

Transitions of Clinical Information Systems

In early February 2003, George Halvorson, Chairman and CEO of Kaiser Foundation Health Plan and Hospitals, Inc, and Jay Crosson, Executive Director of the Permanente Federation, announced that Kaiser Permanente (KP) was purchasing an integrated suite of electronic health record and related applications from Epic Systems (Madison, WI) to deploy programwide. The decision to purchase the Epic products changed the direction set four years earlier for development of an electronic health record system at KP. The decision to change direction in 2003 was made after months of careful analysis and is best considered in the context of KP's previous work to develop electronic health records.

History of KP Regional Electronic Health Record Systems

More than a decade ago, leadership of most KP regions recognized the need for electronic health records. Every region—including some that no longer exist—invested time and money to collect information relevant to patient care and to display that information at the location where care was provided (the “point of care”), usually clinician offices. Each region had episodes of success and failure in these efforts and attempted to learn from these experiences.

Some effort was made in the early 1990s to coordinate these projects. First—and true to the KP culture—each Permanente Medical Group (PMG) needed to define its goals and find the most direct path to those goals. We describe the results of these efforts, most of which remain in use today.

In the KP Ohio Region, Allan Khoury, MD, led development of an operational data store (ODS) of information derived from ancillary systems (eg, for storing pharmacy orders and laboratory results). These data were combined with data extracted from progress notes written after each outpatient encounter and then scanned into the computer system. The ODS is used to generate point-of-care alerts and reminders, which have been extremely effective in helping Ohio PMG clinicians to improve care. This highly successful medical

automated record system (MARS) was recognized with the Nicholas E Davies Award for Excellence, a national award granted (formerly by the Computer-Based Patient Record Institute and currently by the Healthcare Information and Management Systems Society) to promote adoption of the electronic medical record throughout the United States.

In the KP Mid-Atlantic Region, development of the PACE system was led first by Andrew Barbash, MD, and more recently by Mark Snyder, MD. PACE, too, is based on an ODS, and PMG clinicians in the KP Mid-Atlantic Region type their progress notes into the system.

In Southern California, John Mattison, MD, led development and implementation of a highly innovative process: entering structured data (as distinguished from free text) as progress notes. This effort advanced development of a structured vocabulary for clinical data that is rapidly becoming an international standard. This clinical data vocabulary formed the heart of SCPMG's WAVE application used in clinical settings in the KP Southern California and Hawaii Regions. WAVE was the core documentation tool in KP's first effort to collectively develop an electronic health record, the National Clinical Information System (NCIS). The key lessons learned during development of NCIS still apply as KP continues to develop tools and templates for charting that will both speed entry and foster the collection of clinical

data that can be used by many different computer systems.

The KP Northern California Region developed an effective, widely accessible repository of clinical data and a system to present it, the Clinical Information Presentation System (CIPS), on which all clinicians in the region rely. The project has been led by several clinicians over the years, including George Peredy, MD, and Steve Bornstein, MD. CIPS contains data from key ancillary systems and problem lists; summary data related to outpatient visits, hospitalizations, and emergency department visits; transcribed reports; preventive health services information and prompts; and much more. The repository is used by another application,



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Preventive Health Prompts (PHP), to display and print point-of-care alerts about preventive health and chronic disease management. Clinical outcomes have clearly improved as a result of these reminders.

In the KP Northwest Region, Homer Chin, MD, led internal development of an electronic health record. In 1992, the KP Northwest Region purchased Epic's ambulatory health record product (EpicCare) and integrated it with the region's existing ODS and results-reporting system. Implementation was complete by 1997, and the system won the Nicholas E Davies Award.

In the KP Colorado Region, Jeff Rose, MD, and (more recently) Andrew Lum, MD, led development and implementation of the Clinical Information System (CIS) in partnership with IBM (White Plains, NY). By the end of 1998, all outpatient encounters were documented using CIS and the structured clinical data vocabulary developed in conjunction with the work being done by SCPMG. Most data entry occurred in examination rooms, a process resulting in the first large-scale KP experience with examination room computing. The KP Colorado Region stopped using paper health records six months after the last clinician's office was connected to CIS; the KP Colorado Region has since been essentially paperless. The KP Colorado's CIS also won the Nicholas E Davies Award. This was the third time KP had won this award; no other organization had received this award more than once.

Creating a Programwide Standard

In 1999, leadership in the national KP organization decided to stop internal development of NCIS except for the population care registry application, forms of which are still used by the KP Hawaii, Northern California, and Georgia Regions. KP management assessed two existing examples of ambulatory electronic health record systems used in the KP Colorado Region (CIS) and in the KP Northwest Region (EpicCare). After intense analysis and discussion, the decision was made to alter CIS for programwide deployment.

Creating a Programwide Standard

Although the effort to alter CIS proved considerable, it led to implementation of CIS in parts of Hawaii and in building infrastructure to interface to all of the ancillary systems in use programwide—185 at last count. In addition, the structured clinical vocabulary that originated in the KP Southern California and Colorado Regions was expanded, and the PMGs made important collaborative

efforts to develop content (eg, templates for documentation, for order sets, and for decision support). The Interregional Clinical Content Team (IRCCT) of the Care Management Institute is now responsible for ongoing content development. In the summer of 2002, when George Halvorson requested reassessment of KP's approach to development of an electronic health record system, the CIS implementation team had already prepared to upgrade the version used in KP Hawaii, to implement CIS in KP Southern California, and to replace the outdated version used in KP Colorado.

Reassessment Leads to New Programwide Standard

The software reassessment showed that several vendors—most notably, Cerner Corporation (Kansas City, MO) and Epic Systems Corporation—had dramatically improved the functionality and breadth of their products since 1999, when KP last evaluated them. Further, these products were integrated into suites of applications: Data from a database or other data repository could be transferred easily between applications in the suite without requiring interface development.

Reassessment Leads to New Programwide Standard

Evaluations of Cerner's and Epic's products by potential users at KP clearly showed that these products had surpassed the CIS products developed jointly by KP and IBM and that the rapid pace of product evolution was likely to continue. Consequently, although KP's potential users concluded that either Cerner's or Epic's software could be used effectively at KP, these users clearly and consistently preferred Epic's products. This preference was seen among all categories of users and for all products that might be used at KP. The KP Northwest Region had adopted EpicCare, Epic's ambulatory health record product, early; the region's influence on improvement in quality and features of Epic's products was clearly substantial.

The assessment team concluded that the underlying architecture of Epic's products and proposed technical solutions were sound and that adopting Epic's applications would have several important advantages resulting from Epic's extensive, well-codified implementation experience. On the basis of Epic's experience with organizations like KP (and with KP directly, ie, through Epic's long association with the KP Northwest Region), Epic's staff concluded that KP could rapidly implement much of Epic's product suite if KP staff collaborated on basic configuration tasks across regions.

The CIS implementation team had projected programwide deployment of the ambulatory electronic health record system within seven years; instead, Mr

Halvorson is challenging the organization to achieve four major goals within three years:

- programwide deployment of the ambulatory electronic health record system;
- deployment of hospital information systems in regions where these systems are needed;
- creation of a Web presence for clinicians and another for members;
- implementation of integrated electronic patient registration, billing, and appointment scheduling systems.

The three-year goal will probably be accomplished fully throughout KP (except, perhaps, in California, where great progress toward the goal will have been made nonetheless). Potential impediments—in particular, the need to coordinate implementation of the hospital information systems and mandatory seismic retrofitting—may keep California from fully realizing the goal within three years.

In addition to their speed and breadth, the functions inherent in Epic's software products are more extensive than would have been possible after three years with CIS, particularly with regard to decision support for clinicians and Health Plan members. Preprogrammed rules and templates created by KP for charting and ordering will trigger this decision-support mechanism. All KP regions will benefit from the KP Northwest Region's experience with the decision-support features of EpicCare, and KP will reuse the CIS work done previously by KP in preparation for EpicCare deployment. Because Epic's clients routinely share this work among themselves, KP will not need to reinvent decision-support rules and templates already built elsewhere.

In the end, the decision to change from CIS to Epic products was easy, even for those of us who had invested substantial personal energy making the CIS project successful and who were proud of what had been accomplished. In 2003, KP negotiated a contract with Epic Systems that took into account the increased risk and difficulty of implementation created by KP's size and organizational complexity.

Because Epic continues to develop its suite of products, our contract includes the rights to annual updates for products currently licensed to us. Our agreement also includes a favorable pricing structure for any new Epic products that KP acquires. On a formal, regular basis, Epic will solicit KP's input about possible modifications or additions to Epic's products. This contract structure and solicitation of feedback are routine for Epic's clients, who uniformly view Epic as a good organization to conduct business with. The entire project team sees Epic as a capable partner for KP.

Looking Toward the Future

What advantages will KP reap from this partnership with Epic? The practical answer is contained in the catalog of products posted on KP's Intranet site: From the intranet home page, <http://kpnet.kp.org>, click on "Use Technology" in the left navigation bar; click on the "Kaiser Permanente HealthConnect" link; and click on the "Epic Product Catalog" or the "Epic Product Documentation" link. Epic's products and services are also shown on the Epic Systems Corporation Web site, www.epicsystems.com. In general, KP will benefit from having a proven, highly functional, computerized system for gathering, storing, and presenting clinical, operational, and business data that supports clinical and administrative operations and serves our members well. Most observers feel that the system is user-friendly and fits well with the way people think and practice.

Once fully deployed, an integrated information technology support system within an integrated health care delivery system has many transformational possibilities. The basic reason for using an electronic health record system applies also to using an integrated information technology system; to have complete, accurate clinical data immediately available for use in patient care. The greater challenge, however, will be to use this integrated information technology system and integrated health care delivery system to improve patient care in ways we cannot yet foresee.

Implementing the entire suite of Epic's products licensed to KP will be challenging, but changing our processes of patient care to take full advantage of these products will be even more challenging. If we do it, given the inherent advantages of Permanente Medicine and its integrated health care model, the result should be extraordinary. To paraphrase the motto of the medical unit depicted in the hit movie and television show, *M*A*S*H*, our Health Plan members will get "the best care anywhere." ♦

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George Peredy, MD, of The Permanente Medical Group, reviewed the article.

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