

Electronic Medical Record and Quality of Patient Care In the VA

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I was working at the Providence VA Medical Center emergency room when I was asked to see a new, confused, diabetic patient, who was visiting her family in Providence. The nurse informed me that her blood sugar was low. We took measures to correct her blood sugar immediately. The patient was not clear regarding her medications. Her primary care physician was at a VA hospital in California. Logging into the **VA Computerized Patient Record System (CPRS)**, I gained access to the patient's recent outpatient office visit notes, and obtained the most current medication list. It became clear that the patient was not taking her diabetic medications as prescribed and that she was hypoglycemic because of over-medication. Via the electronic medical record, VA physicians can ascertain not only the patient's latest data, but also a complete medical record going back as far as the mid -1980s, including records of care performed in any other **Veterans Health Administration (VHA)** hospital or clinic.

More than \$ 1.2 trillion spent on health care each year is estimated to be wasted—about half the \$2.2 trillion spent in the United States on health care each year, according to the most recent data from Price Waterhouse Cooper Health Research Institute.¹ Much of the waste is a result of disorganization and lack of accurate information. This results in orders for unneeded tests and ineffective procedures and in simple human error. Advanced health information technology can reduce these consequences substantially in the following ways:²

1. Improved communication
2. More readily accessible knowledge
3. Assistance with calculations
4. Performance of checks in real time
5. Assistance with monitoring
6. Decision support
7. Requirement for key pieces of information (dose, e.g.)

Based on a well-specified definition of electronic health records, only 17% of US physicians used either a minimally functional or a comprehensive electronic records system in 2009.³ Twenty four functionalities have been identified as the essential components of comprehensive electronic records system.⁴

In 1995 the VA launched a major re-engineering of its health care system that included better use of information technology, measurement and reporting of performance, integration of services, and realigned payment policies. Health Information technology benefited from significant investments⁶ and the CPRS was implemented nationally throughout the VHA in 1999.^{7,8}

In any VA hospital clinicians can navigate the electronic medical records

by logging into CPRS. Via a graphical user interface, physicians can access complete patient records from inpatient visits, subspecialty consults, primary care visits, emergency room visits, laboratory data, radiology reports, medication history, surgical notes and discharge summaries. All physicians' work on any patient utilizes the same medical record and all entries are legible. This facilitates communication among care providers, makes the data collection process efficient, saves time, and eliminates difficulty deciphering illegible handwriting.

The **Clinical Decision Support (CDS)** component of CPRS provides clinical data, clinical guidelines, clinical reminders, situation-specific advice, and makes relevant information available in

Table 1. Electronic Functionalities of Comprehensive Electronic Records System³

Electronic Functionality

Clinical documentation

- Demographic characteristics of patients
- Physician's notes
- Nursing assessments
- Problem lists
- Medication lists
- Discharge summaries
- Advanced directives

Test and imaging results

- Laboratory reports
- Radiologic reports
- Radiologic images
- Diagnostic – test results
- Diagnostic – test images
- Consultant reports

Computerized provider-order entry

- Laboratory tests
- Radiologic tests
- Medications
- Consultation requests
- Nursing orders

Decision support

- Clinical guidelines
- Clinical reminders
- Drug-allergy alerts
- Drug-drug interaction alerts
- Drug-laboratory interaction alerts
- Drug-dose support (renal dose guidance)

real time to facilitate clinical decision making. Availability of these components makes information collection a smooth process, provides decision support automatically as part of workflow and provides actionable recommendations.⁹ CDS reminds the clinician to evaluate for different JCAHO-required indicators such as pain scale, signs of abuse, safety in the living place, counseling for smoking cessation, assessment for pressure ulcers, medicine reconciliation, and verification of advance directives. The same CDS system reminds doctors to prescribe appropriate care for patients when they leave the hospital, such as prescription of beta blockers after heart attacks, ACE inhibitors for congestive heart failure, left ventricular function assessment by echocardiogram for heart failure, anticoagulation in patients with atrial fibrillation, and daily weight measurement in patients with congestive heart failure.

All patient care orders are entered into CPRS through a **Computerized Physician Order Entry (CPOE)** system. All inpatient orders (for diet, activity, intravenous fluid, medication, lab, radiology, consultations, etc) and outpatient orders are entered through this system.

The CPRS has an active clinical decision support system focused on drugs, laboratory testing and radiology procedures. For example, when a physician enters a new medication order in CPRS, the system immediately alerts the physician to any previous allergic reaction to the same medication and to any relevant drug-drug interactions. CPRS checks for duplicate therapy, provides basic drug dosing guidance, and makes formulary data available. It also checks dosing for renal insufficiency and geriatric patients, medication-related lab testing (e.g. PT, PTT before intravenous heparin initiation), and drug-pregnancy and drug-disease contraindications. The laboratory generates view alerts to the provider on any abnormal testing results through the CPRS. For example, orders for CT scan with contrast generate alerts to the provider if the patient is on metformin, if serum creatinine is abnormal, or if a recent serum creatinine is not available in order to caution the provider regarding potential contrast-related complications. The radiologist can generate a computerized alert to primary care providers (in-

patient and outpatient) whenever an abnormal radiology image is reviewed.

Computerized Clinical Reminders (CCR) are just-in-time reminders at the point of care that reflect evidence-based clinical practice guidelines and reduce reliance on memory. This system keeps track of when veterans are due for a flu shot, pneumococcal vaccine, diabetic eye exam, diabetic foot exam, lipid profile, screening colonoscopy, breast cancer screen, or other screening and generates a computerized reminder to the provider at the time of the patient visit.

The electronic medical record has strongly supported performance improvement throughout the VHA.

When the quality of care in the **Veterans Health Administration (VHA)** health care system was assessed from 1994 (before re-engineering) through 2000, it was found that quality of care improved dramatically in all domains studied. These improvements were evident from 1997 through fiscal year 2000.⁵ Compared with Medicare fee-for-service programs, the VA performed significantly better on all eleven similar health quality indicators for the period from 1997 through 1999. In 2000 the VA out-performed Medicare on 12 of 13 indicators.⁵ The VA also out-performed other health systems in the community on standardized measures of health care quality. Performance in the VHA out-paced that of a national sample for both chronic care and preventive care. In particular, the VHA sample received significantly better care for depression, diabetes, hyperlipidemia and hypertension.¹⁰

The electronic medical record has strongly supported performance improvement throughout the VHA. The VHA instituted a performance measurement initiative nationally in 1996. As a part of this initiative, evidence-based clinical performance measures were identified and performance on these measures

was ascertained via an **External Peer Review Program (EPRP)**. In EPRP, a non-VHA contractor abstracts records of a sample of VHA patients from each VHA facility, derived from electronic health records.¹¹ These measures are incorporated into an annual performance contract, and senior managers are held accountable to meet or to exceed specific performance targets.¹² This VHA performance measurement initiative has been enhanced by the comprehensive electronic medical record system that facilitated the use of electronic decision support such as clinical reminders.¹³ The use of these reminders is at the discretion of the local facilities. The search for strategies contributing to high clinical performance measures throughout the VHA showed that the second most commonly cited strategies across all performance categories were clinical reminders (41.4%).¹³ The computerized clinical reminders^{7,14-22} and computer based standing orders^{18, 23, 24} are proven interventions to enhance preventive care (e.g. immunizations, cancer screening).

The significant improvement in the health care provided by VHA was achieved by transformation into a culture based on accountability for continuous improvement of performance.⁶ The VA's superior quality relative to that of Medicare for the period from 1997 through 2000 probably has more to do with the quality-improvement initiatives that were instituted in the mid-1990s than with structural differences.⁵

In conclusion, the re-engineering of the VHA has resulted in dramatic improvements in the quality of care provided to veterans. In fact, the Institute of Medicine recently recommended many of the principles adopted by the VA in its quality improvement projects, including emphasis on the use of information technology and performance measurement and reporting.²⁵

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