *incentives refer to all the rewards (financial and nonfinancial) agents (physicians or the physician organization) receive conditional on their measured (explicitly or implicitly) performance or behavior*. Incentives have a wide variety of properties, including form (e.g., salary, capitation, fee-for-service), bonus arrangements (e.g., profit sharing, productivity-based gain sharing), target measures and levels (e.g., productivity or quality goals), target-setting processes (e.g., targets as set by health plan, as set as a function of the medical group's prior performance, as set by competition among medical groups), individual versus group incentives, reinforcers (e.g., financial such as revenues, professional such as autonomy), context (e.g., the variety of incentives faced by a medical group from different health plans), and relative importance in terms of magnitude of effect. These properties influence the effects of incentives in both direct and interactive ways.

In this article, *incentives do not refer to organizational structures and processes*, even though structures such as monitoring and feedback are used to support particular incentive designs and influence the effect of incentives (Ichniowski, Shaw, and Prennushi 1997; Hackman 2002). In this article these structures are taken into consideration only when they moderate or mediate the effect of incentives, such as worker ownership and participation affecting profit sharing (Doucouliagos 1995) or the rate of monitoring affecting shirking (Nalbantian and Schotter 1997). Moreover, in this article, *incentives do not refer to psychological and social psychological factors that influence how an individual perceives a situation or the heuristics and rules underlying behavior*[2] that influence decision making (Dawes 1998; Loewenstein 2000, 2001). These factors are considered only when they moderate or mediate the effect of incentives.

A second challenge is integrating economic, psychological, and organizational research. While health services researchers have attempted to integrate psychological and organizational considerations into economic models, this effort often lacks strong input from psychological or organizational theory. Consequently, we do not yet have an adequate theory of the impact of physician incentives. Without the appropriate theoretical model in place for guidance, empirical work on physician incentives risks making erroneous conclusions. This article attempts to begin the integration of economic, psychological, and organizational research on incentives.

The third challenge is developing and testing theories of incentive effects in the complex world of medical group practices. Medical group practices present one of the most promising areas for research dealing with the cost and quality of health care. They represent one of the few organizational settings where the physician component of health care can be studied, and they are rapidly becoming the practice form of choice for physicians. Consequently, much can be learned about how efficient and effective patient care practices are developed and how economic and organizational factors influence those practices. Moreover, these findings have enormous implications for the health care field since they affect an ever-increasing proportion of clinicians as they form or join medical groups.

However, there are major challenges associated with research in incentives in medical groups. One challenge is understanding how medical group characteristics mediate the effect of the incentives a medical group receives or the incentives used within a medical group. An example of the former is a medical group compensated with financial risk-sharing arrangements, such as capitation, choosing to compensate physicians using non-risk-sharing arrangements, such as a salary. A related example is a medical group with a budget including retained earnings, which can moderate the effect of risk-sharing arrangements because physicians have a reserve fund to call on if costs miss a target. Another example suggests within–medical group incentive effects may depend on the types of behavior required in the medical group. Lazear (1989) argued, "Competition encourages effort, which has a positive effect on output, . . . but competition also discourages cooperation among contestants and can lead to outright sabotage" (cited in Gerhart and Rynes, 2003, 102). This suggests that competitive, productivity-oriented individual incentive structures in practices requiring cooperation, such as when caring for patients with chronic conditions, may be counterproductive. A final example is physicians in a practice with a culture of cooperation that values high-quality, cost-effective care and free information flow being able to resolve their conflicting motivations and respond to incentives different from those in practices with cultures that emphasize a competitive orientation ("me" rather than "us"). The key point is that internal medical group features mediate incentive effects.

A second empirical problem is self-selection. A medical group's acceptance of risk-sharing contracts at the group level or choice of internal incentive structures may be influenced by physician ownership, the portion of the total revenue at risk, whether the medical group budgets for retained earnings, and the characteristics of governance and control structures. A second self-selection issue is who is attracted to work in a medical group. Research shows that there are two major effects of incentives on individuals—motivation and sorting (Gerhart and Rynes 2003; Milgrom and Roberts 1992).[3] Motivation,

which appears to be the main focus of incentive research, is the effect through individual productivity. Sorting is the effect through individual choice of work location. All three self-selection issues must be addressed to obtain unbiased estimates of incentive effects.

Because medical group arrangements are so diverse, because incentive effects are sensitive to this diversity, and because of significant self-selection issues, developing meaningful, specific hypotheses requires knowledge of specific research settings. Without such knowledge, hypotheses risk being superficial. So, we choose to describe issues rather than present hypotheses.

The fourth challenge is the strong professional context. Clinicians and technicians, including physicians, nurses, and laboratory personnel, bring powerful professional motivations to their practices that are likely to affect their response to incentives. Medical education includes one of the most intense socialization processes of any profession, and the products of these programs bring strong professional values to the practice setting. These values include personal responsibility for patients as clients, a strong collegial peer orientation, and a strong commitment to patient care regimens based on professional judgments unencumbered by organizational imperatives. Consequently, incentives that are compatible with these professional values may be much more influential than incentives that conflict with professional values. In our review, we seek to show theoretical mechanisms by which such strong values can be integrated into our understanding of incentives.

THE ECONOMICS OF INCENTIVES

It has been 40 years since Arrow highlighted the importance of these "special characteristics" of the market for physician services to economists. In the intervening years, a large theoretical literature studying the principal-agent problem has evolved in economics. This literature studies the optimal contract between the principal who wishes to engage in an exchange with an agent when some aspect of the exchange is not observable to the principal. Once the optimal contract has been solved, the impact of the informational asymmetry on societal welfare is then typically analyzed. This framework has been used to analyze many different institutional scenarios ranging from sharecropping to employee wage structures to CEO compensation. More important, the principal-agent framework has been applied to the market for physician services.[4]

The initial reaction of most economists to the question of how to optimally (to society) structure provider payments would be the following: physicians' pay should be linked to their productive contribution. From the economic perspective, there are at least two important impediments to implementing a pure pay-for-performance method: agency and risk aversion. Agency refers to

the problem of an agent contracting with a principal over a desired outcome where the outcome is not directly observable by the agent. Physician work environments are complex and under the control of the physician, and consequently it is difficult to accurately define and measure physician productivity (Abbott 1988). Furthermore, it may be difficult and costly for insurers and patients to determine the necessity and the quality of the care they receive. If the outcome of interest is not observable and thus not contractible, the direct link between payment and performance cannot be made.

Even when a direct link between payment and performance can be made, there are still situations where structuring incentives with a guaranteed component, such as a salary, is optimal. Pay-for-performance implies that the physician's income is directly tied to his or her revenues or net revenues, and those income streams are sometimes uncertain and volatile, especially in today's health care system. In the face of this uncertainty, the optimal payment structure will differ from a pure pay-for-performance scheme for a risk-averse agent. In such circumstances, the optimal compensation plan will have a component of income that will be guaranteed, and another component will be tied at a rate that ties revenues to performance at less than a one-to-one rate, thereby breaking the pure link to pay-for-performance.

Capitation is another alternative that can be used to provide the same incentive for providers to behave optimally when a direct link between pay and performance at a micro level cannot be made. Paying physicians on a fee-for-service basis gives the physician the incentive to overuse resources (Pauly et al. 1992) and influence payment through service-coding rules (Milgrom and Roberts 1988). This has given rise to payment programs that partially capitate physicians (Ellis and McGuire 1990; Selden 1990). This response, while removing the incentive to overvisit, creates other counterproductive incentives. The most obvious of these counterproductive incentives is for providers to undertreat the severely ill and to cream skim the least costly patients (Ellis 1998). These incentive problems with capitation may explain the apparent recent decline in its use (Robinson and Casalino 2001). The difficulty with capitation is that the variation in the average experience of a capitated physician or provider group is a function of the number of patients for whom they are capitated and the variation among those patients. Without an adequate number of patients, physicians can still face the risk of significant revenue fluctuations.

The approach that theoretical economists generally take in addressing the principal-agent relationship is to construct a model in which the agents choose their effort level given a payment structure, and the principal can only observe a noisy signal about the amount of treatment. Probably the most advanced treatment of this issue in the context of provider reimbursement is Ma and

McGuire (1997).[5] Ma and McGuire investigated the optimal insurance and provider payment system in a model where the physician effort cannot be observed.

There are several insights from the principal-agent that we believe generalize to the physician environment and are important to consider before embarking on an empirical study of physician incentives.

Research on the impact of physician compensation often asks the simple question: do financial incentives matter in physician behavior? However, that strikes us as the wrong question. Financial incentives matter and if sufficiently strong can get physicians to change their behavior in socially desirable ways. The more interesting question is, How much reward does it take to change physician behavior?

Issue 1a: Financial incentives, if large enough, change behavior (Milgrom and Roberts 1992; Lazear 2000).

Ever since the Institute of Medicine's (2001) report on the *Quality Chasm*, there has been a surge of interest in payment policies that directly reward provider quality. However, physician quality is clearly multidimensional. Designing optimal compensation systems requires monitoring and rewarding each quality dimension. A similar comment holds for productivity. Absent the existence of systems capable of monitoring performance at such a level, perhaps because of asymmetric information, a reasonable argument for the effect of compensation systems on physician behavior is that physicians do what they do because they are rewarded for doing it. While we may hope for other behaviors, for understanding compensation effects, it is wise to understand what is measured and rewarded (Kerr 1975; Gibbons 1998; Milgrom and Roberts 1992).

Issue 1b: Individuals respond to what is measured and rewarded.

The presence of asymmetric information is a key insight that guides the development of physician compensation arrangements. Asymmetric information means that the physicians have the capability to game compensation systems in a manner that is difficult for a principal to observe directly. And, it also means that linking pay to explicit performance measures is difficult. In the context of physicians, this suggests that better compensation contracts take the form of a salary with a bonus based on individual or practice performance or the form of fee-for-service payments with a withhold that is paid to physicians if performance targets.

Issue 1c: If individuals can game the reward system to their advantage, anticipate that they will do so (Milgrom and Roberts 1988).

Issue 1d: In the face of asymmetric information, the optimal incentive structure often (but not necessarily so) has the following structure: a fixed payment component (e.g. salary) and a component that is tied to the outcome that is measurable and desired (Stiglitz 1974; Ellis and McGuire 1990).

While salary as a compensation component is important, a component that is based on pay for performance is also important. It has been found that the switch from salary to piece rate pay for factory workers increases productivity about 15 percent to 30 percent (Gerhart and Rynes 2003; Milgrom and Roberts 1992)—productivity incentives have the desired effect on increasing individual productivity. Pay for performance, or productivity-based pay, also affects performance because it influences the characteristics of the workforce through self-selection processes. Pay-for-performance systems tend to attract more productive workers who generally prefer pay-for-performance systems to salary compensation (Gerhart and Rynes 2003; Milgrom and Roberts 1992; Lazear 2000). However, piece rate compensation schemes can also have undesirable consequences. While piece rate compensation rewards increases in individual productivity, it does not encourage teamwork and helping behaviors across employees. Furthermore, it can increase the incentive for individuals to increase quantity at the expense of quality.

Issue 1e: The institution of pay-for-performance incentives likely has two effects: behavior modification and the selection of more productive physicians into the practice (Lazear 2000; Ackerberg and Botticini 1999).

Principal-agent models yield important insights into the logical relationship between information and payment structure. The arguments suggest that optimal compensation includes both fixed (salary) and variable components, with the variable component tied to performance. Research is needed to determine the optimal relative emphasis on fixed and variable components across institutional arrangements and patient populations. The arguments also suggest that each compensation system has both positive and negative effects. It is likely that the positive effects will be strongest in organizations that have implemented the appropriate safeguards against negative effects. But the relative simplicity of these models can provide only limited guidance on how to empirically model the relationship between the structure of physician pay and physician behavior. The obvious response to this issue is to write down a more general model that makes fewer assumptions. However, such a model is likely to be intractable. Consequently, the empirical researcher is in a danger-

ous position of wishing to understand the incentive-physician performance relationship without a reasonably complete theory of physician incentives. The danger rests in the temptation to perform ad hoc variable selection and model specification, and that can lead to erroneous inferences.

What is a researcher to do? The situation, while difficult, is not without hope. Absent performing a randomized trial, researchers studying physician compensation must carefully contemplate and rigorously account for the institutional features of the physician market in their empirical specification. Those features include the following:[6]

1. Most clinical decisions are made under uncertainty, and the degree of this uncertainty varies across patients and the complexity of the illness episodes.
2. Physicians often manage a diverse patient population with patients differing in socioeconomic backgrounds and types and severity of illnesses. That is, a physician's work requires proficiency across many types of tasks.
3. Physicians practice with much autonomy. A physician's practice is often unmonitored, and for much of what they do, instituting monitoring mechanisms is difficult and costly.
4. Physicians practice in heterogeneous organizations, which offer differing financial and nonfinancial incentives that may differentially impact physician behavior.
5. Physicians generally treat patients with heterogeneous insurance arrangements.
6. Psychological and sociological theories, as well as economic theories, may play an important role in explaining physician behavior and thus may be relevant for understanding the impact of incentives on physician behavior.
7. Physicians are subject to significant tort risk. The minimization of potential malpractice lawsuits may directly affect the physician practice style.
8. Physicians are not only motivated by purely financial concerns but also practice in an environment where professional norms and status may be important.
9. The innate quality of physicians is heterogeneous.
10. Physicians and/or their organizations dynamically interact with payers and patients.

In the remainder of this article, we discuss these points in greater detail and highlight the relevant theoretical and empirical literatures that can help inform our thinking on how to account for these features in empirical work.

ORGANIZATIONS, MANAGEMENT, AND INCENTIVES

While economic theory provides a useful formalization for predicting the efficacy of incentive systems, psychological and organizational research provides complementary perspectives that incorporate a richer description of

individual and organizational characteristics. A strength and limitation of both economic and psychological approaches is the focus on individual response to incentives. Organizational theory complements these approaches by suggesting how incentive effects are contingent on organizational structures. In the following discussion, we group psychological and organizational issues separately.

PSYCHOLOGICAL ISSUES

This section discusses the implications of behavioral decision theory and reinforcement theory for incentive design. Both of these approaches take the individual as the unit of analysis. In contrast to the utility maximization arguments of standard economic theory, behavioral decision theory studies how individuals actually make decisions. We present two examples drawn from behavioral decision theory, decision making under ambiguity and expected regret, which present conditions under which incentive effects predicted by economic theories may be attenuated. The use of expected regret as an example is particularly appropriate in this article because it is closely related to professionalism (Freidson 2001) and is a fundamental part of the socialization of physicians in the medical field. Reinforcement theory focuses on how the structure of incentives affects individual behavior.

Behavioral Decision Theory and Incentives

Many economic models are built on a standard, normative decision-making model. It has long been recognized that there are significant anomalies between this model and human behavior (Simon 1955; Kahneman and Tversky 1979; Dawes 1998; Loewenstein 2000, 2001; Rabin 1998). New theoretical developments explore the consequences of relaxing the assumptions of *Homo Economicus*, such as principles of fairness (Rabin 1993), bounded rationality (Conlisk 1996), and prospect theory (Harris and Laibson 2001). In a review of the current state of behavioral decision theory research, Loewenstein (2001) stated that two important features of an alternative to standard decision-making models should take into account "(1) the importance of people's subjective construal of their situations and (2) the role played by choice rules or heuristics." In other words, to understand the effect of incentives on physicians, one must understand how physicians see the incentive and the heuristics they use in making decisions. A further branch of decision-making research explores the role of emotion and visceral states on decision making (Loewenstein 2000).

Ambiguity and decision making. Physician decision making under uncertainty is probably better described as decision making under ambiguity rather than under risk. Ambiguity has been defined as an intermediate state between ignorance (no distributions are ruled out) and risk (all distributions but one are ruled out). Thus, the amount of ambiguity is an increasing function of the number of distributions that are not ruled out. Ambiguity is greater when evidence is unreliable or conflicting or when the causal process generating outcomes is poorly understood. The distinction that can be made between decision making under risk and decision making under ambiguity is that under risk, the probabilities associated with the various events that can occur are known or can be estimated, whereas under ambiguity, much less can be said about the probabilities associated with the various events.

A theory of decision making under ambiguity places emphasis on the fact that in real life, beliefs about uncertain events are typically loosely held and that the uncertainty extends to the underlying generating process itself—ambiguity implies that there is uncertainty about uncertainty. Ambiguities are an inevitable part of patient management, particularly for patients with multiple, complex conditions. There is often a lack of scientific information about the optimal approach to the diagnosis and treatment of many diseases, and physicians are commonly confronted with ambiguous choices and feedback about both the illness and the treatment modality. A physician's response to ambiguity will be a function of how he or she construes a situation and the rules available to respond to the situation. We contend that a model that includes physician decision making under ambiguity will improve the explanation of variation in health care resource utilization but that it will be conditional on (1) differential degrees of ambiguity for individual physicians; (2) differential tolerance levels for ambiguity; and (3) the structure of the medical group, that is, the provision of information that could resolve ambiguity, such as through curbside consulting, and the context and culture defining the appropriate response to ambiguity. These factors, particularly the individual-level factors of ambiguity level and tolerance for ambiguity, may drive a wedge between incentives and medical group performance, particularly if physicians respond to ambiguity by ordering tests and gathering information that is less relevant, much as individuals invest more when receiving equivocal feedback (Bragger et al. 1998, 2003). This suggests the following:

Issue 2a: The level of ambiguity, whether due to physician understanding of symptoms, conditions, and treatment, physician tolerance for ambiguity, or patient mix, affects the effect of incentives on performance.

Regret and decision making. The potential for regret is present in many decision-making situations faced by physicians, such as the emotional feeling that occurs when a physician realizes that a diagnosis has been missed. This potential for regret is an unavoidable component of decision making under uncertainty when an outcome will ultimately be known. The intuitive notion is that regret can occur when "difficult choices" have to be made—an individual cannot know what action is best but, nevertheless, has to choose something. After the uncertainty is resolved, regret is based on the comparison between the outcome of choosing an action compared with the outcome that would have occurred under the same state of the world had the individual chosen differently. Regret for a physician may be magnified when "stones are left unturned," when all possible diagnoses are not explored. This potential for regret shapes and constrains future behavior. Since regret is a sentiment that arises only after the outcome of the choice is known, what really determines the choice is expected regret.

Expected regret theory rests on three fundamental assumptions: first, that individuals experience the sensation regret; second, the negative sensation of regret is experienced asymmetrically to its avoidance; and third, that in making decisions under uncertainty, individuals try to anticipate and take account of those sensations (Loomes and Sugden 1982). There is a desire by decision makers to avoid consequences in which the individual will appear, after the fact, to have made the wrong decision. When faced with new choice situations, people remember their previous experiences and form expectations about the regrets that the current alternatives might entail.

In research on physician decision making, Feinstein (1985) described a theory similar to expected regret and called it the "chagrin factor." It is based on identifying an outcome that will cause major chagrin and avoiding a choice that may lead to that result. Feinstein attributes excessive health care resource utilization to regret: "Many expensive and excessive diagnostic tests are ordered to avoid the chagrin of a lawsuit for a possibly overlooked lesion."[7] The desire to avoid regret also leads clinicians to be overly pessimistic regarding prognosis. Perhaps even more important evidence for this descriptive theory of physician decision making is that physicians tend to minimize the most important risk, regardless of its probability (Elstein et al. 1986). Consequently, physicians give more weight to avoiding a very serious but rare outcome than they believe patients would give.

Regret theory seems particularly applicable to physicians and health care professionals, especially when they are caring for patients with complex, chronic conditions, such as the frail elders. There is arguably no other profession so highly socialized with values that require practitioners to place the

best interest of their clients (patients) above all other considerations including the cost of care (Freidson 2001).

Issue 2b: Regret avoidance, whether due to physician preferences or complexity and threat of patient conditions, is likely to affect the effect of incentives on performance.

Reinforcing Performance—The Structure of Incentives

Reinforcement theory provides a general model for understanding the relationship between incentive structure and behavior (Luthans and Kreitner 1985). Reinforcement theory shows how the characteristics of incentives affect the way individuals respond to them. There are three important issues that reinforcement theory identifies for incentive systems—the content of reinforcers, the type of reinforcers, and the linkage between reinforcement and performance.

Reinforcement theory defines a reinforcer as any outcome that affects the probability of a behavior. In health care, reinforcers can be grouped into economic, professional, and policy categories (Eisenberg 1986). Economic rewards reflect the physician as entrepreneur, professional rewards reflect the physician as a socialized professional acting as the patient's agent, and policy rewards reflect the physician as guarantor of public goods. The effect of each of these rewards is contingent on the utility that a physician has for each type of reward, which is a function of physician education and socialization, and of the amount of each type of reinforcer that is received in a situation.

To understand how any particular incentive will influence physician behavior, it is necessary to understand how it fits into the physician's overall mix of reinforcers. It may be the case that financial incentives will have limited effectiveness because other reinforcers, such as the professionally based outcomes of regret or peer approval, are more important to the physician. Designing effective incentive systems requires understanding what physicians value and how they weight the outcomes.

Issue 2c: Nonfinancial incentives, such as patient outcomes, autonomy, regret, and peer approval, may have as strong or stronger an impact on physician behavior than financial incentives.

Not only do alternative reinforcers arise from the patient interaction process, the wide variety of employer objectives results in performance measurement taking many forms (Ittner and Larcker 2002). While some of these measures are clearly driven by economic considerations, such as financial

performance measures (return on investment, profit), other measures include behavioral measures (accidents, absenteeism, safety inspection ratings), and unit performance measures (productivity, cost, quality, on-time delivery, cycle time). The obvious point is that behavior responds to what is measured and rewarded, which may not be what employers and health services researchers think is being measured and rewarded (Kerr 1975; Gibbons 1998).

It is likely that the number and characteristics of performance measures affect performance. At the lower extreme, a focus on one type of reinforcer could result in a suboptimal focus on a specific behavior. At the higher extreme, a multiplicity of measures could result in confusion about the importance of any particular performance measure. Using subjective measures of performance, such as contribution to a team and team spirit, may offset some of the hazards of objective measures (Gibbons 1998).

Issue 2d: The number and characteristics of performance measures are likely to affect the effect of incentives.

Reinforcers can either increase or decrease the probability of a behavior. Positive and negative reinforcement increase the frequency of a behavior. Positive reinforcement is giving an actor a valued outcome on completion of a behavior. Providing a bonus to physicians who meet performance targets is an example of a positive reinforcer. Negative reinforcement is removing something the actor regards as an irritant on completion of the behavior. Assuming that physicians value autonomy, an example of a negative reinforcement would be reducing direct oversight of physicians, through utilization review, when a physician achieves utilization targets (Smith 2002). Distributing withheld payments is another example of a negative reinforcer. Extinction and punishment decrease the frequency of a behavior. Extinction is ignoring a behavior, which decreases the frequency of the behavior slowly. Punishment is providing a punitive outcome as a consequence of behavior, which decreases the frequency of a behavior quickly. An example would be a penalty charged to physicians if they do not meet performance goals.

Reinforcer type (positive, negative, extinction, or punishment) affects behavioral responses even when the incentive is financially neutral. One could implement an incentive that pays a negotiated fee with a bonus for reaching targets at the end of year (positive), an incentive that returns withheld fees at the end of the year when targets are reached (negative), or an incentive that charges a penalty if performance targets are not reached (punishment). The expected value could easily be equalized across the three structures, making the financial effect neutral. Even if the expected value were equalized, re-

search shows that actors dislike incentive systems that are based on negative reinforcement and punishment. A result may be avoidance or manipulation of rules (Werner et al. 2002; Wynia et al. 2000; Morreim 1991; Freeman et al. 1999). This implies that financially neutral incentive structures may result in unintended, adverse consequences because of the way in which they are implemented (Oliver 1980).

Issue 2e: The degree of acceptance, avoidance, and gaming of an incentive likely depends on whether the incentive is structured as a positive, negative, extinction, or punishment reinforcer.

The structure of the relationship between behavior and reinforcer affects the ease of changing the behavior. The relationship between behavior and reinforcer is typically described in terms of the occurrence of the behavior and the receiving of the reinforcer, which can occur either per behavior or per unit of time and either at regular or variable intervals. Behavioral and time-based systems with regularly scheduled reinforcers are a fee-for-service payment system, which is based on behaviors paid at regular intervals (one-to-one), and a salary system, which has time-based payment intervals. There are a variety of reinforcement systems within health care that are best described as behaviorally based with a variable reinforcement schedule. A good example is treating patients with complex symptoms. It is likely that such patients will respond positively to treatment only at some variable intervals.

Research shows that changing behavior by changing incentives is easiest when the linkage between behavior and reinforcer is clearest, such as a one-to-one relationship. Changing behavior is most difficult when the linkage between behavior and reinforcer is least clear, such as in a variable reinforcement schedule. This suggests that changing behaviors by changing incentives may be most difficult for physicians treating patients with chronic or complex conditions. Positive reinforcers, such as effectively being the patient's agent and obtaining beneficial outcomes, may occur at variable intervals—because of the variability of the relationship between physician action (interviewing for symptoms, diagnostic tests, diagnosis, treatments) and patient outcome. This variability will make behavior resistant to change. In contrast, relatively routine activities such as immunization and strep tests leading to treatment may have a fairly straightforward one-to-one relationship between action and outcome. The straightforward relationship of behaviors to reinforcers in routine will make behavioral change easier.

Issue 2f: The impact of changing incentives on behavior is likely to depend on the degree to which incentive arrangements have a variable reinforcement schedule.

A significant difficulty with using a reinforcement model is determining what bundle of services should be considered a behavior for incentive purposes and determining whether the incentives should be focused on individuals or groups of actors.

BUNDLING SERVICES AND PEOPLE: IMPLICATIONS FOR INCENTIVE DESIGN

The prior discussion has left implicit the definition of products and actors that the incentive system is designed to influence. The product can be generally represented as a bundle of services, and the actor can be generally represented as a bundle of people. At one extreme is fee-for-service—a single physician being paid for delivering a single service. At the other extreme is global capitation to a medical group—the medical group being for all services provided for patients. Services are bundled when compensation is based on some set of services (e.g., primary care, primary care plus specialty care, global capitation). Individuals are bundled when they are held accountable as a care team or contract with a health plan through an organizational entity such as a single specialty or multispecialty group.

For the purpose of theorizing about incentive effects, considering the bundling of services and bundling of individuals separately can simplify analysis. Bundling services, such as with capitation, supports substitution of services in producing health care. Bundling individuals allows group incentives to be used. Using group incentives affects production organization through its effect on organizational culture, shared values among providers, social monitoring, and information sharing (Kerr et al. 1995; Freidson 1975; Wholey and Burns 1993). While bundling of services or individuals tends to be correlated, analyzing them separately simplifies the analysis of the effect of incentives.

Bundling Services

Service bundling has significant advantages for incentive system design. A fee-for-service system may be a barrier to innovation and change. A fee-for-service system that reimburses physicians for patient visits, for example, may be a barrier to substituting registered nurses for physicians for nursing home rounds and may be a barrier to physicians for referring patients to disease management programs. The fee-for-service system is also a barrier to change because it is difficult to administer. The payor (CMS, a health plan) has to have procedures to identify new production arrangements and approve either new services for payment or approve the payment of different types of professionals for payment. This can introduce lags and deter changes. One way to

address this problem is to let each medical group set its own conversion factor for physician services, allowing the physician group to build into the physician service payment the cost of using substitute personnel. This approach has been adopted by the Business Health Care Action Group (BHCAG) in Minneapolis (Robinow 1997a, 1997b; Christianson et al. 1999). In sum, service bundling allows provider groups to substitute inputs and decreases the burden on the payor to manage complex fee-for-service payment rules. In essence, bundling services delegates some responsibility for organizing.

Services have been bundled in a variety of ways. Under salary, services are bundled by unit of time. Under capitation, services are typically bundled as primary care, specialty care, hospitalization, administrative services (utilization review, quality improvement), global, or some combination (e.g., primary care plus specialty care; global plus administrative). A common to bundles services is to use carve-outs, which bundle services based on a patient's condition, such as diabetes, congestive heart failure, behavioral health, or asthma (Blumenthal and Buntin 1998; Frank and McGuire 1998; Maguire et al. 1998). As with capitation, carve-outs can include only certain services, or they can be global, including all treatment for a patient. Contact capitation, a variant of a carve-out, bundles patients with an emergent condition, such as a heart attack, and refers them to a specialist physician for care for a given period of time (Carlson 1997; Robinson 2001; Frank and Brunsberg 1999). Another carve-out variant is an episode of care (Robinson 2001). For hospital care, a diagnosis-related group (DRG) bundles services by patient condition. All of these approaches represent different strategies for bundling services for compensation purposes.

Blumenthal and Buntin (1998; see SP52-SP55 for a discussion of structuring carve-outs and designing carve-out incentives) provide guidance for identifying bundles of services that are good candidates for carving out:

1. The carved-out services should minimize opportunities for risk selection by plans, providers, or patients. Chronic conditions, such as congestive heart failure, which are associated with continuing higher cost level, are better candidates than acute events, such as acute myocardial infarctions, where costs are primarily a onetime event.
2. The carved-out services should minimize administrative complexity, such as by bundling conditions so that risk adjustment is relatively easy and externalities are minimized, conditions that minimize moving in and out of the carve-out category, and conditions with few associated comorbidities that minimize interdependence with other providers (counterexamples include chronic diabetes with comorbidities or frail elders).

3. The carved-out services should benefit from a separate, specialized system, which is a function of the marginal benefit of using specialized teams rather than primary care providers in treating a condition.
4. The carved-out services should be those where primary care physicians play a small role relative to specialists. This reduces the chance of disrupting primary care services and increases the chance of taking advantage of specialist skills.
5. The carved-out services should be for less vulnerable patients unless patient safeguards are available. Moving a patient to a carve-out may disrupt usual safeguards and specialized payment systems such as capitation may result in carve-out providers having an incentive to underprovide services. Vulnerable individuals, such as the mentally ill, may be particularly at risk of being harmed.

When these five conditions are met, carve-outs have a greater chance of success.

Ideally, these bundling strategies allow providers to reorganize production organization, by substituting services that are required to produce the bundled product. A primary care clinic that is capitated for primary care services may substitute a registered nurse for a physician in visits to nursing home residents. This may both lower costs, because of the registered nurse's lower salary level, and improve quality, because the registered nurse may have the opportunity to spend more time with the patient. Proponents of carve-outs, such as behavioral health, argue that the providers accepting the carve-out can pool demand from multiple sources, allowing them to develop specialized resources to manage the condition at lower costs and higher quality levels. If the bundling is done well, all the activities associated with providing care are incorporated in the bundle, and externalities, the shifting of care and costs outside the bundle, are minimized.

Several risks are associated with these arrangements. Because physicians are paid for providing a bundle of services, there is an incentive to underprovide health care services (Ellis 1998). This means that health plans may need to incur monitoring costs to guard against underprovision (however, a similar monitoring cost for overprovision may be incurred in a fee-for-service system). The incentive system must also incur costs to manage favorable and adverse patient selection. A physician capitated for primary care has an incentive to refer patients to specialists quickly. A physician who has a contact capitation arrangement for specialty care may find his or her referral decisions affected by profitability of the patient, referring those patients who are less profitable. And, some of the arrangements, such as carve-outs for behavioral health services, may result in poor communication and coordination between the primary care and mental health services providers.

There are two broad consequences of bundling of services. The first is the effect on productivity, costs, and quality for a particular bundle. There is emerging research that is beginning to analyze these differences, particularly for carve-outs such as behavioral health services carve-outs. Research is needed comparing different ways of bundling services, such as types of capitation (primary care, specialty care, hospitalization, global) and salary.

Issue 3a: The bundling of services into a product is likely to affect the efficacy of incentive structures.

Bundling Physicians

The bundling of providers creates an accountable actor for incentive purposes. Bundling providers can affect the structure of social control mechanisms used to manage provider behavior, and the structure of social control mechanisms can mediate the effect of an incentive system. Physician organization can be roughly placed into three categories—solo practice, office-sharing arrangements, and medical groups. We distinguish between medical groups and office-sharing arrangements by whether physicians operate as a partnership, having a common profit center, pooling income, paying expenses, and then distributing profits to group members rather than operating as office-sharing arrangements, where physicians retain their own income and contribute to common office expenses. The latter form of single-specialty practice organization is most appropriately treated as solo practice for the analysis of incentive effects.

Group organization is important because it facilitates a greater level of social interaction than physicians in solo practice (Mechanic 1975; Wolinsky and Marder 1985). A study of different types of HMOs, for example, showed that physicians in group and staff HMOs had much higher levels of interaction with each other and with the health plan's medical director than did physicians in Independent Practice Association (IPA)-type HMOs (Wholey and Burns 1993). Because of the propinquity and shared nature of profits and income draws, physicians in group practices have incentives to monitor and evaluate their peers. A study of social control structures in a prepaid medical group practice showed that informal peer monitoring and communication patterns are essential to managing physician behavior (Freidson 1975). Similar research in other professional settings shows that control mechanisms based in shared values, close coordination, and monitoring in self-managed teams can result in tighter social controls than bureaucratic mechanisms (Barker 1993). Close propinquity, ease of monitoring, and shared cultural

values can facilitate the translation of incentives into action. But, because values are shared in a common culture, change may be made difficult, particularly when a group coalesces to resist accepting changes in incentives (Oliver 1980). Research shows that the effect of group incentives is mediated by the design of the incentive system and group work structures.

Nalbantian and Schotter (1997) studied the effect of manipulating group reward structures on group performance. They compared five types of group incentives, revenue sharing, forcing contracts, profit sharing conditional on reaching a performance target, productivity based gain sharing, and competitive teams, to monitoring and rewarding individual performance. Under revenue sharing, a firm's revenue was shared equally among individuals, and an individual's earnings were the individual's share minus the individual's efforts. Under the "forcing contract" manipulation (Holmstrom 1982), individuals received a share of the revenue only if preset revenue targets were reached, otherwise they received a low wage. Under profit sharing, individuals were paid if the firm exceeded a target revenue level, otherwise they received nothing. Under productivity gain sharing, individuals earned a bonus if their group improved their productivity over prior productivity levels. Under competitive teams, individuals earn a bonus if their team performs better than other teams. Under individualistic monitoring, individuals are paid a slightly larger wage if their effort exceeds a preset target level. The organization determines whether the effort level is high enough to earn a bonus through random monitoring.

Nalbantian and Schotter (1997) found that (1) shirking occurs, particularly under revenue sharing structures; and (2) history matters. When individuals were in groups that were high performers in the first period, such as under the competitive team incentive structure, their teams were higher performers in the second period. (3) Competition makes a big difference, especially over time. If the criterion is effort, a competitive team incentive structure dominates. If the criterion is low variability in output (reliability), then profit sharing and revenue sharing dominate competition. (4) Monitoring individuals only results in higher effort levels when it is done at a very intensive level; at low monitoring levels, group incentives outperform individual monitoring.

Nalbantian and Schotter's analysis poses some interesting questions for designing and implementing incentives. Forcing contracts, profit sharing, and productivity gain sharing all require a superordinate third party (the health plan) to set a target. Changing the target may become a focus of contention between physicians and health plans. In contrast, changing the target does not require explicit health plan intervention for competitive teams.

Significant limitations of Nalbantian and Schotter's experiment are that they studied undergraduate economic students, the task was simple, and the

team organization was simple. Because the task was simple, monitoring was relatively easy. It is unlikely that a similar high level of monitoring could be done among physicians. Wageman's (1995) research on incentive structure, group structure, and group performance addresses these limitations.

Wageman (1995) studied the relationship between group organization (individual, group, hybrid) and incentive structures (individual, group, hybrid) on performance in a sample of 800 Xerox service technicians organized into 152 service groups. In low-interdependence groups, each individual worked independently, while high-interdependence groups managed parts collectively, made decisions collaboratively, and had frequent meetings. Interdependence was crossed with incentive structure in the design. The dependent variables were customer satisfaction with repairs, parts expenses for repairs relative to a corporate normative standard for the repair, response time, repair time, and machine reliability (number of repair calls) relative to corporate standards. Incentives, such as salary increases (individual outcome), gain sharing (group outcome), and bonuses were based on these dependent variables.

Wageman (1995) selected groups that varied in the group member interdependence (individual, group, hybrid) and manipulated incentive structures (individual, group, and hybrid) for them. Wageman found that performance was highest when task interdependence and outcome structure were consistent—individual interdependence combined with individual incentives and high interdependence combined with group incentives. Groups with hybrid task interdependence or hybrid outcome structures performed worse than groups with pure structures. Helping behavior and a culture of cooperation was highest in groups with high interdependence. Helping behavior was lowest in hybrid incentive structures.

Wageman's (1995) findings straightforwardly generalize to physicians. Service repair technicians have a similar task to physicians of gathering information, diagnosing, and treating. They face similar pressures to do the job in a timely and responsive manner using the appropriate amount of parts and to do the job right the first time. Team interdependence and incentive structure varies in both settings. In addition, both service technicians and physicians work in environments where they are not directly monitored on the job.

The analyses by Nalbantian and Schotter (1997) and by Wageman (1995) suggest the following:

Issue 3b: Group-level incentives based on competitive teams will have a greater impact on behavior than forcing contracts, profit sharing, productivity gain sharing, and revenue sharing.

Issue 3c: Group-level incentives based on forcing contracts, profit sharing, and productivity may have a greater impact on behavior than gain sharing, which outperforms individual incentive structures and revenue sharing.

Issue 3d: Productivity may differ according to whether pure incentive structures (individual or group) or hybrid incentive structures are in place.

Issue 3e: The match of work organization and incentive structures (individual incentives matched to low interdependence; group incentives matched to high interdependence) may affect productivity.

Issue 3f: High interdependence in groups and group incentive structures may affect the degree of helping behavior and the culture of cooperation.

In both Nalbantian and Schotter's (1997) and Wageman's (1995) analysis, each group faced only one incentive structure. In health care delivery, this is an unlikely occurrence at the medical group level, although it may not be unlikely within medical groups. One would expect that medical groups would standardize incentive structures for all the physicians and physician teams within a medical group to simplify administrative burden. Following Wageman, it seems reasonable to expect that where incentive structures are fragmented or hybrid, the effect of incentive structures is attenuated.[8]

Issue 3g: The degree of physicians' incentive fragmentation (hybrid incentive structures for that mix fee-for-service, salary, and capitation) may affect physician productivity.

Both the analyses by Nalbantian and Schotter (1997) and Wageman (1995) are limited because the ownership of the group resembles a typical employment relationship. This does not fit the health care environment, in which many medical groups can be characterized as worker-owned firms. Doucouliagos (1995) performed a meta-analysis of differences between labor-managed firms (LMFs) and participatory capitalist firms (PCFs). LMFs are "worker-owned firms in which labor exercises ultimate and democratic decision making power, with one vote per person." PCFs are "firms adopting one or more participation schemes involving employees, such as ESOPs,[9] quality circles, gainsharing, profit sharing, and autonomous work groups" (Doucouliagos 1995). Doucouliagos concludes that democratic governance (LMFs) does not reduce productivity. In fact, incentive structures such as profit sharing have a greater effect on productivity in LMFs than in PCFs. Within LMFs, "profit sharing is more positively related to productivity than is worker participation in decision making." Doucouliagos's interpretation is that in LMFs, "worker-entrepreneurs are likely to be more interested in profit

and the firm's survival than ordinary employees would be." The analysis by Doucouliagos suggests the following:

Issue 3h: The degree of shared ownership among physicians of a medical group may have an impact on the effect of incentive structures such as profit sharing on productivity.

Issue 3i: The larger the degree of shared ownership among physicians of a medical group, the larger the difference between the effect of financial incentive structures such as profit sharing and the effect of participation in decision making on productivity.

BUNDLING SERVICES AND PROVIDERS: SUMMARY

The above arguments pose some interesting questions. One is, How does bundling services and people relate to accountability? Accountability is an outcome of bundling. It refers to an actor's responsibility to organize and control delivery of a product. The definition of the product being paid for, how services and people are bundled, affects the way providers can combine inputs to produce the product. Responsibility increases as function of the bundling breadth.[10] We also note that bundling occurs even under apparently simple fee-for-service arrangements. An office visit for evaluation of intermediate complexity requires bundling administrative services associated with receiving the patient, nursing services to obtain weight, blood pressure, temperature and complaint, and physician time with the patient. The provider is accountable for organizing these different components of the service so that their total cost is less than the fee. The low level of bundling means that not much responsibility is shared. A conceptual model based on bundling of services and people may provide significant theoretical leverage for understanding accountability.

A second issue is determining the optimal size of the medical group, physician interdependence, incentive structures, and targets. Free riding and shirking problems should increase as group size increases because it is more difficult for social influence and monitoring to operate through peer relationships. A third issue is determining the incentive target—should incentives be targeted toward individuals? Care teams? or Medical groups? Or, should a mix of incentives be used and targeted toward different levels?

A third issue is determining the performance measures that should be used for awarding incentives. It is likely that the relationship between the number of measures and performance is an inverted U. The mix of performance measures is also important, with a mix that measures performance trade-offs

being most appropriate (e.g., productivity, quality, and satisfaction measures). A fourth issue is the legitimacy of the method of implementing competitive teams among medical groups. Since the legitimacy of the institutional structure is important, risk adjustment to ensure fairness and/or physician ownership may be critical for effective implementation of bundling.

INCENTIVE TRANSMISSION: INCENTIVES AND THE HEALTH CARE ORGANIZATIONAL CONTEXT

A significant limitation with our discussion of individual differences and bundling services is the implicit assumption that providers face a uniform incentive structure.[11] This assumption is unwarranted in many health care settings. The health care context can be best described as an incompletely contained hierarchical nest. Incompletely contained means that each subordinate level of a hierarchy may or may not be fully contained in the superordinate level. A rough characterization of the hierarchy from the bottom up is the following:

- Patients see one or more physicians.
- Physicians may work in one or more care teams or microsystems (Mohr and Batalden 2002).
- Physicians and care teams may work in one or more clinical units or groups (e.g., pediatrics, cardiology).
- Physicians, care teams, and clinical groups may work in one or more medical groups or physician organizations, such as IPAs (Hillman, Welch, and Pauly 1992; Rosenthal et al. 2001, 2002), or hospital-based organizations, such as physician hospital organizations (PHOs) (Burns and Wholey 2000).
- Medical groups, IPAs, and PHOs may contract with one or more preferred provider organizations (PPOs), health maintenance organizations (HMOs), purchasers such as Medicare or CalPers, or indemnity insurers.

This nesting makes tracking incentive effects difficult. Because the hierarchy is incompletely contained, there is the possibility at every level of multiple incentive structures being in place at the superordinate level. While research has begun describing this complexity (e.g., Rosenthal et al. 2002), organizational theories need to be developed showing how multiple incentive structures are translated across levels. Each transmission level can result in significant slippage and change in incentive structures from those implemented at the superordinate level. We need to understand how a medical group translates a complex contract environment, such as one that includes both fee-for-

service and capitation, into incentive arrangements for physicians within the medical group.

Issue 4a: The method by which organizational units translate superordinate incentives into subordinate incentive arrangements within the organization[12] is likely to influence the impact of changes in a superordinate incentive.

An important question is understanding how medical groups and physicians respond to mixed incentives—are the incentives associated with a patient[13] passed through to physicians, or are they homogenized through cognitive or organizational processes? An example of homogenization is a medical group adopting the most restrictive formulary policy from all of the health plans it works with in order to simplify the physician work environment. There are a number of arguments that suggest that homogenization occurs. Our earlier arguments suggested that hybrid incentive structures associated with heterogeneity in incentive arrangements may have negative effects on productivity. Another factor driving homogenization is that administrative costs may be increased by the requirement to maintain multiple reporting and monitoring systems. Passing through heterogeneous incentives may also be risky because it makes managing safety more difficult (Reason 1990, 2000). Finally, passing through heterogeneous incentives may conflict with professional norms of "one best way" of delivering care—it may be difficult for professionals to understand why the best way varies across patients because of heterogeneous incentives.

Issue 4b: Medical group or physician response to incentive heterogeneity, either passing through or homogenizing incentives, is likely to influence the impact of incentives.

The prior discussion of superordinate incentives focused on the relationship between superordinate incentives and subordinate incentives. This paragraph argues that superordinate incentives affect productivity through their effect on production organization. We argued earlier that a fee-for-service payment system for a medical group could be a barrier to organizational innovation. Changing to a capitation arrangement for a medical group allows the medical group to more easily substitute types of professionals, such as nurses for physicians. This changes production organization to a more team-based form. As we argued earlier, group incentives are best for teams. This suggests that production function change to a team base caused by change in superordinate incentives will increase productivity most in medical groups with group incentive systems.

Issue 4c: The effect of production function changes caused by superordinate changes on productivity and quality is likely to be mediated by the structure of incentives within a medical group.

Resource dependence theory suggests that the dominance of purchasers faced by a medical group or physician may be a determinant of their response to incentive structures (Pfeffer and Salancik 1978). Changes by a single large purchaser can determine the institutional environment. The adoption of standardized reporting forms and criteria by Medicare, for example, has resulted in the widespread adoption of similar forms and criteria by other purchasers and provider groups. If organizations such as medical groups seek to homogenize diverse incentives in their environments, the change by a large purchasing organization can result in substantial change on internal arrangements in the medical group, while change by less dominant purchasing organizations may have no effect on internal arrangements.

Issue 4d: The impact of an incentive change by any purchaser on a medical group's outcomes will likely be a function of the relative size of the purchaser (e.g., revenue).

The lack of major purchaser dominance may have a number of consequences for the organizational structures and medical incentives observed within medical groups. First, the lack of major purchaser dominance may result in greater variation across medical groups in the structure of incentives within the medical group because each medical group can respond to slightly different aspects of its incentive environment. Second, the lack of a standardized environment may result in significantly higher medical group administrative costs in order to manage a diverse incentive environment.

Issue 4e: The diversity, or lack of a dominant purchaser, in the incentive environment faced by medical groups may affect the diversity in incentive structures across medical groups and the administrative costs associated with managing incentives.

Since other research on the effect of incentives on physician behavior within medical groups is likely to occur concurrently with research on the incentive transmission, the physician behavior researcher will initially not have available an adequate incentive transmission theory to incorporate. However, that still does not mean that the physician behavior researcher should not address incentive transmission. Incentives researchers must explicitly state their assumptions about the operation of the incentive transmission. This will allow

the research community to determine whether the lack of an effect of manipulating an incentive at a superordinate level is due to no effect or due to transmission slippage.

RESPONDING TO CHANGES IN INCENTIVES

Predicting the effect of incentive changes requires understanding when incentive changes are likely to affect provider change. Reinforcement theory shows that the reinforcement schedule can result in behavior that is resistant to change and, as Nalbantian and Schotter (1997) have shown, history is important. This suggests that reinforcement structure and history can attenuate or cause severe lags in responsiveness to incentive structure change.

Issue 5a: History, reinforcement structure, and expectations about the future stability of new incentive structures may influence the responsiveness of medical groups and physicians to incentive change.

It is also reasonable to expect that expectations about the future may have an adverse effect on incentive implementation, particularly when physicians feel that the new incentive structure will be stable enough to reward behavioral change. Response to changing incentives is also likely to be a function of trust between the subordinate and superordinate levels (Miller 2001), especially for changes requiring a high level of investment. Rational investment decisions require the calculation of net present values, which requires making projections about future payment rates and expectations about sharing gains.

Issue 5b: Uncertainty about the future stability of markets and the willingness of insurers to share productivity gains will likely affect the willingness of physicians to implement costly changes.

As well as lags in responding to incentive structures, there is the problem of understanding how physicians and medical groups will respond to incentive changes. We approach the latter issue using an organization learning model (March 1991; Levitt and March 1988). A simple model of adaptive search suggests that when performance is less than a target, organizations search for a solution to the problem (Cyert and March 1963; March and Simon 1958). We assume that the incentive changes create perceived future financial or quality losses that motivate a search for solutions.[14] It is reasonable to assume that the organization changing incentives has expectations about desirable outcomes of the incentive change. But, these desirable outcomes are not the only outcomes—there are undesirable ones as well.

There are a wide variety of desirable outcomes. Demand and disease management, such as lifestyle education for patients with congestive heart failure or diabetes, may reduce use of services, particularly emergency hospitalization. Group-based programs, such as group hypertensive or diabetes care, may result in patient behavioral change through peer information and pressure. These programs can reduce patient demand for services and improve care quality. Profiling can be used to identify high-cost or low-quality providers and remove them from the organization. There are several options for reorganizing work. Examples include substituting nurse practitioners or physician assistants for physicians (Cooper and Aiken 2001; Cooper 2001; Cooper, Laud, and Dietrich 1998; Hooker and McCaig 2001) and using intensivists for inpatient care (Wachter and Goldman 2002). Examples of new types of health care delivery mechanisms are 24-hour nurse call-in lines, using urgent care centers so patients are less likely to use emergency rooms, and developing a policy of getting patients in the first day care. Information systems, such as bar coding medical records and automated drug or lab test order-entry systems (Bates 1999) are examples of capital investments. Other forms of utilization review, such as formularies that guide the substitution of less expensive drugs of similar efficacy, can also be implemented. In addition to reorganizing work, efforts can be targeted at changing provider behavior through continuing medical education, audit, and feedback. Education efforts could focus on the use of guidelines and clinical pathways.

Nonetheless, there is also a wide variety of undesirable actions. Providers may lower their performance aspiration levels so that there is no performance gap. Providers may seek to gain market power by forming specialty groups and integrated delivery systems so that they can raise their prices. Providers may seek to increase revenue by product differentiation, such as using computed tomography (CT) scanners for preventive cardiology or concierge care. Providers may seek to reduce costs by playing a risk selection game, dumping more costly patients and skimming more profitable patients (Ellis 1998). Although incentive designers may not find these solutions desirable, these solutions, particularly market power and product differentiation solutions, may be very attractive to providers.

In sum, there are many organizing alternatives available. These alternatives vary in their attractiveness to incentive designers and provider groups, perhaps inversely. One reasonable expectation is that medical groups search for the least costly solution to the perceived problem. Besides financial cost minimization, least cost can takes a variety of forms, including minimizing internal conflict and change within the medical group. A reasonable expectation is that the evidence base for the effectiveness of the solution, the certainty that investment in a solution will result in a specified outcome, affects the

adoption. The ability to respond to changing incentives may be made very difficult by the lack of information about the effectiveness of an option in the medical groups' particular situation and the presence of significant capital and training costs associated with some of the options. For information technology adoption, for example, some of the issues include initial capital cost, costs to operate old and new systems in parallel, training costs, and disrupted productivity. Also, a rapidly changing technology may make a decision immediately obsolete. It seems reasonable to expect that options that have high initial costs or with an unclear future are less likely to be pursued.

In addition to the choice of response being influenced by characteristics of the solution, the choice is likely to vary as a function of the provider organization and incentive structure characteristics. A rural physician may neither have the option of using an intensivist nor have a 24-hour call-in line available. Smaller practices may not have the funds to invest in an electronic medical record. A medical practice may operate with minimal bundling of services, and people may not be able to substitute nonphysician providers for physicians. In sum, the types of responses to changed incentives are a function of the practice's organization, context, and existing incentive structure. We do not enumerate hypotheses about these effects because they are likely to be numerous, very specific to an institutional setting, and reasonably obvious to researchers who pay attention to the institutional context.

A key point of this discussion for research is that instead of asking why medical groups do, or do not, adopt a particular innovation such as electronic medical records when an incentive change results in a performance shortfall, researchers should ask what determines which option from a set of changes medical groups adopt. Under the learning model, the assumption is that medical groups faced with performance shortfalls will take action. The research questions are the following: (1) understanding the set of options that medical groups feel they can choose from and (2) understanding how medical groups go about choosing from that set. In other words, the question is not one of whether or not a particular solution, such as electronic medical records, is adopted but why one solution rather than another was chosen.

Issue 5c: The multiplicity of potential solutions available to respond to incentive changes may have an impact on the effect of an incentive change because of differences across the solutions in how they affect the medical group.

It is likely that response to incentive change will also be influenced by medical group culture (Kralewski et al. 1999; Kralewski, Feldman, and Gifford 1992). There are many feasible actions that could be pursued by a medical group wishing to address a performance problem. However, this variety

poses problems, particularly when there is weak evidence on the performance of alternatives and when the effectiveness of each alternative varies as a function of organizational characteristics. Because of this lack of knowledge and because of the diversity of professional beliefs about effective care, it is likely that there will be significant debates among professionals within organizations about change efforts and perhaps even a lack of commitment to change efforts. Research suggests that worker ownerships facilitate an organizational culture supportive of risk-taking behavior (Doucouliagos 1995).

Issue 5d: The ownership structure of medical groups will likely affect the investment in productivity and quality improving solutions in response to incentive changes.

This section has argued that there are barriers between incentive change and physicians and medical groups changing behavior in a desired manner. These barriers will attenuate incentive change effects and affect the translations of efficacy into effectiveness. However, the problem is not hopeless. There are cases of significant organizational change and significant improvements in health care quality, such as the Veterans Administration during the past 10 years. Organizational research suggests that necessary conditions for this type of effective change are incentive structures that encourage innovation and new forms of organizing, performance measures that encourage implementation, physician ownership (Doucouliagos 1995), the development of infrastructure and standards that reduce the costs and risks to medical groups, national organizations that support change efforts, and the willingness of professionals to support change (Cole 1985). In the case of the Veterans Administration, it was clear that support for the change efforts include the investment in the infrastructure that was necessary to support change. Before focusing on the effects of incentives, it may be more prudent to ask what support structures are necessary to make sure that effectiveness approaches efficacy.

CONCLUSION

This article describes issues that should be considered in developing and testing theories about incentive effects. We argued that understanding the effect of incentives on physicians starts with an economic theory of incentive effects. We then explored psychological and organizational factors that influence incentive effects. Decision theory suggests that research must take into account ambiguity and regret. Reinforcement theory suggests that since financial incentives are only a component of a witches' brew of reinforcers (all incentives) that are related to a physician's decisions, understanding the effect

of financial incentives requires understanding how they fit with other reinforcers. This is important because it will allow health services to calibrate the effect of financial incentives—what is the relative impact of financial incentives that emanates from a witches' brew of all reinforcers? Then, we considered how the bundling of services or people for payment purposes affects incentive impact. We argued that matching incentives with the organization of work, so that individual incentives are matched with physicians organized individually and group incentives are matched with physicians organized in teams, is likely to influence the impact of incentives. We reviewed literature that showed that hybrid structures (e.g., group-level incentives for physicians organized individually; both group and individual incentives for a team) perform worse than pure structures. Then, we considered how the incompletely contained hierarchical nesting that typifies health care organization in the United States affects incentive transmission and attenuation. Finally, we considered the dynamics of incentive change, asking under what conditions physicians and physician organizations would respond to incentive changes.

A wide variety of issues have been presented in this review. These issues deserve to be incorporated in theoretical developments. Nevertheless, it will be difficult to develop a single comprehensive theory of incentive effects initially because of the complexity of the problem. This article identifies a number of potential research topics that could proceed in parallel:

- Developing economic theories that incorporate psychological and organizational insights
- Understanding the effect of psychological factors, such as ambiguity, regret, and reinforcements, in physician behavior
- Understanding the relationship between bundling, accountability, and behavior
- Understanding the effect of the interaction of physician work organization (individual or team) and incentive structure (individual or group) on performance
- Understanding the process of incentive transmission and attenuation through an incompletely contained hierarchical nest
- Understanding the effect of superordinate incentive change on incentive structures and production organization within medical groups
- Understanding when and how physicians and medical groups respond to a change in incentives

As research develops in each stream, integration efforts could be used to develop a comprehensive theory of incentive effects.

A key difficulty that organizations structuring incentives face is balancing specificity with generality in designing the incentives. Incentives can be made specific by either specifying processes to be followed, such as guidelines or

clinical pathways, or by specifying target performance levels, such as immunization levels. Incentives can be made general by setting broader goals, such as achieving some level of patient satisfaction, productivity, or overall clinic resource use levels. The advantage of more specific goals is that it can result in directed behavioral change. However, specificity can also result in subgoal optimization, with physicians focusing on meeting the narrow, specific target. While generality allows physicians more ways to meet the incentive objectives, it also allows physicians the opportunity to meet targets and objectives in ways that may not be desired by organizational or public policy makers, such as capitation leading to skimping on health care services instead of improving care organization. The specificity or generality of an incentive direction also affects organizational implementation costs. Specific incentives require organizational structures to measure and reward performance at a detailed level. General incentives often require monitoring to guard against undesirable actions being taken. Not only must researchers ask, How do incentives affect an actor's behavior? They must also ask, What do organizations need to do to implement an incentive effectively? The cost incurred with the latter may outweigh the gains from changes in an actor's behavior.

We also argued that the context of incentives is important to consider when studying incentive effects. Incentives as designed and implemented by health care organizations and public policy makers are an attempt to obtain a desired behavior. Incentives are only one of many determinants of a desired behavior. Examples of other determinants are infrastructure (e.g., electronic medical record), individual ability and skills, and the mix of skills available on a care team. Incentive context moderates incentive effects. Developing adequate theories of incentive effects requires that as well as asking the question "What is the effect of an incentive on a desired behavior?" researchers also ask, "What is the desired behavior?" "How does the incentive context affect the desired behavior?" and "Given the incentive context, how much can incentives affect the desired behavior?" This will help us understand whether manipulating incentives or the incentive context can solve the performance problem.

NOTES

1. Rabin (1993) and Loewenstein (2000) provide discussions.
2. In our usage, incentives refer to consequentialist, forward-looking behavior—behavior that is guided by the expectations about future outcomes. Heuristics and rules are backward-looking behavior—once a situation is categorized, the heuristic or rule is applied to guide behavior.
3. Milgrom and Roberts (1992) provide an excellent overview of economic approaches to incentives at an introductory level. Gerhart and Rynes (2003) provide a compre-

hensive survey of psychological and organizational theories and research on incentives and compensation.

4. McGuire (2000) provides a review.
5. The article by Encinosa, Gaynor, and Rebitzer (1997) is an example of a paper at the forefront of the theoretical and empirical analysis of physician incentives.
6. Encinosa, Gaynor, and Rebitzer (1997); Holmstrom and Milgrom (1991); and Gaynor and Gertler (1995) have incorporated some of these features in the context of physicians and other principal-agent scenarios. However, none have presented a model that captures more than a limited number of these features.
7. Kessler and McClellan (1996) provide empirical evidence on the impact of liability laws on physician behavior.
8. Fragmentation is not the same idea as the volume of payments from the largest payer a medical group works with. Fragmentation refers to the heterogeneity in the incentive structure. If a medical group works with two payers who use the same incentive structure, then the incentive structure faced by the medical group is not fragmented. Obviously, if a medical group works with only one payer, then payer does not fragment the incentive structure.
9. Employee stock ownership plans.
10. A management principle is that as responsibility increases, authority and resources appropriate for the responsibility should also be delegated. Unless such delegation occurs, bundling may have minimal effects on performance.
11. This is also true in health services research discussions of incentives. This probably occurs because of the interest in a particular type of incentive (e.g., What is the effect of capitation on quality?) and because it is theoretically easier to deal with pure incentives.
12. Containment is being used in an institutional sense. If all purchasers at a given level change to a similar incentive structure, the new incentive structure fully contains all subordinate levels.
13. Patients are associated with health plans, which can implement their own incentive structures and apply them to physicians and physician groups. If patients tend to be within one plan, the health plan incentive structure can be described as a property of the patient.
14. An alternative may be to specify incentive systems that are highly detailed and that specify exactly what will be paid for. In health care, this type of solution is probably not feasible. First, as discussed under reinforcement, there is the difficulty in adapting the payment systems quickly enough to keep up with provider and professional innovations. Second, there is the risk of subgoal optimization, as providers target their efforts toward the specific incentives. Third, there are monitoring costs to assure that providers are actually doing what is desired. Some of these activities, such as continuous quality improvement and care teams, may be extremely difficult to monitor for reimbursement purposes.

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