Bridging the Gap Between Theory and Practice: Exploring Outcomes Management

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Outcomes Measurement
Brent C. James, M.D., M.Stat.
Introduction

Intermountain Health Care (IHC), located in Utah, southeastern Idaho, and southwestern Wyoming, is a not-for-profit, vertically integrated health care delivery system with 24 hospitals, more than 60 clinics, and an IPA model HMO/PPO insurance plan that serves more than 500,000 enrollees. IHC conducted its first scientifically rigorous inpatient satisfaction survey in 1987. IHC's Planning Department developed a reliable and valid survey instrument that used more than 80 questions to assess 12 major areas that patients identified as critical satisfiers or dissatisfiers regarding hospital-based care. Among a random sample of patients drawn from all of IHC's 1987 inpatient admissions, 94 percent said that, given a choice, they would return to the same IHC facility for future hospital based health care needs.

Compared to other hospital groups in the United States, a 94 percent positive rating is very good. It probably arose from community values found in the Intermountain West, as well as a strong, persistent tradition of caring among IHC's nurses. When the survey's results were released IHC's employees and leaders initially focused on their relative excellence and the feelings of accomplishment that their high performance ratings appropriately engendered. But a satisfaction survey's real value does not come from customers who say they are satisfied. An organization's opportunities to learn and improve come from understanding customers who actively criticize the service they received.

A 6 percent dissatisfaction rate represents about 6,000 IHC inpatients. That is, in 1987, 6,000 IHC inpatients said that, given a choice, they would not return to an IHC facility for future care needs. Not counting contacts with other potential patients (a dissatisfied customer will share his or her negative experience with between 8 and 20 family members, friends, and associates), and controlling for degree of choice (in some instances other factors, such as insurance-based care contracts and physician preferences, may bring a dissatisfied patient back to an IHC facility anyway), IHC's Planning Department estimated that a patient who would not come back for future care, over the life of the patient, represented about $4,000 in lost hospital revenues. Six thousand patients per year at $4,000 per patient totals $24 million per year in potential revenues lost to IHC. That amount exceeds IHC's annual operating margin.

Follow-up focus groups among the survey's dissatisfied respondents disclosed that their discontent had little to do with the clinical care they received. More than 80 percent of disgruntled patients tracked their displeasure to IHC's billing system. It was not the amount of the bills that
so seriously offended patients' assessments of IHC. They were dissatisfied with the bill's format and IHC's collection procedures.

On the basis of the information IHC gained from its survey and its follow-up focus groups, a quality improvement team completely overhauled IHC's hospital bills and the billing process. By 1993, patient satisfaction had improved to more than 97 percent. That change reflected not only in patients' choices among competing health care providers, but in IHC's general standing in the community.

**Rationales for Outcomes Measurement**

The foregoing is but one of many examples of outcomes measurement and management systems. Obviously, health care providers have measured outcomes, and used the resulting information to manage care delivery, for many years. But only in the past few years has outcomes measurement taken a prominent role as an independent activity. Its recent emphasis represents the confluence of three overlapping lines of thought, fueled by national health care reform.

1. **Outcomes Measurement for Medical Research**

   In 1985, in testimony before the Congress of the United States, Dr. John Wennberg advanced the idea of outcomes measurement as a means to address significant variation in medical practice and to control health care costs (ref. 1). He based his recommendation on analyses of medical practices among small geographic areas, which demonstrated wide variation in the rates at which patients were hospitalized for some medical conditions and for some surgical procedures. Wennberg's evaluation suggested that a significant proportion of common treatments did not benefit patients and represented pure waste.

   Wennberg and others tracked treatment variation to professional uncertainty, arising from a profound lack of valid scientific knowledge regarding the true outcomes of common health care treatments (refs. 2-4). He proposed using existing large medical data repositories (e.g., insurance claims databases) to compare the outcomes of treatment alternatives, so that health professionals would have better information upon which to base treatment decisions. He demonstrated the use of existing large medical data sets to compare health outcomes when he analyzed mortality rates for open versus transurethral prostatectomy (ref. 5).
Wennberg called outcomes research and its allied disciplines the Evaluative Sciences. His vision took life in the federal Agency for Health Care Policy and Research (AHCPR). By direct mandate in its enabling legislation, AHCPR must perform outcomes measurement to evaluate treatments. The agency has implemented that mandate through its Patient Outcomes Research Team (PORT) initiative.

Medical research-based outcomes measurement systems ask the question "Which treatment?" They attempt to generate better scientific information that care providers and care consumers can use to choose among competing care strategies.

2. Outcomes Measurement for Accountability

In 1988, Paul Ellwood, M.D., extended the scope of outcomes measurement (ref. 6). He first suggested that health care delivery organizations should track treatment outcomes prospectively, separate from insurance claims. Prospective data collection can address serious technical deficiencies that exist in most existing large medical databases and, hence, more effectively evaluate treatments. He also proposed that society require health care providers to share outcomes measures with health care purchasers in a public forum, so that purchasers could select among competing providers. For Ellwood, outcomes measurement evaluated competing providers as well as competing treatments. He argued that such action would not only help purchasers choose among providers, but also serve as an incentive for health care providers to understand and improve their outcomes.

Ellwood's idea came to rest at the core of managed competition, a leading contender in the national health care reform debate. In that context, outcomes measurement usually takes the form of a report card—a series of well-defined outcomes measures that all health care providers, by mandate, must supply. Under report-card systems, outcomes measurement fuels competition. Competition, backed by direct regulation, manages the health care delivery system. Not waiting for legislative action, health care purchasers in some American communities have joined together and used their market power to mandate report-card systems that track provider performance.

**Accountability: External Report Cards and Internal Instrument Panels**

Outcomes-based accountability systems do not always arise from sources external to health care delivery organizations. Some health care providers have adapted report-card systems for internal use. Management teams talk of instrument panels or dashboards that they
can use for oversight and planning (ref. 7). Internal report-card systems track critical performance factors, identify strategic breakthrough areas, help allocate resources, and follow progress on breakthrough projects.

Just as external outcomes measurement systems (report cards) allow purchasers and regulators to oversee and manage health care delivery organizations from the outside, internal outcomes measurement systems (instrument panels) allow higher levels of management to oversee and regulate lower levels of their organization from the inside. Ideally, the same outcomes data that drive internal instrument panels can also feed external report cards, avoiding the inefficiencies associated with redundant data systems. Health care providers, in some instances, use their internal outcomes systems to proactively market their services to purchasers in place of or alongside external report-card requirements.

Accountability-based outcomes measurement systems ask the question "Who?" They attempt to identify excellent performers as an aid to consumer choice and management decisions, and to identify poor performers as the focus of external regulation or internal intervention.

3. **Outcomes Measurement for Improvement**

Outcomes measurement can serve a final, critical need: Outcomes data are an essential component for operations management and improvement. Dr. Donald Berwick caught the heart of the difference between evaluation and improvement when he asked:

"How can the root causes of differences in results be discovered? This is the most significant question. Unless there is a method for discovering the reasons for differences, the knowledge of results is useful only for judgment, not for improvement. Information on results, alone, is not enough. Knowing how well something works is different from knowing how it works" (ref. 8).

To be fully effective in causing change, an outcomes measurement system must reach to the roots of care delivery, where real clinicians make clinical decisions and deliver treatments to real patients. At that level, improvement-based outcomes measurement systems ask the question "Why?" They close the loop back to Wennberg's original idea: Outcomes measurement is a tool to evaluate, understand, and improve treatments.

In today's complicated health care environment, an outcomes measurement system must serve many masters. Ideally, it rolls up data starting from
individual patient-clinician interactions (treatments), through instrument panels at increasingly higher levels in the health care delivery organization's internal management chain, to high-level external report cards that document provider performance on a community scale. The ideal outcomes measurement system functions as an integrated management information system that simultaneously serves all levels of health care delivery, management, and policy. But no such system currently exists. At best, a few detached components operate at scattered locations: Here a process monitor manages care delivery factors and outcomes for a single clinical condition in a single hospital. There an outcomes study compares competing treatments, without the process data that can lead to improvements in even the best treatment. Elsewhere a community-level report card compares providers but lacks data connections back to the decisions and actions that produced the outcomes that the report card catalogs.

Most existing outcomes measurement systems, besides being incomplete as compared to the ideal, arose from a management viewpoint, whether inside or outside a provider organization. That is not surprising since only management commands the resources that such a system requires. In building outcomes measurement systems, management naturally leans to its own perspectives and needs. Their usual aim is to identify a list of summary measures that make sense as part of a report card or instrument panel, then to collect additional data and "drill down" when the report card discloses aberrations or opportunities.

In that context, this paper has three parts:

- The first section, "Elements of Outcomes Measurement," describes the theory of outcomes—the underlying functional components of health care outcomes and the processes that produce them. It suggests heuristics and other tools to combine such functional components into efficient, effective, integrated outcomes management systems. As the core business of any health care delivery system is clinical care delivery, this section (and, in fact, the whole paper) focuses on clinical outcomes. But the principles described are not limited to clinical settings—they apply to all processes, including those that drive nonclinical health care activities.

- The second section, "Building an Outcomes Measurement System," uses examples from Intermountain Health Care to illustrate key planning requirements and practical considerations for combining functional outcomes components into a tracking system.

- The third (and most important) section, "Breaks in the Outcomes Measurement"
Data Chain," describes pitfalls inherent in incomplete outcomes measurement systems. Significant dangers appear when links between high-level information (report cards or instrument panels) and low-level information (process monitors) break down. They show themselves within health care organizations as disconnects in management information flow. They harm performance through the predictable human behaviors that result when outcomes data are put to expedient but ill-considered uses.

**Background Theory: Elements of Outcomes Measurement**

**Outcomes Arise from Processes**

Outcomes do not happen by themselves. In order to produce an outcome, any organization or individual must follow a series of one or more operational steps that transform inputs into outputs. Taken together, the series of operational steps that produce an outcome is called a process. A process is a series of linked, often (but not necessarily) sequential steps designed to cause some set of outcomes to occur. Process steps represent the actual work that produces an outcome. Organizations or individuals can control outcomes only by changing the inputs or process steps that generate each outcome.

The idea of a process not only describes almost everything that happens in health care delivery; it characterizes any repetitive human activity designed to add value, convert an input into an output, cause an outcome to occur, or generate useful information. Perhaps because of its simplicity, the concept of a process turns out to be a very powerful tool for analyzing, understanding, and managing many areas of productive human activity.

Start with a knowledge of processes. Add to it knowledge of systems processes interacting together. Include knowledge of basic human psychology in a work setting. Finally, incorporate knowledge of statistician understanding of the variation that exists in any real process. On the basis of those disciplines, start from first principles and build a rational system to manage processes. The result is quality improvement theory. More accurately, the result is the *methodology* of quality improvement theory, as opposed to its complementary philosophy. The idea of process management lies at the heart of that methodology.

In a similar way, the idea of the practice of medicine lies at the heart of the medical profession. Every physician commits to track treatments given to patients, and outcomes achieved, with an aim to improve treatments for future patients. Every physician also learns the need for objective
information when tracking treatments and outcomes. Medicine is a science. Effective treatment rests on appropriate, accurate information to select and direct therapy. But any person ever assigned to oversee a real health care delivery organization, be it a solo practice, a group practice, a clinic, or a hospital, soon discovers a separate overriding responsibility: A medical practice must also succeed as a business. It must operate within a budget, based on available resources, if it is to survive to deliver excellent patient care in the future as well as the present.

Process management marks the overlap of those two obligations. It is, first, a system to manage performance. Good day-to-day performance (operations) leads to cost control, business success, and long-term financial survival. Quality improvement manages performance by constructing and implementing data systems (process monitors) that track and control care delivery and other critical, nonclinical processes. Under a clinical process monitor, managed care means, precisely, managing the processes of care—getting the right data, at the right time, in the right way, into the hands of the clinicians who deliver the care, so that those front line clinicians can consistently produce clinically effective, cost-effective patient treatment. In that sense, process management stands in opposition to traditional managed care systems. Traditional systems attempt to manage clinicians, not care processes, through preauthorization and utilization review.

Second, process management is a system to improve. It builds on its case management data infrastructure to associate treatments with outcomes. It aims to systematically improve care processes and resultant patient outcomes over time. This second use of process management ties directly to clinical research. But because it functions in a day-to-day operational setting, quality improvement works more as operations research (health care delivery research) than as basic medical research.

Quality improvement asks the question: "How does one structure a health care delivery system to systematically gain scientifically valid medical knowledge from every patient treated, with an aim to improve treatment (both medical outcomes and costs) for future patients?" The answer starts with Wennberg's original idea of outcomes research as a means to compare treatments in a routine practice setting, then backs it up with accurate outcomes data and consistent processes of care. This approach significantly improves the reliability of the clinical information that an outcomes measurement system can produce.

Quality improvement adds very little that is truly new to the core philosophies of the medical profession. It only supplies tools that can help health care professionals realize central values that have rested at the heart of their discipline for more than a century. But at a practical level, quality
improvement makes an essential contribution. It builds process improvement on the foundation of good case management, thus linking outcomes research to the business resources necessary for its routine implementation.

A health care delivery organization represents thousands of processes interacting together. At the organization's base, front-line workers oversee the day-to-day operation of production processes that generate outcomes to serve the needs of customers. People at higher levels of the organization use management processes to coordinate work groups, identify key breakthrough areas, and to track and allocate resources. All levels of the organization need information to guide their actions. Frontline workers need real-time data regarding each process's outputs and operation, so that they can make appropriate operational corrections. The organization's management team needs data regarding the external environment, their customers' needs, and process outcomes, so they can focus resources in key strategic areas, plan new processes, and make strategic improvements to existing processes.

A management information system collects, analyzes, and distributes data at all levels of the organization to ensure its efficient operation, planned adaptation to meet a changing environment, and long-term survival. Ultimately, it may provide outcomes information mandated for report cards in a competitive health care delivery system, or to market the health provider's services to patients and purchasers.

**Outcomes Measurement Drives Outcomes Management**

*Outcomes measurement* is a management information system that tracks key outcomes within a health care delivery organization.

*Outcomes management* represents the management decisions that the measurement system supports.

The introduction of an outcomes measurement or management system as a separate term (as opposed to a management information system) represents a confluence in the thinking of two groups: Health care administrators have long understood management, management information systems, and their importance to the long-term survival of an organization. But as the health care environment has shifted to cost-based, provider-at-risk payment mechanisms in an intensely competitive marketplace, administrators are finally beginning to recognize that their primary business is clinical medicine. In that new environment, management information systems need to extend to clinical measures as well as financial measures.
On the other side, clinicians have always understood that their central purpose was clinical medicine. They developed sophisticated research methods to study new patient treatments and their outcomes. But now, faced with the same competitive environment, they finally recognize a critical need to apply their research tools to day-to-day care delivery, not just new treatments.

**Process Monitors Include Three Necessary Elements**

Process monitors form the grassroots foundation of an integrated outcomes management system. In that role, process monitors exhibit three sequential data components: process input factors, process operation factors, and process outcome factors. These three factors directly parallel the data components that make up a randomized control clinical trial (RCT).

- **Process input factors** describe a process's appropriate domain of application. For example, clinical process monitors use well-specified indications for treatment to define cohorts of similar patients who should receive the same process of care, except for small variations arising from random patient differences. These treatment indications (process entry criteria) correspond directly to eligibility criteria in an RCT. As in a clinical trial, they must balance internal and external validity: Through their content, they must prevent patients with significant nonrandom differences from entering the process, as such could hopelessly bias process and outcome evaluations and damage subsequent process management decisions (internal validity). Simultaneously, they must be broad enough to match the decisions that real clinicians face when treating real patients. If they are too narrow (to control possible internal bias), they will apply to such a small subgroup of patients as to be useless in practice (external validity).

A single medical condition can hide several parallel processes of care. For example, a recent review of coronary artery bypass graft (CABG) at IHC disclosed at least four different care processes within that single condition, based on patient factors present at admission: routine uncomplicated CABGs; CABGs with significant comorbidities; emergency CABGs; and repeat CABGs. Some severity-of-illness systems provide estimates of the severity and complexity (comorbidities) of patients' presenting disease. Such measures can form an objective basis to assign patients to treatment
cohorts within a process monitor, and represent one of the few legitimate uses of severity-of-illness data.

Instances occur in which patients should receive a single process of care even though, at the time of entry to the care process, they exhibit measurable attributes that partially predetermine the process's outcomes. Such predictive attributes are called *stratification factors*—elements that do not change treatment but do change outcomes. As in clinical trials, outcomes management systems must identify and track stratification factors in order to adjust and appropriately interpret outcomes data. In some instances, severity-of-illness measures also can be used to adjust outcomes inside a treatment process. When used in that manner, they form a stratification system.

Figure I describes the process used at IHC's LDS Hospital to prevent postoperative deep wound infections. The process applies to a single patient cohort: all clean and clean-contaminated elective surgical cases. Within the cohort, specific surgical procedure type is an example of a potential stratification factor. Some specific surgical procedures produce different inherent infection rates, but the infection prevention process does not differ across them. Therefore, a single process monitor can track infection prevention across the different surgical procedures, but the overall postoperative deep wound infection rate requires adjustment by type of surgery before it can be used to make fair comparisons across institutions or over time.

- **Process operation factors** represent critical performance steps that are essential to the process's successful operation.

Figure I also illustrates the inherent hierarchical nature of processes: Every step in a flowchart hides a sub-flowchart, just as every step in a process is the outcome of a subprocess (ref. 9). Flowcharts confer a series of important advantages to a process management system. They include a written model (which clinicians can criticize, test, and improve); a means to manage any process's inherent complexity (by expanding or contracting individual process steps in hierarchical levels); and a context for evaluation (by showing surrounding steps, even though they may not be part of a particular measurement project). But most important, a flowchart lists measurable substeps through which process managers can track process performance. For example, the process steps listed under the "Antibiotic Prophylaxis" subprocess in figure I define a series of measurable performance factors that determine whether or not appropriate antibiotic prophylaxis occurred.
A process monitor must first stabilize key process operation factors. Stabilization means that, except for appropriate responses to small random variations among the process's inputs, each process step is performed consistently, without variation. For clinical processes, stable process operation corresponds directly to the protocols that control treatments in an RCT.

Process operation factors differ from the protocols used in traditional clinical trials in two ways:

1. Because process monitors are designed to work in routine practice settings, their process input factors (eligibility criteria, including indications for treatment) often let some small random variations among patients slip into their patient cohorts. Those variations appear in process operations factors as small random variations in the performance of specific steps, as clinicians, using clinical judgment, appropriately react to patient differences. Process monitors track such deviations to ensure that they follow random patterns across clinicians, among treatment units, and over time (ref. 9).

In other words, process monitors sacrifice some internal validity in order to maintain external validity. They knowingly allow small, random internal process variations so that they can generally apply to the range of patients that come for treatment in real care delivery settings.

2. In order to achieve a stable treatment process, traditional RCTs mandate treatment steps through formal protocols established at the start of the measurement activity. In contrast, process monitors usually achieve a stable treatment process through iterative data feedback as part of the measurement process. They allow practicing clinicians to settle on a preferred, common treatment approach through data feedback over time. In the end, both approaches arrive at the same end point. For example, for several mature clinical processes within IHC, process stabilization has finally arrived at formal care protocols implemented as standing orders.

- **Process outcome factors** reflect measurable factors that track a process's important outputs, as determined by those who use or have expectations regarding the process, its operation, or its outputs. Process outcomes factors correspond directly to the outcomes tracked in a clinical trial.

Because processes are hierarchical, process steps and outcomes
differ only in their level of abstraction (ref. 9). Every process step is the outcome of a subprocess. Every outcome is a process step in some higher order process. Within a process hierarchy, transactions between producers and consumers create a break in the hierarchical process chain, define a level of appropriate abstraction, and distinguish among data elements that measure outcomes and those that track process performance. Those who use or have expectations regarding a process's outputs or performance—its customers—thus define the process's outputs relative to its performance factors.

Clinical outcomes information provides a means to evaluate the effectiveness of treatments in achieving their stated goals. Clinical managers can use such process monitor information to select among competing therapies when more than one treatment option is available for a particular disease. Process monitors thus represent one way to implement the outcomes measurement system that Wennberg originally described. But as with any valid outcomes research system, such a use requires that the first two steps—stabilized process operations across cohorts of comparable patients—be in place and functioning properly. Only then are the results of the final outcomes measures valid and useful.

**Outcomes Fall into Three Classes**

In general, any process simultaneously produces three types of outcomes. Those three outcomes classes roughly parallel the three classic categories that underlie health care policy: quality, access, and cost. Physical outcomes correspond to traditional ideas of quality. Service (satisfaction) outcomes parallel health care access. Health care processes' cost outcomes combine to generate the cost of the entire health care system.

- **Physical outcomes** are measurable attributes of the tangible outputs that a process, by design, produces. In a clinical process, physical outcomes equate to medical outcomes. The degree to which a process achieves predefined therapeutic goals, complication rates, and functional status (patients' subjective perceptions of their own physical and emotional state) are all physical outcomes. This is the class of outcomes that health care professionals traditionally equate with "quality." It represents quality from an internal, production perspective.

- **Service (satisfaction) outcomes** describe consumers' subjective perceptions of the interaction between a provider and a consumer
when a transaction takes place, they also characterize consumers' subjective evaluations of how well a service or product functions relative to their personal needs and expectations. Within a health care delivery organization, access to care (as reflected in geographic accessibility and waiting times) falls into this class. Satisfaction represents quality from an external, marketing perspective. It is the primary determinant of whether customers (patients or others) will return to an organization to meet their future needs.

- **Cost outcomes** measure the resources that a process consumes as it operates. Within process monitors, cost outcomes nearly always appear as unit costs—the resources consumed per unit of successful service or physical output. For example, under a process-based cost management system, a clinical laboratory would track cost per specific test; an insurance plan would track cost per member per month (equivalent to premium rates); a hospital would track cost per specific case type.

It is important that health care managers recognize that costs are just one more outcome of a process. The same process monitor that manages physical outcomes (traditional medical quality) also manages costs (traditional case management).

Service outcomes and cost outcomes both offer obvious measures that sum across processes, making it relatively easy to roll satisfaction and cost measures up into summary instrument panels and report cards. But physical outcomes are usually unique to a single process. Combining physical outcomes into meaningful summary reports presents a significant technical challenge.

**Outcomes Classes Interact with One Another**

Because all three classes of outcomes arise from a single process, process changes that affect one outcomes class nearly always also affect the other two outcomes classes. The interaction between cost outcomes and physical outcomes is particularly strong. Specific process-based mechanisms can reduce costs by improving physical outcomes (quality waste), reduce costs while holding physical outcomes constant (productivity/efficiency), or improve physical outcomes by appropriately increasing a process's resource consumption (cost-benefit) (ref. 10).

Just as quality controls costs, costs directly affect access: As health care services increase in price, potential health care consumers can afford fewer services. Finally, access affects quality. Patients cannot gain the physical
and perceptual benefits of effective, appropriate treatments and health care interactions if they cannot gain access to those treatments and interactions.

Evidence suggests that the relationship between service (satisfaction) outcomes and physical outcomes, at least within clinical processes, is not as strong as the direct mechanisms that link physical outcomes and costs. Within clinical care delivery, while physical outcomes and cost clearly arise from condition-specific processes, patient satisfaction may grow out of a separate, generic process that extends across many clinical case types.

**Outcomes Classes Have a Natural Order**

The first goal of good clinical management is to seek process changes that simultaneously improve all of a process's outcomes. For example, reducing quality failures will both improve physical outcomes and reduce costs. Similarly, process changes that improve one outcome, while not damaging any other outcome (such as improvements in process efficiency), present no conflict. But some process changes improve one class of outcomes only at the expense of some other class. A common example is new technology: Some new medical procedures show real, but small, improvements in medical outcomes, while imposing very high additional treatment costs. The three outcomes classes have a natural hierarchy that is sometimes useful when a process manager must make choices among a process's competing outcomes.

Outcomes conflicts center around the idea of cost-benefit. Declines in one outcome (costs) are offset by improvements in some other outcome (benefits). In practice, consumer education can nearly always resolve trade-offs between physical outcomes and service outcomes. As a result, resource consumption (financial costs) lie at the heart of most health care outcomes conflicts.

Cost-benefit analysis calculates the ratio of costs to benefits for a particular process. It thereby provides a means to rank competing process choices, by ranking their cost-benefit ratios. A series of outcomes tradeoffs produces an ordered list of cost-benefit ratios. The term value describes consumer judgments applied to such an ordered cost-benefit list. It inherently implies that some health care consumer, or their agent, evaluated outcomes tradeoffs against needs and expectations, to decide if the benefits justify the costs as compared to other benefits that the resources could provide if applied in some other area. To the extent that consumers purchase health care services because they perceive that those services offer value, the three classes of process outcomes—physical outcomes, service (satisfaction) outcomes, and cost outcomes—follow a
natural first-pass order. Physical (medical) outcomes hold top priority, service outcomes follow, and cost outcomes come last.

Together, the natural order of health care outcomes and the idea of value provide the means for health care delivery organizations to resolve outcomes conflicts. The natural order of outcomes classes provides resolution for simple cases. Difficult cases require consumer (patients, payers, regulators, etc.) judgments of outcome cost-benefit trade-offs.

**Practical Issues: Building an Outcomes Measurement System**

Any health care delivery organization consists of thousands of interlinked processes. Many of those processes focus on the organization's core business: patient care. Others provide direct or indirect support for clinical services but are not, themselves, clinical. But taken together, any health care delivery organization operates so many processes that their sheer numbers and complexity must overwhelm any reasonable management system. An organization's first task is to search out the relative handful of processes that are key to its success, where management can have the greatest effect to guarantee the organization's long-term survival.

Two major approaches can help an organization select key processes to include in its outcomes measurement system. The first approach starts at the level of front-line workers, building process monitors at the organization's roots. It then "rolls up" process data to create a series of summary reports, ultimately producing instrument panels or report cards at the apex of the organization. With a roll-up approach, management can always break any summary outcome measure into its underlying components, down to the level at which root decisions and actions occur.

The second approach starts from the top, choosing high-level, summary outcomes measures that can help upper management allocate resources. choose breakthrough projects, monitor progress, and interact with external customers. When a high-level report shows a defect or an opportunity, this approach "drills down" by collecting additional information at increasingly lower levels in the organization to answer specific questions and solve specific problems.

In actual practice, an integrated outcomes measurement system combines both approaches. While it builds process monitors for key production processes, it concurrently tests high-level instrument panel
measures for use in summary management reports. As the two methods begin to intersect (as "drill down" encounters "roll-up"), the two approaches negotiate to create a rational system. The "roll-up" subsystem adds, drops, or modifies some process monitors. The "drill-down" subsystem changes some summary measures on high-level instrument panels. The complexity of a health care delivery organization leaves few other reasonable means to build an integrated reporting system.

1. Selecting Key Processes—The Bottom-Up Approach

The core of any outcomes management system is the processes that generate key outcomes. The first task of outcomes management, then, is to identify and prioritize processes. That task divides into two management imperatives at each level of an organization: First, each management group must develop a procedure that identifies core work processes. The management group invokes its "process-identification" procedure on a routine basis, usually once each year. The process-identification procedure should identify opportunities for new processes that can meet changing customer needs, as well as list existing processes.

Second, each management group must develop a procedure to prioritize its list of processes. That procedure usually grows out of a set of criteria that the management team can use to rate each process's importance to the organization's customers and, hence, the organization's long-term success.

Figure 2 shows a simple heuristic that IHC uses to organize its processes into manageable pieces. It divides the hospital portion of a vertical health care delivery system into three major categories: Administrative support services, clinical infrastructure, and clinical conditions. The relatively limited scope of each category makes it easier to generate reasonable lists of processes and compatible prioritization criteria.

Within figure 2, "Clinical Infrastructure" denotes those parts of a hospital that provide clinical services, but that do not directly admit patients or treat specific conditions. It captures care processes that follow hospital wide complications, such as adverse drug events (ADEs), hospital-acquired infections, deep venous thrombosis (DVTs) with the risk of pulmonary embolism (PE), and pressure ulcers. It also tracks processes that fall within clinical departments. For example, when asked to identify the areas that accounted for most of their patient care efforts, LDS Hospital's respiratory therapists produced a list of five key processes: oxygen therapy, chest physical therapy, administration of aerosolized bronchodilators, teaching incentive spirometry, and support for ventilator
As all clinical departments list and prioritize their own processes, each can begin to build process monitors to manage and improve critical areas. For clinical processes, process management usually requires clinical ownership in the form of clinical champions. For example, LDS Hospital's Department of Infectious Disease (a.k.a. Clinical Epidemiology) owns three key processes: adverse drug events, hospital-acquired infections, and antibiotic ordering. The Department of Pulmonary Medicine oversees deep venous thrombosis and pulmonary embolism. The Department of Nursing manages pressure ulcers. In each instance, clinical management takes the form of standardized care protocols and standing orders, implemented through process monitors that track process compliance rates and outcomes, with direct oversight from respected clinical leaders.

The third category shown in figure 2, "Clinical Conditions," provides a second example of process identification and prioritization. IHC's casemix database records a standard record for every inpatient admission or campus-based outpatient encounter within IHC since 1985. It categorizes each inpatient admission by DRG code. Members of IHC's Finance Department subcategorized DRG assignments to identify more than 850 specific clinical conditions treated in IHC acute care hospitals. They then developed a list of prioritization criteria and applied them to the clinical conditions on the extended list. Their criteria included the following:

- Each clinical condition's risk to the patient, rated on a scale of one to five, where one represented very low risk of mortality or morbidity, and five represented high risk of mortality or significant morbidity
- Total case volume within the clinical condition
- Cost per case
- Provider-at-risk care penetration, as a percentage of all cases treated within the clinical condition (The Finance team argued that, while IHC is committed to manage all of its care, it is appropriate to start building management data systems in those areas where IHC feels the worst financial pain.)
- Cost variance within each clinical condition (The team's aim was to identify high-variance conditions, arguing that high variance indicated a better opportunity to improve; cost was the best indicator for variance available for analysis.)
- Convenience surveys of major purchasers, to obtain their rankings of key clinical conditions

When the team applied their criteria to IHC's entire inpatient load, roughly 40 clinical conditions accounted for almost 80 percent of IHC's total inpatient care volume. Eight hundred fifty clinical conditions may be
beyond the management capacity of any organization. A management system that routinely tracks 40 clinical conditions is much more reasonable.

Figure 3 shows a later iteration of process identification and prioritization for inpatient care within IHC. It lists high-priority processes as drawn from earlier analyses, but adds additional prioritization criteria. The conditions and their rankings are displayed as a summary matrix, built from detailed data obtained from lower-level reports. Knowing that different IHC facilities faced different management challenges and different key processes, IHC's senior management prepared and distributed the matrix to help individual IHC hospital management teams, including both administrative and clinical leaders, identify key breakthrough areas for clinical management.

Based on their review of the matrix, IHC's largest hospitals all identified coronary artery bypass graft (CABG) surgery as a key breakthrough area. Midrange hospitals independently identified total hip arthroplasty as a key management project. Small rural hospitals selected community-acquired pneumonia for focused management efforts.

Figures 4-6 show process and outcomes reports for total hip arthroplasty. Key outcomes include cost per case and patient functional status (calculated as changes in pain and mobility scores on the SF-36 functional status instrument, measured prior to surgery and at 6, 18, and 36 months after surgery). Key process factors include length of stay, the occurrence of any inpatient complication (including wound infection, lower respiratory infection, deep venous thrombosis, excessive blood loss, or death), and choice of prosthetic device. The three figures demonstrate summary reports that "roll up" individual patient data from the level of a process monitor. The same data set can produce reports comparing hospitals, physicians, time periods, hospital units, days of the week, or any other breakout that might help clinicians understand and manage their care processes. IHC management can justify the effort that went to develop the process monitor, and the resources that goes into its ongoing operation, because it gives front-line workers the information they need to manage the process, control costs, and improve patient outcomes. Summary management reports, including instrument panel gauges, report-card data, and marketing materials, come as secondary benefits of the primary process management system.

2. Selecting Summary Measures-The Top-Down Approach

Ideally, management information rolls up from existing process monitors.
But in some instances, management teams need information for areas where process monitors are not yet functioning. In others, management needs summary data from processes that are not of high enough priority to justify the expense of an ongoing process monitor. Figure 7 displays a heuristic that helps identify high-level summary outcomes—instrument panels and report cards—within a vertically integrated health care system.

As figure 7 implies, physical outcomes (medical outcomes) are highly process-specific. For that reason, it is often very difficult to combine them into meaningful summary scales. Instrument panels frequently must choose a few representative physical outcomes measures and report them in detail, rather than reporting summary scales that combine overall performance on physical outcomes. Both service and cost outcomes, however, lend themselves to consolidated reports. For example, in response to American health care's shift from cost-plus financing to provider-at-risk fixed-payment methods, IHC is converting its cost accounting systems and management incentives from departmental revenues and expenses to cost-per-unit accounting. Volume-adjusted summary reports normalize cost-per-unit over time and across divisions.

IHC's systemwide patient satisfaction tracking system has grown rapidly since its first implementation in 1987, as described in the introduction. Originally a lengthy instrument applied to a random sample of inpatient admissions, it now collects short-form satisfaction information for every patient discharged from an IHC inpatient facility or from a same-day surgery center. Individual questions combine to form two major scales: perceptions of clinical quality and perceptions of service quality. Figures 8 and 9 give examples of the monthly reports that the satisfaction system distributes to each hospital and department. In addition to the two major clinical-quality and service-quality subscales, each figure shows two of the 18 individual questions that contribute to each summary measure.

An independent public pollster conducts IHC's patient satisfaction census survey by telephone. That approach ensures adequate response rates and avoids potential bias associated with patient perceptions regarding the source of the questions. The pollster initiates all calls and records all responses through a computerized polling system. The polling computer can add items to the core questionnaire based on patient factors in the computerized contact record. Individual departments and process teams use that feature to add survey questions that address specific process management topics.

Prior to the introduction of IHC's central satisfaction survey system, different IHC process management teams contacted each patient an average of more than three times collecting uncoordinated satisfaction
data. On those satisfaction surveys, patients often complained about the number of times they were called by IHC representative seeking satisfaction information. By implementing a single central satisfaction survey system, IHC was able to improve the technical rigor of the survey effort, eliminate duplicative survey work, and reduce patient complaints about multiple contacts.

In addition to the short-form census survey, IHC's Planning Department also conducts regular inpatient random sample surveys that contain considerably more detail. Other special surveys, conducted every four months, track perceptions of therapy and testing, emergency department services, and psychiatric services. Beyond patients, the satisfaction system routinely community thought leaders, physicians, employees, and members of the community at large. Special surveys for IHC Health Plans (IHC's IPA-model HMO/PPO) use random-sample methods to follow general member satisfaction (to the level of individual physician assessments), disenrollment, and ease of access to primary care.

The IHC Planning Department uses in-depth personal interviews and focus groups, numbering in hundreds per year, to track survey findings to root causes. Without that ability to "drill down" to root causes, the satisfaction survey system would be largely useless—it would not be able to generate process improvements. The census survey system also provides a convenient means to obtain follow-up functional status (e.g., SF-36) information to track long-term medical outcomes.

**Lessons Learned: Breaks in the Outcomes Data Chain**

**Outcomes Measurement Supports Improvement or Accountability**

A key performance factor in any organization is the way its management information system moves data between levels of the organization. Most health care organizations show a disconnect between information at the local production process level and information at the management level. That disconnect inherently limits an organization's ability to implement effective, rapid change and, hence, its ability to survive and succeed in a shifting environment. The disconnect reflects two competing views that lie at the heart of outcomes management: improvement versus accountability. Differences between the two approaches rest not only on the types of data collected (outcomes measurement) but also on how those data are used (outcomes management).

Improvement-based outcomes management systems ask the question "Why?" They invest the extra resources necessary to link outcomes to the processes that produce them, whether through "roll-up" (ongoing process
monitors) or "drill down" (instrument panel) methods. Within health care delivery, processes represent the decisions and actions that clinicians actually perform in order to cause medical outcomes to occur. The only way to change outcomes is to change the decisions and actions that form the production process. Without a link between actions and outcomes, improvement is impossible. A management information system that links process operations data to process outcomes data not only has the capacity to manage, but it also has the capacity to improve. It supplies frontline workers with knowledge and tools to manage their processes and the resultant outcomes. Improvement-based outcomes management systems justify the expense of process-level data collection by using those same data to optimize process performance and generate lower operating costs.

Accountability-based outcomes management systems ask the question "Who?" Because they do not track the more complex and expensive process data required for improvement, either through ongoing process monitors or through instrument panels backed up by "drill down" methods, they break the link between process and outcomes. But by itself, outcomes information is useful only for making judgments. Standalone outcomes information can, for example, identify good versus bad providers, support selective contracting in a competitive health care market, or help apply regulatory standards.

At some level, every accountability-based management information system is inherently "us versus them"—on one side, evaluators, and on the other side, workers. By their actions, if not their words, the overseers disown the production process. They supply external incentives, with the hope to force lower-level workers to somehow manage their own processes, without direct management involvement or additional resources. Such systems inherently assume that the workers already have the knowledge and the tools necessary to accomplish that task. All that the workers need—and all that management supplies—is motivation.

Obviously, improvement-based systems can generate information to establish appropriate accountability. But when tools for improvement are readily available, "accountability" comes to mean common vision and coordination. Pure accountability-based systems, on the other hand, cannot directly drive improvement. They lack the data necessary to track outcomes back to their root causes.

The complexity of real-world health care processes makes constructing and operating a complete process/outcomes system a very difficult undertaking. Even if an organization has the vision of an integrated outcomes management system, it must build that system one piece at a time. Resource constraints force most organizations to start with a high-level report card or instrument panel, then "drill down" to underlying
processes. But it takes time and resources to "drill down"—to collect and analyze detailed process data, in order to track aberrations on instrument panels to root causes. The danger comes when a crisis demands immediate action. Lacking process-level data, and lacking the time and resources needed to generate those data, managers face an almost insurmountable temptation to use their high-level outcomes measurement system for the only purpose to which it is directly suited—to make judgments.

The problem is, human beings can, and routinely do, respond to judgment-based systems through means other than improvement. William Scherkenbach cataloged predictable human reactions to accountability systems in a manufacturing environment. He named the cyclical response the Cycle of Fear (ref. 11). Dr. Donald Wheeler demonstrated that an accountability approach causes distortions in outcomes data and distortions in production systems, rather-than process management and improvement (ref. 12). Others have tracked the same behaviors within health care delivery (refs. 13, 14). Beyond failing to generate improvement, such predictable human behaviors do demonstrable harm to an organization and its ability to compete.

Good managers—leaders—cannot disown the oversight and improvement of daily operations and retain any hope that their organization will long survive. But when an organization’s information system fails to track process information as well as outcomes information, it becomes practically impossible for the organization’s management to use anything but accountability methods to manage the rapid change and regular crises that typify modern health care delivery. It is far easier to fix blame than it is to fix systems. But better outcomes come from better systems, as does a health care delivery organization’s ability to survive and thrive in an increasingly competitive health care marketplace.

References


4. Eddy, D. M., and Billings, J. The quality of medical evidence: im-


Figure 2. A Heuristic to Help Identify Key Processes

Key Processes

Support Services
- Insurance plan
- Purchasing
- Billing
- Hospital Ops
  - Admit/Dischrg
  - Scheduling
  - Housekeeping
  - etc.
- Clinic Ops

Clinical Infrastructure
- Hospital-wide complications
  - ADEs
  - Infections
  - DVTs / PEs
  - Pressure sores
- Departments
  - Radiology
  - Blood bank
  - Clinical lab
  - Anesthesiology
  - Dietary
  - etc.

Clinical Conditions
- Started with 850+
  clinical conditions
- Evaluation criteria:
  - Risk to patient
  - Case volume
  - Cost per case
  - Managed care penetration
  - Internal variance (costs)
  - Purchaser preferences
- < 40 conditions accounted
  for 70%+ of business

(Separates physicians as customers vs. providers)
(Helps identify key processes)
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Figure 4. Total Hip Arthroplasty (ICD9 Code 8151)
Hospital Length of Stay

X-Bar Chart: 0.01 control limits
LOS is decreasing, on average, 0.0323 days (0.775 hours) per month

S Chart: 0.01 control limits
Variance in LOS

Outcomes Measurement
Figure 5. Total Hip Arthroplasty (ICD9 Code B151)
Prosthesis Cost Per Case

X-Bar Chart - 0.01 control limits

S Chart - 0.01 control limits

Mean

Variance in Prosthesis Cost
Figure 6. Total Hip Arthroplasty (ICD9 Code 81.51)
Improvement in SF-36 Mobility Score - PreOp to Six Months PostOp
Figure 7. A Heuristic for Selecting Dashboard Gauges

Other Measures
- Enrollee demography
- Burden of disease (population measures)
- Severity of illness measures

Cost Outcomes
- Premium cost per member per month
- Primary care cost per member per month
- Secondary care utilization rates
- Campus-based care utilization rates
- Cost per case

Service Outcomes
- Plan access satisfaction
- Care access
- Care satisfaction
- Care access
- Care satisfaction

Physical Outcomes
- Secondary prevention
- Primary prevention
- Overall functional status
- Condition-specific medical outcomes
- Condition-specific functional status

Insurance Plan → Primary Care Panel → Secondary Care Panel → Secondary Care Panel (Outputs: Services) → Long-Term Care (Rehab, Nursing Home, etc.)
Figure 9. Perceptions of Service Quality
Alta View Hospital Inpatient Survey - February 1994

Service Quality Scale

Overall quality of care and services

Caring and concern of nurses

Brent C. James, M.D., M.Stat. 34
Discussion Points
Outcomes Measurement
Brent James, presented a comprehensive conceptual framework for outcomes measurement system, including practical issues for building such a system. Participants and fellow faculty were particularly struck with the following highlights from the paper and presentation:

- Outcomes measurement is required in three general areas: outcomes measurement for medical research, outcomes measurement for accountability, and outcomes measurement for improvement. According to James, "In today's complicated health care environment, an outcomes measurement system must serve many masters."

- Outcomes management really means a new management information system. The major work before us is to transform our data systems. If we fail, we will fail as health providers and we will fail as businesses.

- Every outcome results from a process, and there is a need to understand both. "To be fully effective in causing change, an outcomes measurement system must reach to the roots of care delivery, when real clinicians make clinical decisions and deliver treatment to red patients."

- An organization's information system fails if it fails to track process information as well as outcomes information.

- Preauthorization and utilization review are traditional systems that attempt to manage clinicians, not care processes, and are, therefore inferior to process management systems that capture root causes and can lead to process, and, therefore, outcome improvements.

- Quality improvement works by constructing and implementing dam systems (process monitors) that track and control care delivery and other critical, nonclinical processes.

- It is important to distinguish between two different needs for information, which have essentially different natures: management needs high-level summary information, while practitioners need to track key processes, which are then identified and assigned priorities. Both top-down and bottom-up approaches require measurement. Both require input from all the customers of that information, including patients, clinicians, managers, and the public. However, incomplete outcomes measurement systems result when there are "breaks in the outcomes data chain," that is, when
links between high-level information (report cards or instrument panels) and low-level information (process monitors) break down.

- Brent James identified a "natural order of outcomes," which he lists in the following rank order of importance: (1) quality, (2) satisfaction, (3) cost.

- Dr. James further identified "outcomes conflicts" in terms of costs and benefits. Because outcomes classes interact with one another, declines in one outcome (costs) are offset by improvements in some other outcome (benefits). These conflicts arise when there is disagreement on the relative costs and benefits of a particular intervention. Consumer education must play an important role to help resolve these inevitable conflicts.

- There is a tension between accountability systems that seek to answer the question "who?" (discerning between competing providers) and improvement systems that focus on the "what?" (competing treatments). Improvement systems avoid the chilling effect on continuous quality improvement that identifying blame on certain clinicians has.

- "Any health care delivery organization operates so many processes that the sheer numbers and complexity must overwhelm any reasonable management system. An organization's first task is to search out the realistic handful of processes that are key to its success, where management can have the greatest effect. . . ." "Roughly 40 clinical conditions account for almost 80 percent of Intermountain Health Care's total inpatient volume."

- Dr. James informed participants that his organization is careful in selecting its projects and cautioned others to start with a small number of priorities, that is, a few key clinical processes in key clinical areas. Intermountain Health Care's approach is to: (1) develop an opportunity statement, (2) develop a work plan, (3) develop a balance sheet arraying costs and benefits, and (4) determine how to track the project's successes.

The reactor panel applauded Dr. James's important new concepts, the natural order of outcomes, and outcomes conflicts. David Nash, M.D., M.B.A., made the provocative statement that America was committing medical education malpractice and asked participants and faculty to think carefully about how we should be training future physicians in light of the papers and concepts presented at this forum. Dr. Nash further asked how we widely disseminate and incorporate into practice a realistic
process-monitoring approach. Dr. Nash further provoked discussion by asking the question of who really owns data on performance.

Marcia Orsolits Stevie, R.N., Ph.D., focused on outcomes conflicts and underscored the importance of asking patients directly for their own evaluations of treatment options and using them both in long-term treatment of that individual patient and in informing the care of future patients. She agreed with Dr. James's view that preauthorization and utilization review seek to manage clinicians and not care processes and are, therefore, inferior to the process-monitoring system described in his paper.

Deborah Bohr, M.P.H., responded to Dr. James's statements regarding what he sees as the conflict between accountability (who?) versus improvement (what?). While not discounting the tension between the two concepts, Ms. Bohr stated that providers have to be publicly accountable which implies public disclosure on the part of providers of summary high-level measures that monitor an impact on community health as well as document improvement.