Information Systems & Technology

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Valuing Investments in Clinical Information Systems

IN RECENT YEARS, health care organizations have significantly increased expenditures for information technology (IT), including clinical information systems. The growth in IT spending and a broadening menu of technology investment choices have caused health care organizations to critically evaluate potential investments for the value that they can deliver.

While most organizations seek to identify a financial return on investment (ROI) that can be used in the purchase decision process or in benchmarking activities, a hard-dollar amount is not always ascertainable. In no way does that imply the system lacks quantifiable value, however. In this article, several ways will be presented to value investments in clinical information systems in terms of how they meet business objectives and solve problems. Examples of how such systems can provide demonstrable value, in terms of the clinical process and business objectives they address and the direct impact of the clinical system in care delivery, will be presented.

Defining the Measurements

Most IT solutions, including clinical information systems, can be evaluated based on the type of objectives or problems addressed and can be classified in one of the following categories:
- *Infrastructure requirements* (usually associated with financial, patient accounting, and other systems that are typically viewed as a cost of doing business).
- *Operational performance objectives* (shorter-term business goals that usually focus on the bottom line; often involve process improvements to affect revenue growth, expense reductions, productivity improvements, and cash-flow enhancement).
- *Strategic objectives* (focus on how to ensure the organization's long-term viability by optimizing market share and strengthening competitive position; often include goals to maximize customer, employee, and physician satisfaction and quality of care).

True clinical information systems are relatively new IT innovations. Although eventually they may become such fundamental information tools that they meet an organization's infrastructure requirements, for now they and other newer technologies are not generally regarded in this manner. Instead, clinical information systems are generally intended to address operational performance objectives, strategic objectives, or both.

As for operational performance objectives, IT often allows, and sometimes drives, organizations to make process improvements that would not have been possible in the absence of the technology. The same systems provide the means to manage or monitor the new processes.

Ongoing process improvements are the byproduct of analyzing processes and making decisions on how to change them for the better. The right information available at the right time in a usable format is a critical ingredient to such continuous improvement processes. Automated reporting and decision-support functions in clinical and other information systems enable the detailed process analysis that so often spark needed change.

Concurrently, IT can help health care organizations improve resource utilization by streamlining work processes, optimizing the investment in supplies and inventory, and efficiently scheduling and using fixed cost resources such as facilities and equipment. Such resource optimization can be critical since all health care organizations have a significant investment in a variety of resources (people, supplies, inventory, facilities, equipment) and they share a continuous quest to make their investments as productive as possible.

At the strategic level, it is difficult to measure a direct ROI that supports the achievement of service, satisfaction, and quality-of-care goals. However, the ultimate, underlying objectives, particularly improving revenue and market share, are quite quantifiable.

The Impact of IT on Clinical Process

To understand how clinical information systems can be evaluated using the background just described, it is helpful to characterize the clinical work process objectives that systems are intended to support. Clinical process objectives can reasonably be grouped into two categories: consistent delivery of quality care and elimination of waste.

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Table 1.
Clinical Pathways

Clinical Process Objectives	Operational Objectives	Clinical System Impact
Consistent Delivery of Quality Care • Best care planning • Best delivery to plans, informed decisions Elimination of Waste • Supplies and materials	• Process improvements and monitoring	• Support for clinical pathways initiatives

Table 2.
Medication Management

Clinical Process Objectives	Operational Objectives	Strategic Objectives	Clinical System Impact
Consistent Delivery of Quality Care • Minimize opportunity for human error • Patient satisfaction	• Process improvements and monitoring	• Quality of care • Customer service	• Medication management

Table 3.
Home Care Management

Clinical Process Objectives	Operational Objectives	Clinical System Impact
Consistent Delivery of Quality Care • Best care planning • Best delivery to plans, informed decisions • Minimize opportunity for human error • Compliance management Elimination of Waste • Unproductive time	• Process improvements and monitoring • Improved resource utilization • Improved reporting and decision making	• Support for clinical pathways • Medication formulary information availability • More efficient use of employees' time • Support for HCFA reporting requirements

Table 4.
Remote Physician Access

Clinical Process Objectives	Strategic Objectives	Clinical System Impact
Consistent Delivery of Quality Care • Best care planning • Best delivery to plans; informed decisions • Minimize opportunity for human error • Patient satisfaction Elimination of Waste • Supplies and materials • Undocumented charges • Unproductive time	• Competitive positioning • Distinctive focus • Market share • Revenue growth • Quality of care • Quality of staff and physicians	• Timely access to information • Physician convenience and satisfaction

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Consistent-quality-of-care objectives are accomplished through:
- Planning for the best care.
- Making informed decisions about how to deliver the best care.
- Minimizing opportunities for human error.
- Maximizing patient satisfaction.
- Managing compliance issues.

Elimination-of-waste objectives are achieved by concentrating on these areas:
- Wasted supplies, excessive materials costs.
- Undocumented charges.
- Unproductive time, including underutilized resources and staff time.

From here, the evaluation of clinical information systems can focus on how they affect the components of each of these objectives. Systems are likely to generate value if they support operational performance and strategic objectives that are reflected in these clinical processes. Following are some examples.

Clinical Pathways

Clinical pathway initiatives are most often intended to address quality-of-care and cost-management objectives by changing the way care is planned and delivered. Clinical information systems designed to support clinical pathways both change processes and enable organizations to monitor and analyze care-delivery patterns, patient outcomes, and costs.

Making clinical pathway content available at the point of care makes it much easier for clinicians to follow the intended care-delivery protocols. The ability to analyze variances using a combination of clinical and decision-support systems provides the means to identify opportunities for improving both outcomes and costs (see Table 1).

The value that a clinical system brings to the care-delivery process can in part be quantified by studying the impact of additional process management and monitoring capabilities. Providence Medical Center in Portland, Oregon, has a long history of successfully improving care and costs using manually documented and managed clinical pathways. The organization conducted a study that demonstrated additional improvements by adding IT to support its clinical pathways program. In this case, the incremental cost reduction averaged 8% of variable care-delivery costs.

Medication Management

Managing medications is both a cost and quality-of-care concern for organizations. Typically, there are a number of steps and people involved in delivering medications to patients. The process starts with a physician's assessment of need, followed by medication ordering, prescription fulfillment, medication delivery and, finally, medication administration. Consequently, there are multiple opportunities for human error that can have an adverse impact on patient outcomes and satisfaction, as well as on care-delivery costs. Severe errors can result in liability problems and a negative public image. All errors challenge strategic objectives directed toward improving customer service and reputation.

Clinical system functionality may range from the ability to deliver drug-drug, drug-allergy, and drug-food interaction information to more comprehensive controls to ensure that the right medication is given to the right patient in the right dose at the right time via the right administration (see Table 2).

Value can be estimated by studying the impact that the clinical system has on medication error and adverse drug event (ADE) incidence rates. Research from Harvard University, Brigham and Women's Hospital, and Massachusetts General Hospital, all in Boston, indicated that an ADE costs over $2,000 per incident excluding malpractice costs or the cost of injury to the patient (Bates et al., 1997). A separate study conducted at LDS Hospital in Salt Lake City also concluded that the average cost per ADE exceeds $2,000 (Classen et al., 1997). A 1998 study conducted by Concord Hospital in Concord, New Hampshire, after the installation of a clinical system designed to reduce medication errors, demonstrated a 70% reduction on what was already a below-average error rate.

Home Care Management

The physical separation of care providers, patients, and administrative offices in home care makes processes such as clinical documentation, scheduling, and reporting inefficient. That separation presents unique challenges to service delivery that can be addressed by IT. Point-of-care technologies can not only reduce the impact of that separation but also improve the management of care defined by clinical pathways, medication management, documentation accuracy, billing timeliness, and compliance requirements (see Table 3).

The value of IT comes from measurements ranging from the clinical pathway and medication management opportunities previously summarized to employee productivity improvements. In some instances, information systems may enable home care organizations with multiple agency locations to reduce the number of office locations by consolidating intake, scheduling, and billing functions.

Remote Physician Access

Clinical systems that allow physicians to review and act upon clinical information from a variety of settings not only support more rapid decision making and care delivery but also provide a convenience for physicians. The value of this functionality is more difficult to quantify than the more operationally oriented examples provided. However, organizations that work to improve physician satisfaction attract and retain top talent, which in turn fuels strategic objectives

related to quality of care and reputation that can affect market share and revenue objectives (see Table 4).

Evaluating Future Clinical System Investments

As organizations evaluate clinical information technologies, the challenge of valuing the investment may be addressed by striving to identify how the system under consideration supports key strategic and clinical process objectives. An analysis of those objectives, as well as the actual clinical process objectives to be supported by the system, will provide guidance on how reasonable it will be to expect the investment to deliver a quantifiable return.$

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