Strategies from a Nationwide Health Information Technology Implementation: The VA CART STORY

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The VA Cardiovascular Assessment, Reporting, and Tracking (CART) system is a customized electronic medical record system which provides standardized report generation for cardiac catheterization procedures, serves as a national data repository, and is the centerpiece of a national quality improvement program. Like many health information technology projects, CART implementation did not proceed without some barriers and resistance. We describe the nationwide implementation of CART at the 77 VA hospitals which perform cardiac catheterizations in three phases: (1) strategic collaborations; (2) installation; and (3) adoption. Throughout implementation, success required a careful balance of technical, clinical, and organizational factors. We offer strategies developed through CART implementation which are broadly applicable to technology projects aimed at improving the quality, reliability, and efficiency of health care.

KEY WORDS: health information technology; implementation; barriers; facilitators; EMR; organizational culture.

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INTRODUCTION

All participants in the current health care reform debate seem to agree computerization of health care records is necessary to improve quality and control costs. Indeed, in his 2009 State of the Union address, President Obama remarked that computerizing medical records will “reduce errors, bring down costs, ensure privacy, and save lives.”¹ Despite the tremendous potential of electronic medical records (EMRs) to achieve these goals, successful implementation of EMRs demands a balance of organizational culture and administrative hierarchies with technical requirements and workflow integration. Many people must be engaged in this process, including technical staff, clinicians, and hospital administrators. Even so, if the technology does not immediately improve efficiency, reduce costs, integrate with workflow, or support the potential for quality improvement, providers may refuse to use it. Because of these complexities, many projects aimed at computerizing aspects of our health care system have been unsuccessful²⁻⁶. While there are now examples in the health information technology

(IT) literature of successful implementations, most describe health IT endeavors at a single hospital or clinic setting and not in a large, integrated network.⁷⁻¹⁰

In the Veterans Affairs (VA) hospital system, we have developed an EMR for cardiac catheterization procedures called the Cardiovascular Assessment, Reporting and Tracking (CART) system. Here, we describe the implementation of CART—from planning to adoption—at the 77 VA hospitals which perform cardiac catheterization procedures. By describing technical and organizational components of the nationwide CART implementation, we hope to provide strategies for other organizations who attempt to improve health care through the use of technology.

BACKGROUND

Health IT Implementation in the United States

Much of the record-keeping in hospitals and clinics in the US is still done on paper.¹⁰ In a recent national survey of physicians, only 4% reported having a comprehensive EMR; 13% reported having a basic system.¹¹ Even in health care facilities with basic EMRs, the systems often do not track all parts of a patient's care and are not able to transfer that information to other facilities easily. Rates of IT project failures are reported to be between 12–40%, across all industries,¹²⁻¹⁴ but are believed to be higher in health care for several reasons. Compared to other highly professionalized industries, physicians retain an exceptionally high degree of autonomy.¹⁵ Additionally, the US health care system is highly fragmented, resulting in locally optimized solutions that undercut many of the principal advantages of computerization, notably interoperability and transfer of information.¹⁶ Furthermore, providers pay for EMRs but the efficiencies accrue to payers and purchasers.¹⁷

There is a growing body of evidence regarding barriers and facilitators to health IT implementation. While the majority of this research is focused in single hospitals or clinics, or projects in a subset of a larger health system⁷⁻¹⁰, some common themes have emerged. Of note, organizational and cultural facilitators often offset perceived technology-based barriers. Strong support from senior management coupled with implementation leadership from key physicians is particularly vital.^{2,5,7,9,18-20} In addition, strategic collaborations between technical, clinical, and organizational entities throughout implementation are essential^{2,21}. From a design standpoint, health IT which draws from standardized data elements is favored by providers because there is greater

potential for data sharing and interoperability.^{9,18–19} Finally, successful health IT projects cause minimal disruption to the normal workflow of busy clinicians,^{2,3,5,7,9,20,22} and provide mechanisms for ongoing technical support.^{5,20,22} Against this background, the VA has developed the Cardiovascular Assessment Reporting and Tracking system (CART), an IT solution specifically designed to simultaneously support clinical practice and quality management.

The VA Cardiovascular Assessment, Reporting, and Tracking System

Nearly two decades ago, the VA was charged by Congress with providing care that is equivalent or superior to care at non-VA facilities, and with assessing quality between VA and non-VA care to ensure that mandate was fulfilled. However, no direct VA and non-VA clinical data were available to make these comparisons, apart from VA internal quality improvement programs.²³ Furthermore, these data could not be acquired through the existing computerized record system in the VA. The VA's computerized record system is widely recognized as among the country's oldest and most robust, conceived in the 1970s. However, it is limited because it does not provide standardized data entry for all types of patient care. Few discrete, standardized data entry fields existed in the VA's system to support the mandated comparisons in many clinical areas.

In initial studies comparing VA and non-VA patients after acute myocardial infarction (AMI), veterans were shown to have more comorbidities, worse overall health status, and lower socioeconomic status than non-veterans.^{24–28} Veterans were also reported as having a higher one-year mortality rate after AMI than non-veterans,^{27–28} and were less likely to receive coronary angiography.²⁶ To address these reported disparities in the quality of cardiovascular care received by veterans and provide a mechanism by which the Congressional mandate could be met, the VA introduced a multi-layered plan to improve cardiovascular care by opening new catheterization labs, adopting national VA performance measures, and developing a national quality improvement program for cardiac catheterization procedures. Through this quality improvement initiative, CART was conceived. VA Patient Care Services (PCS) in Washington DC, which oversees the delivery of medical services for the VA system, and clinicians involved in the national VA Ischemic Heart Disease Quality Enhancement Research Initiative (IHD-QUERI), established the overall goals for CART. *CART was developed as a clinical reporting software application that is part of routine clinical workflow, integrated in the VA's computerized record system, and supports a national data repository, catheterization lab volume assessments, patient safety surveillance, and a national quality management and quality improvement program for cardiovascular diseases and procedures.*

CART IMPLEMENTATION

Strategic Collaborations

The first stage of planning and development for CART was completed by PCS and cardiologists involved in IHD-QUERI. These groups recognized the need for a national clinical application for point-of-care reporting and collection of data

to support national quality of care assessments, including VA and non-VA comparisons. PCS provided funding to IHD-QUERI to work with IT developers to create a prototype version of CART in early 2004. Following a demonstration of this prototype to VA leadership in Washington DC, funding was provided by PCS to IHD-QUERI to proceed with development and national implementation of CART. In addition, very early in planning and development, key communications and collaborations were established with other important VA stakeholders, including the Office of Quality and Performance, Decision-Support Services, regional directors, chief medical officers, and information security officers. Communication was also initiated early with the Food and Drug Administration, to lay the foundation toward using CART to monitor patient safety and cardiovascular device surveillance, and the American College of Cardiology, to incorporate a core of standardized data elements from their National Cardiovascular Data Repository and thereby provide a mechanism for national VA and non-VA benchmarking.

Initial testing of CART was completed at VAs where IHD-QUERI clinicians, who could act as “clinical champions”, were located. Through direct outreach to other colleagues in the VA system as well as presentations at national VA clinical meetings, additional sites were identified that were interested in being early implementation sites. At each site, clinical champions identified a technical champion within their facility's IT department. CART development, thus, evolved as a clinical application led by a group of clinicians involved in national VA quality efforts, but with direct IT interaction, engagement of champions at each site, and strong national administrative support.

Installation

Full installation of CART to the 77 VA catheterization labs commenced in January 2005 and continued through the end of 2008. (Fig. 1) During installation, CART technical staff coordinated with IT staff at each VA. VA hospitals differ considerably in the structure of their IT departments and readiness to install new software. In addition, during the time period in which CART implementation took place, new and more stringent privacy and security requirements were enacted. These technical challenges initially represented serious roadblocks.

To alleviate burden on local VA IT staff, CART installation was streamlined to require very little personnel hours. The entire CART installation could be accomplished at many sites in as little as two hours. Moreover, installation was conducted remotely and no site visits were required to install CART.

Privacy and security concerns were allayed in two ways. First, CART technical staff kept their mandatory VA privacy and security training up-to-date and were able to provide documentation of their credentials when requested. Second, CART achieved national Certification and Accreditation. Certification and Accreditation, a security certification developed by the National Institutes of Standards and Technology, is a process by which government agencies can ensure technology meets federal security standards. This security accreditation is required for all VA information systems, and at some sites was necessary for approval from local IT departments and Information Security Officers before any installation could begin.

Figure 1. Seventy-seven Veterans Affairs catheterization lab locations and the VA Cardiovascular Assessment, Reporting, and Tracking (CART) System sites.

To introduce the CART application and encourage adoption by clinical champions, we utilized a “train-the-trainer” method. A CART clinical in-service was conducted in a one and a half hour conference call between the site clinical champion and the CART clinical and technical directors. A sample patient exercise was used to guide the clinical champion through use of CART. Clinical champions were strongly encouraged to provide feedback and suggestions for improvement; in short, they were encouraged to take part in future CART development. While CART was a fully-developed application when the national installation took place, it was understood that modifications and updates would continuously be included in subsequent versions of CART. We believe that encouraging clinical champions to have a role in version enhancements and changes has improved acceptance of the application. To date, several dozen modifications or additions have been suggested. These are tracked by the CART Coordinating Center and reviewed for implementation by the CART Clinical Advisory Committee, composed of VA catheterization lab clinicians. In addition to encouraging feedback on the clinical report function of the application, clinical champions often expressed interest in using CART in other ways, including standardized documentation to meet Joint Commission requirements, research, or for catheterization lab volume assessments.

Adoption

CART sites are in various stages of adoption as they transition to use CART as the single method of documenting catheterization lab care in the VA. To assess adoption, we have requested each catheterization lab submit their paper or electronic log of patient appointments and procedures. These logs have been compared with the data obtained through CART to verify that each lab is entering all of their procedures into the CART system. This exercise has been conducted at three distinct times thus far (May 2007, November 2008, and April 2009). Sites which were not entering 100% of their data into CART were re-surveyed until their cases matched the records in CART. By September 2009, nearly all VA catheterization labs had adopted CART. Monthly procedural volumes for diagnostic and interventional procedures are tracked by the CART Coordinating Center for each site to verify continued use. While we have noted fluctuations in volume during the adoption phase, catheterization lab procedure reports gener-

ated using CART have risen steadily (Fig. 2). CART's tight integration with the VA's computerized record system and easy-to-use graphical interface have garnered praise and positive feedback (Fig. 3). Moreover, while it is too early to evaluate long-term sustainability, all sites that have implemented CART continue to use it.

DISCUSSION

Like most health IT projects, CART implementation did not proceed without challenges and some resistance. Strategies learned during CART implementation are summarized in the table. (Table 1) Engaged, clinical champions were key facilitators of the entire implementation process; they helped identify a technical champion at their facility to coordinate installation and encouraged overall acceptance of the new clinical application by their peers. At sites where there was an identified clinical champion, implementation was generally much faster.

The current health IT literature supports incentivizing adoption,²² although it is important to note that incentives do not necessarily assume a monetary form. In the VA system, clinical champions had a wide array of motivations for adopting CART. Every effort was made to encourage participation in the development process for CART, and to accommodate requests for changes in the application or support mechanisms for future use of site data for research or local quality improvement. In addition, great care was taken to ensure

Figure 2. Catheterization lab reports generated using the VA Cardiovascular Assessment, Reporting, and Tracking (CART) System, 2004–2008.

Figure 3. Sample screens from the VA Cardiovascular Assessment, Reporting, and Tracking (CART) System (Simulated data).

CART would integrate with the workflow of the catheterization lab at the point-of-care, and not significantly increase record-keeping or time, nor require new staff.

Incentives, whatever their form, are necessary to encourage adoption but occasionally are insufficient. In those cases, strong administrative guidance may direct health IT implementation. A VA National Directive was issued at the end of 2005²⁹ and mandated the use of CART in all VA catheterization labs. This directive has never been enforced through administrative action, but the presence of such a mandate from management within an integrated healthcare system could be a significant facilitator of implementation for systems like CART.

To combat technical resistance, the VA National Directive mandating CART was occasionally referenced, but more often simply to allay fears that CART might be an ad hoc solution and not part of an approved national quality improvement initiative.

Technical champions and staff at each VA placed high value on the ease of CART installation and having a direct communication channel with the CART technical director. Also, CART technical staff maintained up-to-date training and VA security clearance. In a few cases, despite all of this and the existence of a National Directive, it was necessary to provide technical decision-makers with documentation of CART's national security accreditation before proceeding with installation.

There are several considerations in the interpretation of this paper. CART was implemented in the VA system, which has embraced some form of a computerized record system since the 1980s. VA organizational and financial structures also differ from other health care systems. This may limit the generalizability of CART as a model for health IT implementation outside the VA system. However, as the U.S. health care system moves increasingly towards interoperability and adoption of standards—the hallmarks of ideal electronic health records systems—an application such as CART can be effectively deployed. Moreover, CART may serve as an important model for interoperable, point-of-care clinical applications which document and track quality of care as part of routine clinical workflow. As such, the CART model is extensible to other clinical areas and medical procedures.

Table 1. Key Strategies in CART Implementation

PHASE	STRATEGY	IMPACT
Strategic Planning	Establish key collaborations with high-level stakeholders	High-level management buy-in
	Identify facility-level clinical champions	Facility-level support
	Design prototype to minimally impact workflow	Clinical support
Installation	Develop and agree on a set of primary project requirements	All
	Minimize local facility IT staff workload during installation	Facility-level IT support buy-in
	Conduct remote installation without burdening local IT resources	Facility-level IT support buy-in
	Address privacy and security concerns by having software undergo security certification and be able to provide this documentation. Also document privacy and security training of all project staff	Facility-level IT and administrative IT support
	Utilize clinical champions to generate excitement, and identify technical champions	Facility-level support
	Conduct clinical in-service ("train the trainer") between clinical champion and Clinical Director, encouraging facility-level feedback, such as development requests or desire to participate in future research	Facility-level support

CART=Cardiovascular Assessment, Reporting and Tracking system, IT=information technology

To date, CART has achieved its foundational goals. CART has facilitated standardized documentation, such as pre-procedure patient risk and indications, and enhanced communication of the results of catheterization lab procedures within the VA system. CART also supports local site quality assessment reporting, and national reports of catheterization lab volumes, procedure types, and complications to VA leadership.

Successful implementation and adoption have also created new avenues for development. Very soon, CART will allow derivation of quality metrics for national quality oversight by VA leadership, including benchmarking of care among VA's. Continued technical maintenance and updates of the core application are ongoing, with the CART Clinical Advisory Committee to guide future development requests. The CART Analytic Database is now being developed to link CART to longitudinal care and outcomes from other VA data sources, and to support quality management and health services evaluation. National benchmarking of VA data with the American College of Cardiology National Cardiovascular Data Repository will commence in 2010. Lastly, the VA and FDA have jointly approved a Memorandum of Understanding to support CART as a national network for cardiac catheterization active device surveillance. Through full adoption, CART holds great promise to improve the delivery of care, promote quality improvement, enhance patient safety, facilitate research, and provide useful administrative data assessing catheterization lab volumes, coding, and quality oversight.

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