Outcomes Measurement in Hospitals: Can the System Change the Organization?[1]

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Summary

The U.S. health care industry is in crisis—a crisis of accountability. Many believe that improved information, especially outcomes information, is at least part of the solution. If this assessment is accurate, outcomes measurement could offer a powerful opportunity to help mold our dysfunctional health care machinery into an effective infrastructure. This article explores whether implementing an outcomes measurement system in a hospital compels this kind of change. It examines the experiences of 31 hospitals that implemented a market-leading outcomes measurement system. Despite its potential, Medis-Groups did not *compel* important improvements in hospitals' quality of care or their internal practices. Hospitals found it particularly difficult to maintain momentum throughout implementation and to structure the system as a supporting tool, rather than a driving influence, in their pursuit of operating improvements.

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The U.S. health care industry is in crisis—a crisis of accountability (Relman 1988). The nation spends more than 12 percent of its gross national product on health care, and these costs show no sign of abating. Despite escalating costs, consumers and purchasers are increasingly concerned about the quality of medical care (Faltermayer 1988; Chambliss and Reier 1990). Our traditional control mechanisms—market forces, regulatory sanctions, and medical professionalism—have all been ineffective in guaranteeing high-quality, cost-effective health care. The state of the industry can be cynically described as "punitive, witch-hunting regulators vainly attempting to inspect an entrenched clan of autonomous peers who protect, but do not discipline each other in spite of delivering inadequate or inappropriate services to customers who cannot tell what they are getting for ever-increasing prices" (Linder 1991).

The problem has been characterized as a failure of information (Ginsburg and Hammons 1988; Arnould and DeBrock 1986; Iglehart 1988). Many believe that improved information, especially outcomes information, is at least part of the solution (Vladeck 1988; Wennberg 1988). With objective information about exactly how their performance compares with that of other professions, physicians could refine their norms of practice. Giving the same kind of information to those in authority positions—regulators, boards of trustees, and administrators—might enable them to manage clinical quality actively.

If this assessment is accurate, outcomes measurement would appear to offer a powerful opportunity to help change our dysfunctional health care delivery machinery into an effective infrastructure—one in which costs and quality are measured and continuously improved. This article examines the experiences of 31 hospitals that implemented MedisGroupsII®, the market-leading outcomes measurement system, to understand whether it had that effect. Data for this study were gathered during late 1989 and early 1990, and the MedisGroups system has been enhanced since that time. The study is intended to focus on management issues in executing organizational change rather than on the current state of the system's technical development.

The next section of the article describes the system and explains why it appears to have the potential to precipitate fundamental change. This is followed by an analysis of why hospitals did not, in fact, report that result.

MedisGroups: The Potential to Drive Change

MedisGroups is a clinical outcomes measurement system designed for the health care industry and used predominantly by hospitals. (Thomas and Longo (1990) present an excellent comparison of MedisGroups and the sys-

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tems that compete directly with it.) The system helps a hospital assess the effectiveness of its medical care by measuring outcomes. When a patient enters the hospital, MedisGroups determines the disease state by classifying the severity of illness based on clinical instability leading to the risk of organ failure.[2] Cases are assigned a severity score of 0 to 4 by using key clinical findings—about 260 well-defined, objective clinical results obtained from diagnostic tests and physical examinations. Subjectively determined information such as diagnosis is not used to determine severity. MedisGroups also tracks medical services rendered and evaluates a patient's clinical instability after treatment. The system compares the results—both in patient health and charges—with a data base of similar procedures that has been accumulated from all MedisGroups users. This comparison indicates whether the rate of in-hospital mortality and morbidity are statistically different from the current, empirical MedisGroups norm for similar cases.

MedisGroups has flexible reporting capabilities but produces three standard reports for evaluating performance. *Appropriateness reports* focus on low severity and "no findings" cases that may have had treatments not actually required. *Efficiency reports* compare the hospital's procedures and charges to those of other hospitals and compare individual physicians' practice patterns. *Effectiveness reports* compare medical outcomes by disease to those achieved by other hospitals. (Lanning and O'Connor (1990) link these three types of assessment neatly into a comprehensive definition of health care quality.)

MedisGroups data is drawn from medical charts after patients have been discharged from the hospital. Before the charts are permanently stored in medical records files, they are abstracted by a trained reviewer, often a nurse. This individual selects information from the chart based on extremely specific criteria contained in the MedisGroups glossary. For example, a clinical finding is ignored if it is termed "possible," but taken into account if called "probable." A trained abstractor requires about 15 minutes to code an average chart. Abstractors are not allowed to submit data to the MedisGroups national data base until they have been certified as 95 percent accurate. After being certified, abstractors are periodically checked for compliance with the MedisGroups quality standards. (Iezzoni and Moskowitz (1988) provide an excellent description of the abstracting process.)

At the present time, MedisGroups is used by over 500 hospitals in the United States and Canada—more than any other clinical outcomes information system. Pennsylvania has mandated that all of its hospitals generate and report MedisGroups severity and clinical outcome data to the state's central health information commission. Iowa has adopted a similar regulation.

MedisGroups technology is well within the financial and information technology reach of most organizations,[3] and the implications for hospital care are

potentially significant. MedisGroups purports to make measures of clinical effectiveness available for the first time. In the past, this kind of information has been fragmented and anecdotal when it has been available at all. Autonomous physicians have controlled clinical decision making without the benefit of comprehensive effectiveness metrics; separately, administrators have managed the fiscal health of the institution. Accurate, reliable outcomes measures should make it possible to assign and execute these responsibilities quite differently. For example, hospital leaders could use outcomes data to consider both the cost and effectiveness of alternative courses of treatment to make prudent clinical decisions. In theory, then, MedisGroups holds the potential to compel important changes in hospital practice that would translate into significant and durable improvements in performance.

Realistic Possibility or Flight of Fancy?

MedisGroups is only an information system. Is it likely to have a dramatic impact on the way hospitals deliver care? The answer to this question hinges on two others: Is the system functional, and if so, is that functionality influential? For the system to be functional, it must be usable and provide information that is accurate, reliable, and valid. Some evidence is available to indicate that MedisGroups meets this test. It is the market leader among severity-adjusted outcomes measurement systems, suggesting an acceptable level of usability. Independent research has shown that its severity measures correlate well with probability of death, although not as well with resource utilization (Iezzoni and Moskowitz 1988). Stringent data collection controls are in place to ensure that data accuracy remains high, both at the hospital level and for the national comparative data base. Finally, because MedisGroups relies primarily on objective clinical findings, its measures and results are relatively immune to the inconsistency and bias of diagnosis-dependent assessment. Some questions have been raised about the validity of MedisGroups data for widespread quality measurement (Iezzoni and Moskowitz 1988), but its use as a screening tool to suggest areas for potential quality improvement is well accepted.

MedisGroups appears to be functional; does that functionality compel change? We know that it is possible for an information system to be instrumental in organizational change (Barley 1986; Leonard-Barton 1988). Prior research has demonstrated clearly that information systems alone do not guarantee change (Kling 1980; Bariff and Galbraith, 1978). The innovative use of information technology does not create change unilaterally, but it appears to be a driving force in some cases (Linder 1989).

MedisGroups would seem to have the potential to compel changes in hospital practice because it enables performance to be measured in a way that was

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previously impossible. New information might cause procedures that had been accepted as the norm to be revealed as ineffective or inappropriate. Hospital leaders would be provided with objective evidence to instigate changes in practice patterns. However, their ability to use outcomes measurement in this way would depend on their ability to link outcomes with the processes of care that produce them (Vladeck 1988).

To play an influential role, MedisGroups must be adopted, implemented, and actually used (Mohr 1987; Rowe and Boise 1974). This presents a dilemma. A system that compels changes in the way processes work is, by definition, incompatible with existing practices. Yet, this incompatibility tends to inhibit the system's adoption (Rogers and Shoemaker 1971) and threatens implementation (Keen 1981; Bariff and Galbraith 1978). In other words, systems that are likely to be implemented are unlikely to change the way business is conducted, and vice versa.

The system's ability to compel changes in practice, then, depends on whether hospital leaders can accomplish a difficult implementation. (For our purposes, we will define implementation as the ability of the organization to reach the point at which the system is used for a desired purpose.) Several factors are known to be important contributors to success. The involvement of a powerful, respected leader is critical in giving revolutionary change enough momentum to overcome naysayers (Nord and Tucker 1987; Nutt 1986). If this kind of support is not forthcoming, information technology is more likely to be molded to the organization rather than the other way around (Kling 1980; Leifer 1988). Effective leaders sustain their involvement long enough for the change to take a life of its own: the organization becomes convinced that the system's benefits outweigh the financial, political, and attentional costs of change (Rogers and Shoemaker 1971; Markus 1981, 1983; Keen and Gerson 1977; Robey 1987).

While Damanpour and Evan (1984) found that low-technology libraries were likely to undertake administrative innovations before associated technical ones, they argue that effective high-technology firms such as hospitals would reverse this order. They advise a hospital to begin organizational innovation with the technology, then allow the organizational adjustments to follow.

Leonard-Barton (1988) finds that "wringing value" out of innovations also entails managing a process of mutual adaptation between the technology and the organization—of incrementally resolving misalignments between business practices and technology features. This is a kind of give and take in which both the system and the organization adjust over time in a series of adaptive cycles. These vary in disruption, depending on the magnitude of the changes to be made.

Based on prior research, then, we would expect MedisGroups to be influential in changing hospital practices and improving performance if it is cham-

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pioned by powerful hospital leaders who create a perception of its benefits, install the system technically, then help to organize through a process of mutual adaptation to exploit the value of the innovation.

Methodology

To understand how hospitals implement, use, and benefit from MedisGroups, I conducted 103 interviews with 31 MedisGroups users during late 1989 and early 1990. (Nine other hospitals were contacted, but declined to participate.[4]) The hospitals represented a cross-section of MedisGroups users in terms of geography, teaching affiliation, size, and system experience. Each participating hospital had leased the system for at least one year, and the average term of use was more than three years.

In each hospital, I asked to speak with at least three members of the organization involved with outcomes measurement: the quality assurance director, a physician involved in quality management, and a senior executive responsible for outcomes information. Nineteen of 31 participating hospitals agreed to all of these interviews, and I was also able to interview a member of the board of trustees and the information systems manager in several cases. One subsequently became the subject of a case study on total quality management. My access in the remaining hospitals was more limited. Additionally, I interviewed the management of the software vendor, Mediqual Systems, Inc., to get an understanding of the product itself.

The interviews were tape-recorded, resulting in more than 3,000 pages of transcript, which were content-analyzed. These self-report data are subject to the usual caveats about bias; however, they are qualitatively richer than survey information and, I argue, appropriate for an exploratory study such as this one. One-third of the hospitals were willing to share organization charts and recent financial results with me. I used published Health Care Financing Administration statistics for demographic information about the participating hospitals. Table 1 shows that the participating hospitals ranged from small community institutions to large teaching hospitals. They were located in all regions of the country, although more concentrated in the New England and Middle Atlantic states.

Findings: Little Evidence of Change

Despite its potential, the MedisGroups system failed to *compel* important changes in hospital practices that led to performance improvements. Only four hospitals of 31 agreed that the quality of care they delivered had improved as a direct result of using the system. The remainder believed that medical

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Table 1
Descriptive Statistics about the Participating Hospitals

|	n	Average	Median	Minimum	Maximum
Teaching programs	31	38.7%			
Number of beds	31	434.7	433	116	815
Active M.D.'s per bed	31	.72	.68	.28	1.59
Percent Medicare admissions	23	44.1	45	18	65
1989 capacity utilization	28	73	75	45	92
1988 capacity utilization	28	73	74.5	49	87
Operating profit/revenue	21	.022	.026	−.174	.119
Months on the system	32	38	36	12	78
Number of interviews	32	3.4	3	1	7
Geographic region					
Northeast	8				
Middle Atlantic	5				
Southeast	2				
Central	9				
Midwest	5				
West	3				

quality had not changed or that outcomes measurement was not responsible for changes they had seen. Although more than one-half agreed that the system had helped them cut resource utilization, they claimed they did not achieve this result through changed practices, but through administrative cost-cutting—business as usual. These hospitals received enough benefits to convince most of them to continue to pay an average of $100,000 per year to lease the software and staff the organization; the impact simply was not transforming. The most common view was consistent with this administrator's statement: "We cannot demonstrate any quality improvements from outcomes measurement. Some things may have changed, but they have no relationship to the system."

These results can be explained in terms of three management issues: intention to change, implementation difficulties, and the ability to capture value from the system. The following three sections describe these issues. Figure 1 arrays the hospitals by these management issues, and the appendix defines the variables that are used in this analysis and describes how they were coded.

Intention to Change

Twelve hospitals (37.5 percent) reported no significant organizational changes after implementing MedisGroups because they did not intend such change to occur. Their reasons for purchasing the system and the ways they intended to use it were qualitatively different from those of the other institutions. They

Figure 1
Did the Information System Compel Change?
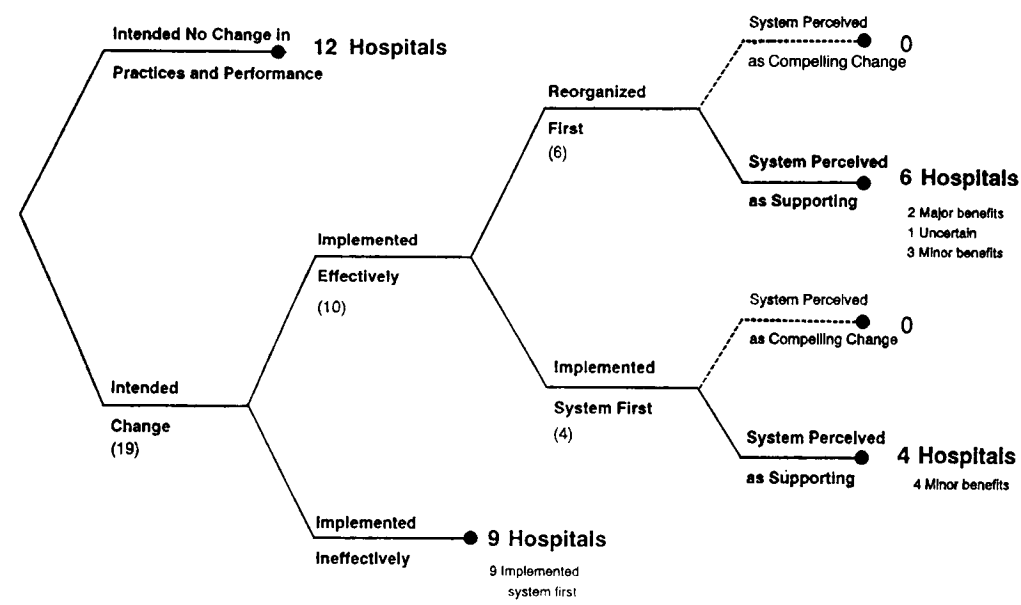
implemented the system as a technical tool but disavowed its organizational potential. These hospitals might be called "pseudo-adopters."

Why did these hospitals install MedisGroups if not to help change their practices, drive performance improvements, or alter their competitive positions, as other institutions reported? Their reasons fell into three categories. Four hospitals intended the system to automate their existing information flows. The director of medical affairs from one said, "We looked for a program that did exactly what we were attempting to do manually. We decided Medis-Groups was the best fit, and we could introduce it without disrupting the medical staff organization as it existed." None of these hospitals used the system to hold medical professionals accountable for their quality or resource utilization. Instead, the system was used to mechanize existing quality assurance functions. In this way, a potential innovation was converted to a safe, ordinary investment.

Four institutions installed the system explicitly to protect themselves from the demands of external constituents. They implemented the system to manage the *image* of quality and effectiveness they presented to their customers and to the regulators who inspected them. MedisGroups reports were used as evidence that 100 percent of hospital admissions were screened for quality problems, as required by the Joint Commission on the Accreditation of Health

Care Organizations (JCAHO). As one medical director remarked, "When we implemented the system, quality was good. We just wanted to be able to show that to people."

The other four hospitals in this category were forced to implement the system by legislative mandate in their state. This use of MedisGroups was an especially ineffective mechanism for encouraging hospitals to change their internal practices. Mandated hospitals kept the system in an organizational closet and managed it for damage control. Its information was not used within the hospital. Administrators tended the system merely to make sure it was coded optimally and accurately.[5] One hospital's chief operating officer said, "How do we use it today? It's an overhead expense. We send in our monthly report [to the state]. When it comes to determining quality of care, it is of no value."

Clearly, introducing MedisGroups did not necessitate change. Despite the system's potential for measuring clinical effectiveness and encouraging professional accountability, it did not, in and of itself, require hospitals to adopt new attitudes or behaviors. This finding corroborates prior research that information systems do not deterministically compel change.

Table 2 compares the hospitals that stated they intended to change the way they delivered care with those that did not. The two groups of hospitals are largely indistinguishable. Hospitals that intended no change have, on average, fewer active physician's per hospital bed. This is not a particularly strong result, however, as it is significant at only the .09 level, but it could indicate that this group of institutions is less specialist-oriented. Pseudo-adopters also tended to have installed the system more recently than their opposite numbers, but when the hospitals that implemented the system because of regulatory mandates are excluded, this distinction disappears.

Implementation Difficulties

Nineteen hospitals (61 percent of 31 study participants) adopted MedisGroups in conjunction with an initiative to make significant changes in their operations and performance. As predicted, implementation was a much more difficult experience for these hospitals than for those that intended no organizational change. Table 3, Panel A, shows that hospitals that intended organizational change were significantly more likely to fail at implementation, defined as achieving system use for a desired purpose.

The two groups described the process of implementation quite differently. Pseudo-adopters complained of technical and resource issues such as coder turnover and the availability of funds for hardware upgrades. These were temporary set-backs that were handled by middle management. Physicians

Table 2
Hospitals That Intended Change Compared to Those That Did Not

	n	Intended Change	Intended No Change	Significance
Proportion with teaching programs*	31	33.3%	50.0%	.3993
Average number of beds*†	31	436.9	430.4	.9400
Active physicians/bed*†	31	.7932	.5702	.0899
Profits/revenues*	20	.0312	.0092	.4276
Percent Medicare admissions*	23	42.8%	46.6%	.5196
1989 capacity utilization*	28	73.4%	72.3%	.8402
1988 capacity utilization†	28	74.8%	69.6%	.1295
Percent of physicians board-certified†	28	77.7%	77.5%	.9600
Average months since system adoption*	31	42.2	27.6	.0597
Average months from adoption to first system output*	22	19.1	11.6	.3188

*Interview data.
†Health Care Finance Administration data.

and administrators in change-intending hospitals, on the other hand, described intense resistance, political battles over who would control the data, and the requirement for board-level involvement in the effort. Three kinds of implementation problems plagued these projects: hospitals experienced difficulty in establishing the system's credibility, in managing project momentum, and in structuring the system's use.

Establishing System Credibility

Attacks on the system's validity, especially by physicians, inhibited its acceptance. MedisGroups' severity scoring algorithm had been kept proprietary to protect it from being copied by competitors. Because physicians were unable to examine and verify the system's logic, they had difficulty accepting its results. Even nonresistant users reflected this discomfort. Additionally, MedisGroups' rigid data-gathering rules that enabled cross-hospital comparisons and kept the system objective forced important, subjective information to be ignored. For example, abstractors were instructed to accept findings described as "probable" and ignore those termed "possible." Physicians frequently disagreed with a case's assigned severity score, which they had no ability to change. Inevitable coding errors exacerbated this issue and threatened the system's credibility.

Table 3
Hospital Characteristics and Implementation Effectiveness

Panel A		Effective Implementation		Ineffective Implementation
Hospitals that intended organizational change associated with system implementation		10 (52.6%)		9 (47.4%)
Hospitals that intended no organizational change		11 (91.7%)		1 (8.3%)
	Chi-square with yates	5.1285	significance	.0254
	correction	3.4977	significance	.0615
	Kendall's Tau B	−.4067	significance	.0259

Panel B		Effective Implementation		Ineffective Implementation
Hospitals that reorganized before implementing the system		7 (100%)		0 (0%)
Hospitals that implemented the system first		4 (30.8%)		9 (69.2%)
	Chi-square with Yates	8.8112	significance	.0030
	correction	6.2360	significance	.0125
	Kendall's Tau B	.6638	significance	.0038

For some hospitals, the way work was structured helped create invalid results. If critical hospital tests were performed on an outpatient basis, the results would not be taken into account in computing a patient's admission severity. These cases would then be reported as having unnecessary or inappropriate medical treatment. Even though a careful analyst would review patient records before drawing conclusions from the system's reports, physicians were enraged that the data could be so potentially misleading. They were concerned that the computer reports would outlast the detailed explanations.

Sustaining Project Momentum

Hospital leaders had difficulty maintaining their interest and commitment throughout the process of implementation. They were frustrated: "It took a long time to get started." This is at least partially due to the nature of the system. Data entry clerks had to be hired, trained, and certified as reliable. The ideal candidates for these jobs were familiar with medical terminology but willing to set aside their own judgment to follow the system's rules explicitly.

Because the system was designed to provide a rigorous, integrated information infrastructure for performance management, it required six to nine months of concerted data entry before the first statistically valid report could be produced.[6]

Many hospitals experienced problems that delayed their first useful outputs even further. For example, one hospital's medical records and quality assurance departments held an internecine war over who would be responsible for abstracting. Other institutions complained of turnover among quality assurance personnel and the press of JCAHO surveys that detracted from their MedisGroups efforts. On average, 17 months elapsed between the time the system contract was signed and information was available for analysis. By this time, initial excitement surrounding the system had faded, sponsors and champions had often moved to other jobs, and the project foundered for lack of interest. One physician commented:

> You don't learn anything in a year except how to go about the process. You certainly don't have any answers. All the initial excitement has died down because nothing seem to be happening. It's hard to maintain the momentum and the level of energy required. The frustratingly slow progress is one reason that the chair of our Medis-Groups committee just quit.

Resistance stalled progress and stretched the time required to implement the system and demonstrate its benefits. When the system was viewed as part of an organizational-change initiative, threatened physicians and administrators recited a litany of "logical" reasons for avoiding adoption. As one doctor said, "The data is suspect because we don't really want to have a quality assurance system, so if we can show it's bad data, we're done with it."

The regulatory environment increased the stakes in this issue because the system reported on the performance of individual physicians. One quality assurance director noted, "Our doctors have a constant fear that the data will be misused. They are paranoid about even members of our own in-house staff having information about them. They don't want these data to exist."

This concern can be explained partially as the threat of accountability. Professionals who have never been subject to performance measurement might well fear scrutiny. However, the regulatory environment of medical care gives physicians some basis for their paranoia. Information that is used for quality assurance is theoretically immune from legal discovery in a malpractice claim. MedisGroups information was secure, but only if handled confidentially[7] *and* if its immunity remained intact in spite of lawyers' efforts to circumvent the protective regulations.

Sustained resistance, either in active or passive form, delayed the system's implementation and inhibited its use. MedisGroups did not gain the credibility of an accepted performance measurement system with predictable consequences. It continued to absorb the time and energy of a nucleus of committed champions even though its benefits materialized slowly at best. Sooner or later, many tired of the struggle. As one administrator said, "It never gained a life of its own; it never became impersonal."

Structuring System Use

As a measurement system, MedisGroups did not impose a structure of use; management had to design and build this. The point at which output first appeared—when interest was often at low ebb—was the time when this structure had to be established. The system's extensive capabilities provided so much latitude to its users that many could not overlay an adequate order on it.

MedisGroups did not come with packaged prescriptions about what reports should be produced, who should see them, how they should be interpreted, or how their results should be linked to processes of care.[8] An enormous amount of information was available without guidelines for action.

For the system to be beneficial, dedicated analysts had to invest time in the system to understand its content, to explore its results, and to draw valid, useful inferences about clinical practice. These analysts required different skills from the data collection organization previously described. The former succeeded by drawing innovative insights from complex statistics; the latter by processing mountains of data with rote, machinelike consistency. Yet, most hospitals asked their quality assurance staffs to do both jobs. One administrator explained:

> The people who want one-page, presynthesized management reports are naive. Evaluating medical care is a complicated process and hard, analytical work. There are not many quality assurance staffs in hospitals today who are qualified to do what we are asking them to do. You need operations research people with a background in organizational theory.

The task of educating physicians and administrators to interpret and use the information was difficult even when they were willing to attend to it. One medical director explained, "We assumed that once we had the data, it would be usable. We collected data for nine months to get to that point, but when we looked at the reports, we discovered they had little meaning. We had not spent time educating ourselves about how to interpret or use the data. It's like learning a foreign language."

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Hospitals could not rely on assumptions embedded in the system to establish quality measurement. As one administrator explained, "We made the questionable assumption that the system would provide a structure for our quality assurance activities." Instead, they had to make deliberate management decisions about how MedisGroups information would be used in their organizations. This proved to be beyond the capabilities of many hospitals. Without this structure of use, the benefits of outcomes measurement were elusive. As one cynical quality assurance director who described herself "the captain of the Titanic" remarked, "I read the [MedisGroups] reports for entertainment; I can't do anything else with them."

The results were unsatisfactory for many institutions. Some hospitals searched for a less expensive means for severity scoring that would match their costs more appropriately to their perceived benefits. Others continued gathering data in spite of partial or minimal interest in the output. For many hospitals, the system remained operational in that netherworld of half-done initiatives that are too embarrassing to stop and too threatening to push to conclusion.

Achieving Effective Implementation

Ten (52 percent of 19 change-seeking) hospitals were able to implement Medis-Groups effectively in spite of these challenges—that is, they reached a point at which the system was actually used for a desired purpose. Effective implementers captured data, produced reports, evaluated results, and took appropriate action. In contrast, ineffective implementers said things such as, "We can't get our doctors to look at the reports," "We have no ability to discern meaning from the data," and "Our system is on the back burner."

Effective implementers achieved system use through three primary mechanisms. They *changed the organization structure* before implementing the system and found powerful, respected system advocates who helped create a *perception of a proximate threat or opportunity* that the system could address, and they used *staged implementation* to manage project momentum.

Restructure the Organization

Six of the ten effective implementers (60 percent) restructured their organizations before installing MedisGroups. In contrast, all nine of the institutions that implemented ineffectively had installed the system before making changes in the organizational structure. This finding runs directly counter to Damanpour and Evan's (1984) hypothesis that the technical aspects of innovation should precede the administrative ones in a high-technology organization. (Table 3, Panel B, shows the relationship between this organizational structure choice and implementation effectiveness.)

Six effective implementers formally allocated responsibility for an aggressive quality initiative to senior members of the hospital leadership. In five out of six cases, these moves entailed asking physicians to take authority for both administrative and clinical aspects of quality management. They chose MedisGroups as one of the tools they would use to execute their new agenda. As a result, the system had a credible owner, a defined role in the hospital's agenda, and benefits it was intended to achieve. One administrator remarked, "MedisGroups is revolutionary. To keep the system above water until we do the necessary (organizational) redesign requires energy, and more importantly, authority." Effective implementers found a way to bring this kind of authority to bear.

When hospitals failed to make structural changes before implementing MedisGroups, the effort was more likely to languish. Thirteen hospitals made no structural changes before implementing the system; only four of these (31 percent) succeeded in implementation. While these four did not assign formal, structural responsibility for the quality initiative, they were able to secure well-placed, influential advocates for the system. Whether through formal structure or informal advocacy, effective implementers found system champions. These individuals were boundary-spanners, bridging departments and specialties within the hospital. They were tough and relentless in their pursuit of quality and in their insistence on measurement. Through their backgrounds, relationships, or personal styles, they crossed factional barriers and enabled the hospital to move beyond parochial disputes.

The MedisGroups champions at hospitals that had effective implementation remained in leadership positions throughout the implementation process. The opposite was true for ineffective implementers. Ineffective implementers placed responsibility for MedisGroups well down in the organizations, either from the start or as a result of having lost advocacy.[9] When these hospitals did identify influential MedisGroups champions, these individuals left the hospital, rotated out of contact, or lost interest in the system before the implementation process was complete. Consequently, the system was ignored by hospital leaders and never achieved acceptance and use.

These findings support prior research that demonstrates the importance of a persistent champion in change-making projects (Nord and Tucker 1987; Tichy and Devanna 1986). They also suggest that formally allocating responsibility to that individual through organizational structure changes improves the probability of sustained leadership.

Perceived Threat or Opportunity

Effective implementers created a perception of a significant, visible threat or opportunity and positioned the system as an important part of the hospital's

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response. One hospital had a "bad actor" to deal with—a physician who practiced in a way that endangered patients. Another hospital was working toward earning an award for total quality management. A third built the belief that the hospital had to make significant changes to deal with prospective payment. A fourth was criticized on the evening news for its high costs. Each of these change-triggers was ambiguous enough to give hospital leadership latitude in deciding how to address it, but compelling enough to stimulate progress.

The mandated installation of MedisGroups did not have the same positive impact as these internally acknowledged threats and opportunities. Each of the four hospitals that implemented MedisGroups in response to a state mandate saw it as oppressive rather than beneficial. This perception inhibited their ability to exploit its potential. As a chief operating officer said, "One of our administrators tried to champion the system, but he couldn't maintain the facade that it was good for us." A medical director commented, "Mandating the system removes your commitment to understand how it works and, therefore, your ability to use it."

Staged Implementation

Effective implementers used a staged approach for putting the system in place. They did not try to implement MedisGroups for an entire hospital, but started with more limited objectives. Most began with a particular specialty or set of diagnosis-related groups (DRGs), others with a targeted study of a particular quality problem in the hospital. This enabled them to focus the system's use and demonstrate its benefits explicitly. It also gave them an opportunity to begin to design the ways the system would be used. Staged implementation did not completely counterweigh the long, resource-intensive infrastructure building effort that MedisGroups use demanded, but it did help generate a series of benefits and small successes that system advocates could use to create momentum.

System Impact

Despite achieving system use, the ten effective implementers did not characterize MedisGroups as the change lever postulated at the beginning of this article. These hospitals fell into two groups: two enthusiastic advocates for the system's use as a supporting tool in achieving their strategic aims, and eight that found little value in the system's output (plus one hospital that had high expectations but could not yet assess the system's impact).

In the first group, hospitals extolled the virtues of MedisGroups and, in fact, contradicted some of the criticisms expressed by other institutions. For example, one CEO remarked that MedisGroups was *the* structure for his retro-

spective quality assurance program. Another claimed that the information system had reached the point where it was an impersonal substitute for hierarchical authority to increase control over physician behavior. However, both of these hospitals emphasized that major structural changes in their quality management programs were made *before* implementing MedisGroups. MedisGroups was seen as a necessary supporting player, but not a change-driver.

After having faced and overcome the implementation issues described above, the eight remaining hospitals (four that reorganized before adopting MedisGroups and four that implemented the system first) found the system's output unsurprising. One medical director said, "It took lots of resources and told us nothing new." Another explained, "Our results were all good. There was no point to it." Others claimed benefits in improving documentation of good care rather than the quality of care itself. The self-reported impact of Medis-Groups on quality was statistically indistinguishable for the effective implementers that intended to change and those that sought significant operating improvements.[10]

What accounts for the difference between low-impact and enthusiastic users? Low-impact hospital managers disagreed fundamentally with enthusiastic users about the system's flexibility. A hospital administrator who claimed the system offered little benefit stated, "MedisGroups is a very canned, rigid standardized product. Maybe it has to be to be valid." An administrator with a similar view cut back on system use before discovering that it was flexible enough to be integrated with the hospital's cost accounting system. In contrast, an enthusiastic user remarked, "The most critical element of Medis-Groups is that it can evolve. It is structured so that it can improve as we learn." Enthusiastic users continued the adaptive process—adjusting both the organization and the technology to capture additional value—long after low-impact users lost interest.

The intricate organizational machinery required to make the system work may well have presented a barrier to learning. To get the system functioning, with its trained data analysts, reporting structures and data flows, security measures, and linkages with quality assurance and utilization review functions, the hospital had to construct a tightly managed, fairly mechanistic MedisGroups unit around the system. While this was necessary to implement the system, it tended to freeze the hospital's perception of what the system was and how it could be used. In other words, the burden of building a reliable, consistent data-gathering infrastructure may have inhibited adaptation; yet the system's deep benefits were gained only through continuing, postimplementation learning. For example, one enthusiastic MedisGroups user had added employer data to the system and was beginning to feed health care

quality information back to benefits officers. This hospital's stated intent was to use this service to create a customer preference for the institution.

A second, counterintuitive explanation for the unspectacular impact of MedisGroups was offered by a hospital administrator. He had the advantage of having managed the system's implementation in two independent hospitals. About the first, he said, "Because quality assurance was considered irrelevant, putting this system in was not threatening to the physicians. As a result, we did not get the resistance we should have gotten for a system of this sort. We didn't fight out the issues, and we didn't learn. Maybe if we had, we would have been able to exploit the system more fully." The physicians in the second were threatened by the system and, as a result, became involved in understanding the content and use of MedisGroups information. Through the process of resistance—questioning and arguing about what the information meant and how it would be used—they were converted from adversaries to advocates. This interesting example suggests that both too little and too much resistance impede change-making information systems. Too much resistance hobbles implementation, too little hobbles the learning that enables the organization to adapt continuously. This is consistent with Keen's (1981) advice to systems developers that they "seek out resistance and treat it as a signal to be responded to."

Both explanations for MedisGroups' modest impact revolve around foreshortened organizational learning. While low-impact hospitals achieved system use, they did not describe the continuing process of adaptation that Leonard-Barton (1988) suggests is necessary for innovations to be institutionalized and exploited.

Conclusions

Despite its apparent potential to compel important changes in hospital performance, MedisGroups failed to fulfill this role. This result reminds us that information technology is not deterministic. It does not structure an organization's behavior without the interest, initiative, and involvement of at least some influential members of the group. Organizational choice—taking responsibility for the decision to change—is an absolutely critical element in achieving results.

This research also points out that implementing change-oriented systems is risky and focuses our attention on the factors that contribute to success. Hospitals implemented the system effectively through sustained leadership by respected advocates who applied their energy and authority to three implementation challenges. They established the system's credibility, and therefore its promise of benefits. They managed the project's momentum to build the

perception that benefits were realistic and achievable. And they structured the organization's use of the system to attempt to bridge the gap between information potential and behavioral change. In contrast to Damanpour and Evan's (1984) hypothesis, hospitals did not succeed by implementing the technical aspects of the system first, then allowing organizational adjustments to follow. The opposite was true.

If the MedisGroups experience holds true for other innovative measurement systems, managers are advised to implement by changing organizational structure first, then use the information system to support the new dynamic. They should pay particular attention to the process of mutual adaptation. When it is foreshortened, the organization does not capture full value from system. Rather than something to be avoided or overcome, a certain amount of resistance to change appears to improve the organization's ability to master and benefit from the system.

For the health care industry, the conclusion is basic. MedisGroups may help hospitals attack the "information problem" that stands in the way of effective delivery of care. However, it is neither a quick solution nor a panacea, and the technology certainly does not substitute for responsible, imaginative leadership that is required to make important improvements in hospital performance.

Acknowledgments

Notes

1.   This article was written with the cooperation of MediQual Systems, Inc., but its conclusions are solely those of the author.

2.   Clinical instability is the likelihood of poor and/or deteriorating health.

3.   The annual costs for labor and the software license vary with hospital admissions. For the group of hospitals in this study, it averaged $100,000. The software is a package that runs on an IBM or compatible personal computer.

4.   The hospitals that declined to participate were no different than the study participants in average size, capacity utilization, proportion that were teaching institutions, percentage of physicians who were board certified, and mortality rates for common diseases as reported by the Health Care Finance Administration.

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5.   Where coding choices existed, the hospital wanted to make sure it made the choice that served its own interest.

6.   The system had to accumulate enough cases for each category of disease (diagnosis-related group) to have a statistically meaningful sample.

7.   For MedisGroups information to be legally undiscoverable, it must never be left in an in-basket or on a desk in anything but an envelope marked "Confidential." It must be filed in locked cabinets or stored in a room that itself has controlled access.

8.   Pennsylvania's Health Care Cost Containment Council prescribed the data that had to be submitted to the state and decided how that data would be represented and reported to the public. It did not dictate how hospitals should use MedisGroups information internally.

9.   Depending on strategy, some hospitals considered clinicians most influential, others saw management as dominant, and a third group had struck a collaborative balance. In an administratively oriented hospital, a system with clinical ownership would be poorly positioned in the organization, and vice versa.

10.   With impact of MedisGroups on hospital quality coded as minor or major, the chi-square statistic was .8914, significant at the .3451 level.

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Appendix
Defining and Coding the Variables

Intention to Change:	Hospital leaders explicitly stated an intention to make significant changes in hospital practices or levels of performance.
Examples Coded YES:	"The board wanted to know how we stacked up against our competitors....plus management wanted to get a handle on QA for the medical staff. Our medical director wanted timely information on medical practice so we could use it for reappointment."
	"We want to use the system to identify problems and to get the various departments of the medical staff to focus on those problems, so it's a way to set priorities for the medical staff structure."
	"The health planning folks appeared on a nightly TV series for a week showing four area hospitals' utilization rates.... The data was a public embarrassment for us.... We decided to buy MedisGroups to help us achieve state average rates on length of stay. We held a press conference and put ourselves out there publicly, so we could not go back to business as usual."

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Examples Coded NO:	"MedisGroups has a local objective—to support QA activities more cheaply."
	"We can't let [MedisGroups] change the way we operate."
	"When we considered managed care contracts, we always used the argument that they would have to come to us because our hospitals handled the severe cases. We could never prove that, but we believed it. We purchased MedisGroups to demonstrate our quality."
Effective Implementation	The hospitals reaches a point at which the system is used for a desired purpose.
Examples Coded YES:	"MedisGroups data now flows to the utilization review committee and to the all-physician subset which is our peer review committee. It also goes to the professional affairs committee of the board. Chiefs get profiles of each of the doctors in their sections."
	"The comparative outcome and research evaluation reports go to the UR committee to compare with the national data base. Other reports go to division heads. They do their own physician QA. The canned reports are not very useful—we've had to get involved in ad hoc reporting to answer our own questions. The division heads ask us, 'Can you get data on this or that?'"
Examples Coded NO:	[After 5 years of experience with the system] "We don't use the MedisGroups data in the individual divisions and the individual doctors don't use it for peer review. We are just beginning to get the data to them.... We want them to decide what information they want from the system."
	[After 2 years of experience with the system] "We have not been able to get our physicians to look at the aggregate data, so they pick apart the individual case codings."
	[After 3 years of experience with the system] "I give presentations to the medical executive committee and everyone wants the data, but it's been difficult to disseminate the information. People say they don't have the resources to do the analysis, so let's just educate people rather than distributing the data. As soon as we get a schedule

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Appendix (continued)
Defining and Coding the Variables

	together on how we will implement, someone else will interpose, saying we can't do it that way."
Change System or Organization First	**Were organizational changes put in place before the system was implemented, or not?**
Exampled Coded SYSTEM FIRST:	"When MedisGroups was introduced, we hired a few people in the QA department to do data entry and abstracting. We tried to get a physician MedisGroups committee, but that never happened until four years later."
	"We needed broad commitment [to solve our performance problems], so we formed a committee with representation from the board and handpicked medical opinion leaders.... The committee decided to purchase MedisGroups."
Examples Coded ORGANIZATION FIRST:	"We changed the staff and committee structure about two years after we got MedisGroups." When we wanted to increase the emphasis on quality, we hired [Dr. X] as our first Medical Director for Quality Assurance.... She decided to implement MedisGroups."
	"After researching total quality management for a year, we appointed a vice president for quality and began to build that organization.... One of our philosophies was, if you can't measure it, you can't tell whether you're improving it. That led us to MedisGroups."
System Impact	**The effect attributed to MedisGroups on the hospital's quality or cost performance.**
Examples Coded MINOR BENEFITS:	"We have sanctioned physicians, but not as a result of MedisGroups."
	"Quality problems have been uncovered during the past two years, but not through the formal QA process. The meeting process has pointed out some things that seem to be recurring."
	"MedisGroups is icing on the cake. We are already taking care of our quality problems in other ways. This is merely confirmation."
Examples Coded MAJOR BENEFITS:	"There is some evidence that the doctors move to the norm simply by displaying the data. The data forces movement.... Our care is better. We can probably show that with data."
	"MedisGroups has breathed life into our QA process.... Quality has undoubtedly improved."