Challenges and methodologies for successful implementation of Computerized Provider Order Entry (CPOE)
## Table of contents

- Foreword ......................................................... 3
- What is CPOE? .................................................... 4
- Benefits of CPOE .................................................. 4
- Barriers to CPOE implementation and the steps required to overcome them .... 4
- Considerations for device deployment .................................. 7
- Emerging positions, roles and team responsibilities in healthcare IT .............. 7
- The Dell Services perspective .......................................... 8
- Summary ........................................................................ 10
- References ...................................................................... 11
Foreword

It is evident that CPOE will be a driving force toward improving healthcare safety, quality, and efficiency in reducing healthcare disparity while providing comprehensive access to health records by patients and healthcare providers. The arrival of mandates and timelines from the American Recovery and Reinvestment Act of 2009 (ARRA), and the resulting need to demonstrate ‘meaningful use’ of technology has led to CPOE becoming an urgent and top priority for most organizations. In the context of preparing for much more healthcare reform on the horizon, CPOE can provide an early opportunity to transform an organization and set the stage for major change initiatives still to come.

This paper examines the challenges and methodologies utilized in a comprehensive Computerized Provider Order Entry (CPOE) initiative. The goal is to provide insight into the requirements and recommendations of incorporating best practices, lessons learned, patient safety processes, transformation methodologies and the examination of process change on physicians, nurses, pharmacists and all other personnel who interact with the order entry and completion process. The paper concludes with an overview of Dell Services experiences and methodologies based on involvement in many successful CPOE deployments and support initiatives in healthcare organizations of all sizes.
What is CPOE?

Computerized Provider Order Entry (CPOE) is a computer software application utilized by providers to electronically select and place patient care orders. Orders are transmitted electronically to the departments and personnel responsible for acting upon and completing the order. Most CPOE implementations are hospital-based and involve several core components: hospital and registration systems, departmental information systems, billing systems, and other integrated clinical information systems. When the core components are implemented together, a CPOE system can improve patient safety, improve quality of care and reduce patient care costs.

What are benefits of CPOE?

CPOE is a powerful software tool that delivers many benefits to a healthcare organization. These benefits are discussed below.

Improve workflow efficiency

The streamlining of the order process and information availability benefits within a CPOE system can be seen immediately after the system has been deployed. Prior to CPOE implementation, a paper chart would reside on the nursing unit and orders would be addressed as soon as the chart was found and time permitted. In a hospital that has implemented CPOE, a physician can initiate the patient’s care by merely selecting and entering the orders in the electronic system. Once the order is electronically transmitted, anyone providing care for that particular patient now has the knowledge of the orders placed, the order status, the results of the order upon completion, and other critical patient care information. Electronic orders can also improve efficiency of hospital provider workflows.

Many organizations are able to measure these results with the implementation and review of key healthcare metrics. For example, an electronic system can track the ‘time of order placement’ to the ‘time of order processing’ to the ‘time of result completion’ for analysis and review. When properly deployed, the speed of electronic order delivery decreases turnaround times for medication delivery, lab specimen collection, and completion of diagnostic tests.

Evidence-based standardized order sets

Among the clinical decision support tools available today is the standardized order set, which has become fundamental in shaping patient care. The use of evidence-based order sets with CPOE allows the alignment of orders by diagnosis or specialty to be standardized across the hospital facility. This enables the facility to encourage clinical best practices, as well as consistent order patterns, throughout the organization. Clinical decision support capabilities range from informing end users of significant patient information, allergy and medication alerts, automatic order substitution, duplicate orders messaging and the calculation of dosing regimens in complex medication orders. The decision support information is presented during order entry and provides the clinician pertinent healthcare information to assist in decision making.

Despite its many benefits, less than 5 percent of U.S. hospitals have fully implemented CPOE. A survey of community hospital physicians found that, even in hospitals that have adopted CPOE, less than half of physicians entered at least 80 percent of their orders electronically. The Leapfrog Group, an initiative driven by organizations that buy healthcare and are working to initiate breakthrough improvements in the safety, quality and affordability of healthcare for Americans, estimates that it will take more than 20 years for CPOE to achieve “maximum penetration” within urban hospitals.

Barriers to CPOE implementation and the steps required to overcome them

Like any major enterprise-wide initiative, there are several challenges that must be addressed for successful deployment. Three significant barriers that can hinder the adoption and implementation of CPOE will be reviewed here:

- Lack of a clear vision and involvement from all key stakeholders, contributing and leading to the misalignment of common benefits and goals.
- Resistance to workflow changes that accompany the deployment of a CPOE system.
- Costs associated with a major facility installation of a CPOE system. Costs can be substantial and may present a significant, and in many cases, overwhelming challenge. Up to this point, it has been difficult to quantify the anticipated savings from implementing CPOE systems, and equally as difficult to determine for whom the savings accrue (payers vs. providers).
Drawing upon lessons learned from successful CPOE initiatives and using best practices for adoption and implementation strategies, each of these barriers can be overcome.

**Align stakeholders with the CPOE vision**

A CPOE implementation should be led by clinicians and supported by information technology staff. All stakeholders across the organization should collaborate to develop the strategy and bring all stakeholders into alignment. One alignment method is use of a visioning exercise where executive sponsors facilitate discussions with other stakeholders to establish and embrace the overall vision.

There are many approaches to overcoming resistance and they will vary from organization to organization based upon cultural differences. However, there are several key tactics that should be addressed in every implementation:

- **Ensure strong leadership**: hospital leaders need to be firm believers in the benefits of CPOE and demonstrate a commitment to the implementation. They need to be in a position to deal with the changes that arrive with a CPOE implementation.
- **Identify physician champions**: their knowledge of their workflow processes assists tremendously in the selection process of a vendor (CPOE) system. The physician champion can facilitate the communication of system utilization and benefits to the greater physician population, and they can also alleviate and relay physician concerns to the project implementation team.
- **Address workflow concerns**: listen to the stakeholder population and have adequate training and assistance available.
- **Leverage house staff or hospitalists**: physicians-in-training have a higher level of comfort with technology. They can provide valuable feedback on how to improve the product. (8 & 9)

**Turn physicians into key enablers of workflow transformations**

An important step in the CPOE implementation process is to ensure that the physician community understands their role as champions of the initiative.

With CPOE, physician workflows change significantly. Physicians can either be enablers or a significant obstruction to the process. An organization needs to develop their implementation and deployment strategy around physician transformation while taking care not to underestimate the changes in work flow that will occur.

With standardized order sets, physicians may develop a negative perception of "cookbook medicine". It is important to embrace the concept of "benchmarking" and how it facilitates better and safer medicine. It is also important to stress the importance of a consistent patient care standard across the organization.

Another relevant consideration for CPOE implementation is the perception by some providers that electronic-based systems make them one step further removed from "caring for the patient at the bedside." The system build, appropriate training, and integration of CPOE into the patient care continuum need to be objectively evaluated in order to overcome that perception.

**Focus on organization efficiency to offset costs**

The costs associated in the implementation and deployment of a CPOE system represent a large financial commitment. There are costs related to the networking of systems, software and licensing, implementation and deployment, hardware, and ongoing support. Networking, software and implementation costs are large investments that must be made up front while hardware costs can be an ongoing battle.

Ultimately, the successful CPOE system needs to enable quick and easy access to patient information for providers. To deliver this capability, there are significant setup and configuration requirements that need to be considered, such as hardware maintenance, software upgrades, single sign on capabilities, and the number and types of devices deployed. These devices can range from a desktop computer, a wall mounted computer, or a workstation on wheels, to handheld devices that a clinician can utilize during daily rounds or patient assessments. Each device requires periodic maintenance and eventual upgrade or replacement. Another added cost to be aware of is the "learning curve investment", during which time the staff is learning and refining the new processes to gain the highest efficiency. (10)

While cost issues are not insignificant, there are several ways to minimize the overall costs of implementing CPOE:

- **Realign hospital priorities to focus on patient safety and reduce medical errors.**
- **Measure CPOE’s impact on hospital efficiency**: quantify the benefit of reduced delays in patient care through improved communication and standardized procedures. Collect the baseline data as soon as possible. Engage the facility’s quality management department, as they may already be collecting and analyzing such data.
- **Improve system interoperability**: ensure currently deployed systems are optimized prior to CPOE implementation and deployment. This can assist in maintaining and/or decreasing future costs once a CPOE system is in place.
- **Provide third-party payer incentives for implementing CPOE**: while CPOE costs are borne entirely by hospitals, incentives from government or private insurance can help to alleviate some costs. (11)
Sustain and advance channels of communication

In a paper-based system, physicians, nurses and ancillary staff interact together on the unit, in the hallways and at the patient's bedside. However, these familiar communication channels change when physicians can enter orders from anywhere within the hospital, from an off campus clinic office or from home. In some ways, CPOE can reduce communication between providers. There is also a perceived loss of control among nurses and ancillary providers, who may have been at the core of an order communication process in a paper-based environment.

Furthermore, hospital personnel are increasingly navigating a fragmented communication environment with disconnected systems and processes that force them to communicate through several disparate methods: face-to-face encounters, phone messaging, electronic health record messaging, e-mail, digital beepers, and of course, paper. This fragmentation can result in delays or omissions of important information, yielding lower provider satisfaction and quality of care. Additionally, communication methods and tasks are often poorly matched.

To help combat this challenge, a review of current practices, the leveraging of electronic communication systems, and the evaluation and revision of hospital workflow and policy and procedures needs to be an integral part of any CPOE project.

Barriers and resolutions to CPOE communication adoption

Providers, staff and organizational factors are all critical to creating an efficient electronic communication process. Providers come into contact with a CPOE system with different levels of skill, experience and comfort with computer-based technology. CPOE design needs to accommodate new users who will require a detailed and intuitive interface, while simultaneously accommodating established users who will need communication shortcuts to avoid frustration.

Typical barriers to communications include:

- Skill, experience and comfort with computer-based technology will vary across clinicians and provider groups.
- Clinical context of a patient medical communication note will vary across clinicians and provider groups.
- Scope of issues, duration of patient relationships and communication methods will vary across clinical specialties.
- Non-specialty providers view patient problem needs across the continuum of care, while specialists may have a narrower clinical perspective.

To overcome these barriers, providers must:

- Tailor CPOE design to the diversity of provider needs: new users need a detailed road map and intuitive navigation; established users need web navigation short cuts.
- Adjust and align organizational expectations regarding initial communication needs. Tailor communications to specific clinician groups and specialty, and prepare all staff for changes in messaging content over time. Develop strategies to target "later adopters" earlier in the process.
- Examine provider-to-provider communication needs across specialties and the continuum of care.
- Bridge differences in perspectives about patient communication across specialties

A communication management strategy should address guidelines for appropriate communication content and expectations about how the system will respond. The strategy should include guidance about the content of, the communication process (e.g., which providers—physicians, nurses, or other clinical staff—will respond, expected response times, limits on the number of interactions within a thread), and additional rules of engagement (e.g., rules for managing the provider portal health record). Some professional groups have published guidelines for the use of online communication in clinical settings. (12, 13 & 14)

Organizational design considerations for electronic communications

Each organization requires a thorough understanding of the technical and operation challenges of building integrating electronic communications in a clinical setting and a clear vision of how these new communication tools will meet larger organizational goals. Effective communications tools should include service-related features, such as medication requests and renewals, referral requests, scheduling, and billing; a provider-to-provider communication tool; and a provider portal to the patient’s health record. Each of these components can be deployed separately and evolve over time in a phased rollout.

Considerations for device deployment

There is no “one size fits all” scenario for computing solutions in healthcare, but one point is universal: it is critical to match provider workflow and CPOE software with the right computer device. Without the appropriate understanding of provider requirements, software capabilities and hardware utility, your organization will either lose money on its investment or fail to maximize it.

Collaboration between clinical staff and information technologists is key during the device selection process. Organizations must decide on the types of devices that are needed for deployment as well as the number of devices required. A CPOE project could fail if there are not enough devices for clinicians to use, deployed where they need them, or available when they are needed.
Competition can occur among caregivers when devices are not deployed in sufficient numbers. Conversely, too many devices can add unnecessary bottom-line costs and increases the challenge of storage when they are not in use, as well as increase ongoing maintenance costs.

Communication strategies
Ongoing communication of team activities, progress and results to all stakeholders is an important element of the implementation plan. A comprehensive communication strategy should include components outlined below:

• Develop a communication plan.
• Develop a “Branding” and strategy.
  - Create organizational/facility ownership by branding the vendor product as their own.
  - Create posters, newsletters, and flyers to advertise and promote the project.
  - Develop a marketing strategy.
  - Provide “Proof of Concept” and viewing sessions.
• Communicate early and often.
  - Hold frequent meetings with physicians and nursing/ancillary teams.
    - Provide updates of project, review workflow and system decisions made or to be made, review high priority challenges around workflow and system utilization for input, offer viewing of features to be rolled out, request testing and training sponsors, etc.
    - Physician Champions to take decisions made and decisions to be made to medical staff for review and input.
    - Physician groups meet monthly for review and input to design decisions.
    - Nursing/Ancillary Champions to take decisions made and decisions to be made to staff for review and input.
• Communicate the project timelines at monthly physician and nursing staff meetings.
  - Discuss project schedule and progress.
  - Discuss risks and issues and strategies toward resolution.
  - Discuss CPOE objectives and benefits.
  - Provide open discussion / questions and answer session.

Emerging positions, roles and team responsibilities in healthcare IT

Chief Medical Information Officer
The Chief Medical Information Officer (CMIO) is an emerging position in healthcare facilities that bridges the gap between physicians and technology. The position arose out of the recognition for specialists who had an understanding of both the Chief Information Officer and Chief Medical Officer roles. The CMIO provides a means for interacting with clinicians and administrators within and across their respective environments. This position is a vital communication channel from which organizations implementing a CPOE system can maintain and foster open communication across both medical and IT organizational units. Frequently, these positions are filled by medical physicians with a background, interest, and knowledge in technology, but are increasingly being taken up by new technology professionals that have specialized training in the field of Health Informatics.

Responsibilities:
While CMIO responsibilities and skill sets vary from facility to facility, the following are among the more common and universal areas they are expected to fulfill:

• Serve as a liaison between medical and technical departments and executive leadership.
• Exercise strong communication skills, especially in the area of relaying messages between IT and medical staff.
• Head studies for the design and integration of IT systems and infrastructure in the medical department.

“Utilization of multidisciplinary teams in CPOE project planning, implementation and deployment brings tremendous value to the decision-making process.”
The Dell Services Perspective

Dell Services has been involved in thousands of clinical information system deployments and support initiatives across all of the major technology vendors and suppliers. Our perspective, which has evolved as a result of those experiences, has shifted from the technical aspects of deployment to the current emphasis on adoption and value. In our view, healthcare transformation requires a fundamental and interconnected change in the structure and function of healthcare systems that will transform the characteristics of healthcare, resulting in optimized health and quality of life for all patient populations and added value for all stakeholders.

We consider healthcare transformation to be a continuous process that provides real measurable value, while posing significant challenges:

- **Study trends in health informatics to develop and deploy applications that increase efficiency in patient care.**
- **Manage projects and lead organizational change.**
- **Develop standards and “rules” in medical terminology and application to increase efficiency in patient care.**
- **Advise steering committees on subject of health informatics and policymaking within the organization.**
- **Possess excellent interpersonal skills including a collaborative and facilitative style.**
- **Provide management and leadership in a politically astute manner.**
- **Understand the modern health field and its direction.**
- **Reform organization to facilitate changes in technology.**

**Multidisciplinary team approach**

Utilization of multidisciplinary teams in CPOE project planning, implementation and deployment brings tremendous value to the decision-making process. Team members with different experiences, opinions, education, and areas of expertise help to create a shared pool of knowledge that provides a stronger foundation upon which to make decisions. Through open and free sharing of ideas and information from different perspectives, team members develop a greater understanding of the issues and gain a stronger commitment to the solutions. [18, 19]

Multidisciplinary teams should include key stakeholders, directors and point of care staff members. These teams should be prepared to address key decision areas, such as design and build, implementation and deployment, and risk and issue management, where workflow and decisions extend across disciplines and providers.

Also, the creation of sub-multidisciplinary teams, reporting up through a defined governance structure, can be leveraged for the investigation and recommendation of resolution for key risks and issues throughout the CPOE project life cycle.

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We consider healthcare transformation to be a continuous process that provides real measurable value, while posing significant challenges:

- **Transformation requires a substantial investment of time, talent, and financial resources to be successful.** Clinical systems and the required hardware and infrastructure are expensive and require expertise for successful deployment and for the ongoing maintenance and updates that are necessary for continued benefits.

- **A successful transformation effort needs to have precisely aligned critical success factors.** The strategic drivers for the business and the stakeholders need to be well understood and the drivers for sustainability of the continuous process of improvement required for transformation need to be articulated. Success requires an unwavering focus on the structures and functions to be transformed with a clearly defined methodology, roadmap and accountability for making the change happen. It is imperative that success is described in terms of value measures that are defined and valid.

- **The continuous process of transformation is challenging to execute: the healthcare environment is dynamic, with changing regulatory requirements, practice variations, and reimbursement standards at the same time that there are entrenched practices and practitioners within organizations that are reluctant to change.**
The transformation cycle is comprised of three key elements: strategy, methodology, and measurement. Strategy drives transformation efforts by creating a vision of the future and synergies among people, process, and technology to achieve the vision. The execution of repeatable methodologies provides the roadmap and implementation of the change efforts (technical and non-technical). Measurement is the final part of the cycle and provides the means to assess the results, optimize outcomes, and ensure sustainability.

The drive to quality

Dell Services believes the purpose of healthcare transformation efforts should be to achieve real and lasting improvements in the quality of healthcare delivery. We call this focus the “Drive to Quality”. By our definition, healthcare transformation is a comprehensive ongoing approach to care delivery excellence that delivers value by measurably improving quality, enhancing service, and reducing costs through the effective alignment of people, process, and technology.

The healthcare transformation point of view

The healthcare transformation point of view is the implementation cornerstone for the Dell Services approach to healthcare transformation.

Historically, Dell Services has used a framework of “people, process, technology and results” as the guiding theme for our approach to IT support. However, this theme is depicted in a linear fashion. Based on our ongoing experiences, we recognize, that while the elements are correct, a linear approach to clinical information systems initiatives does not articulate an approach that effectively drives value for our clients. Our realigned perspective is designed to capture the integration and intersection between people, process and technology. We realize that by combining the right mix of these key elements, healthcare organizations can achieve a more successful, value-driven approach to clinical information systems design and deployment. Balancing these forces is truly the key that enables the effective use of technology that allows healthcare providers to manage organizational change and clinical implementation.

People

There are many activities critical to the “people” within a healthcare transformation initiative. To positively address the “people” component, organizations must establish a flexible, learning culture; foster an organization-wide commitment to change; align leadership within the organization to the objectives of the healthcare transformation effort; define clear performance incentives and results metrics; establish a collaborative governance and structure; and develop a clear communications plan. Even though people represent a core component of transformation, they are frequently one of the most neglected areas.

Process

An equivalent degree of attention must be paid to the “process” of the organization. Examples of process issues include examining the patient throughput and tracking issues prevalent throughout the organization; determining how support for effective clinical information flow can occur; analyzing workflow management (e.g., records, medication management, orders/results, clinical knowledge management); establishing an organizational approach to benchmarking best practices; and supporting data analytics. Like people issues, a lack of focus on process represents one of the core problems with traditional approaches to healthcare transformation.

Technology

The technology focus is more than determining which technology to deploy. Rather, the technology focus must address other important issues, such as adopting data standards for the organization; establishing a common approach lexicon and data dictionary; integrating applications; building infrastructure connectivity; and — more generally— appropriately and effectively using the various deployed tools and technologies. Traditionally, technology has most frequently been the primary consideration in healthcare transformation initiatives. While important, it needs to be considered an enabler and supporter of the critical people and process elements.

Dell Services believes that the intersection points of these three areas require an equivalent degree of attention from those who are leading healthcare transformation initiatives. For each one of these intersection points, an organization will require customized approaches to change management (the intersection of people and process), implementation management (the intersection of process and technology), and enablement management (the intersection of technology and people) areas to foster an effective deployment.

ADOPTS framework

In Dell Services’ experience, far too many healthcare organizations have yet to embrace a clear methodology or framework for managing and communicating the entire clinical transformation process. Although many consulting organizations and vendors offer methodologies, the issue for some healthcare organizations is the lack of understanding of how these methodologies can augment and support the care and operational redesign process.
Because organizations are frequently in very different places in their transformation journey, we use a flexible framework as the basis of our approach. We learned that an inflexible approach requiring rigid adoption of certain methods and tools will frequently be met with significant resistance from those involved in the frontline of healthcare delivery. We determined that a more flexible but rigorous framework that offers a customized approach to healthcare transformation offers a better solution for meeting the needs of healthcare organizations. Our ADOPTS (Assess, Design, Optimize, Prepare, Transform, Sustain) framework has been developed from our hands-on experience with healthcare transformations and other clinical initiatives and the lessons learned from those experiences. The major lessons include the need to:

- Reframe the culture – For transformation to succeed, it must be woven into the fabric of the organization.
- Create improvement capability – The organization must use a flexible framework for solving problems and applying knowledge.
- Collaborate across boundaries – Cross disciplinary teams create more effective long term results.
- Make decisions based on evidence – Data, not anecdotes, must drive process improvements and performance.
- Drive results and benefits – Ideas are good … execution is better … pace is critical.
- Maintain constancy and ongoing focus – The attention of leadership on importance of healthcare transformation must be present, palpable, and persistent.
- Allocate resources – Ensuring the adequacy of people, time, and funds in support of the initiative sends critical messages and generates support.

There are six content areas that are woven into our ADOPTS framework: Governance and Leadership, Process Redesign, Change Management, Clinician Participation and Adoption, Benefits Realization, and Technology Enablement. The phases are iterative and the domains’ activities and deliverables are interwoven to ensure that the intended value of the transformation effort is achieved.

It is important to reiterate that the ADOPTS framework, while linked together, is not implemented as a linear set of activities. This entire framework can be used as the core methodology for supporting clinical transformation in a variety of organizations — large or small — ranging from teaching facilities to community hospitals because of its modular design and the resulting flexible workflows. This framework, when viewed in total — regardless of the project or organization culture — is an integrated whole that has been built by clinicians and technical healthcare experts to help healthcare providers meet the needs of their clinical transformation situations and, ultimately, improve healthcare for consumers and clinicians alike.

ADOPTS is currently in use by many large healthcare systems as the support for their overall clinical transformation initiatives and improvement in healthcare operations. The methodology has been shown to be an integral resource for facilitating collaboration across divisional and facility boundaries within complex organizations. The framework supports evidence-based decisions that drive the organization toward better results and the realization of benefits that are measurable. It also assists in maintaining the clinical transformation that has been achieved by providing ongoing focus on the ultimate goal of improved healthcare for consumers and clinicians.

Summary

CPOE is a powerful software tool that provides immediate benefits to healthcare providers for improving patient safety, improving quality of care, and reducing patient care costs. When properly deployed, electronic order delivery decreases turnaround times for medication delivery, lab specimen collection and completion of diagnostic test. The use of evidence-based order sets with CPOE allows the alignment of orders by diagnosis or specialty to be standardized across the hospital facility. This enables the facility to encourage clinical best practices as well as consistent order patterns throughout the organization.

CPOE implementation is challenging and must address three significant barriers that hinder adoption and implementation: (1) lack of clear vision and involvement from all key stakeholders; (2) resistance to workflow changes that accompany CPOE; and (3) costs associated with a major facility installation of a CPOE system. The keys to overcoming these barriers are to ensure strong leadership, identify physician champions, address workflow concerns and leverage house staff or hospitalist. Cost challenges can be addressed by realigning hospital priorities to focus on patient safety; measuring CPOE’s impact on hospital efficiency; improving system interoperability; and providing third-party incentives for implementing CPOE. Other considerations should be addressed during a CPOE implementation are organization design, communications, device deployment, IT roles and multidisciplinary team responsibilities, and the emerging position of Chief Medical Information Officer.

Dell Services has been involved in many clinical information system deployment and support initiatives across all of the major technology vendors and suppliers. In our view, healthcare transformation requires a fundamental and interconnected change in the structure and function of healthcare systems that will transform the characteristics of healthcare, resulting in optimized health and quality of life for all patient populations and added value for all stakeholders. The continuous process of transformation, or the transformation cycle, is comprised then of three key elements: strategy, methodology, and measurement. Strategy drives transformation efforts by creating a vision of the future and synergies among people, process, and technology to achieve the vision. The implementation cornerstone for the Dell Services approach to healthcare transformation is our Healthcare Transformation Point of View. This perspective was designed to capture the integration and intersection between people, process and technology.
By combining the right mix of these key elements, healthcare organizations can achieve a more successful, value-driven approach to clinical information systems design and deployment. Balancing these forces is truly the key that enables the effective use of technology that allows healthcare providers to manage organizational change and clinical implementation.

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