Electronic Medical Records for Use in the Family Medicine Teaching Environment

the Healthcare Informatics for Research Education and Service (HiRES) project

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http://hiriresearch.wordpress.com/
Chronology

• 2009 - Chair of Family Medicine at McGill, Martin Dawes instructs FM teaching centers to adopt eMR in preparation for accreditation in 2012

• 2010 - Healthcare Informatics in Research Education and Service (HiRES) project adopted by St. Mary’s Hospital Center of Montreal in support of its Family Medicine teaching mandate

• 2011 – FMF Presentations
  1. Electronic Medical Records for Use in the Family Medicine Teaching Environment
  2. HiRES and its Application of HL7 Clinical Document Architecture in a Training Context (2)
  3. Process Modelling of a large Family Medicine Teaching Facility
Practices with EMRs Quicker to Identify Patients who would Benefit from Evidence-Informed Interventions

Paper Records: ~ 31 hrs
Low confidence review included all eligible patients

EMR: ~ 1.37 hrs
High confidence review included all eligible patients

Please visit the Canada Health Infoway booth to learn more about the Population Health Management Challenge, key findings and lessons learned.
STANDARDS FOR ACCREDITATION OF RESIDENCY TRAINING PROGRAMS

Family Medicine  
Enhanced Skills

Emergency Medicine  
Palliative Medicine
Each residency program must demonstrate a commitment to integrating the tools of information management into patient care, teaching and research.

This will require that the program have an organized approach to promoting the use of, and fostering the teaching of informatics.

Essential elements of this commitment will include:

1. Providing residents and faculty with ready access to the tools of information management in the areas where they usually conduct patient care.

2. Developing, implementing and evaluating a resident curriculum and faculty development program in family medicine informatics.
HiRES Project - Mission Statement

The advancement of research, education and service in healthcare through the application of biomedical informatics and systems engineering principles

“information in the service of health”
Information; the water we swim in

“I don't know who discovered water but it certainly wasn't a fish.”

Marshall McLuhan
“In attempting to arrive at the truth, I have applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purposes of comparison.”

“If they could be obtained, they would enable us to decide many other questions besides the one alluded to.”

Nightingale, Florence; “Notes on a Hospital” 1873
100 years of information
The Tsunami of Information

• The scientific method is under threat due to its own success

• 4 exabytes (4.0 x 10^19) of unique information was generated in the last 12 months

• Healthcare practitioners are being swamped by a tsunami of clinical research information
“Two hundred years ago enlightened physicians understood that empiricism needed to be replaced by a more formal and testable way to characterize disease and its treatment. The tool they used then was the scientific method. Today we are in an analogous situation. Now the demand is that we replace the organizational processes and structures that force the arbitrary selection amongst treatments with ones that can be formalized, tested, and applied rationally.”

“Four rules for the reinvention of health care”
Enrico Coiera, BMJ 2004;328:1197-1199 (15 May),
“If communities were the size of cells and
if hospitals, pharmacies, laboratories, patients and physicians were the size of sub cellular particles,
no doubt they would be the subjects of a great deal of research, and
much more would be known about their relationships and pathophysiology.”

Weed, Lawrence; “Medical Records, Medical Education, and Patient Care”; The Press of Case Western Reserve University; 1969
“Data Discipline”

• “If we accept the limits of discipline and form as we keep data in the medical record,
• the physician’s task will be better defined
• ...and the art of medicine will gain freedom at the level of interpretation and be
• released from the constraints that disorder and confusion always impose.”

Weed, Laurence; 1968
What is Informatics?

- **S: (n)** information science, informatics, information processing, IP (the sciences concerned with gathering, manipulating, storing, retrieving, and classifying recorded information)

  [http://wordnetweb.princeton.edu/](http://wordnetweb.princeton.edu/)
(Problem Oriented Medical Information System)

1) Facilitate good patient care by making immediately available (in minutes) to the individual physician a complete, updated list of problems on any patient and by providing simultaneously, as a unit, all the data in sequence (narrative, laboratory, etc.) pertinent to any of these problems.

2) Make possible epidemiological studies and other research endeavors in terms of problems, having all the data on any given problem immediately available.

3) Make possible a medical audit whereby the standards of care being provided for a given entity (e.g. hypertension) can be rapidly assessed because of the specific orientation of all the data.

4) Make possible a business audit to assess the physical, financial and time resources that go into the solution and management of a given problem.”

Weed and Schults; Problem Oriented Medical Information Systems (PROMIS) Laboratory of the University of Vermont. 1964
Le Dossier

• A patient record is an informatics tool
• The paper record is robust, reliable, easy to use and endures BUT it is large, hard to access and takes up too much room
• The digitized record is compact and easily accessible BUT is volatile, may not endure and can slow down the clinical encounter
• So what is the electronic medical record?
What is an EMR?

- an evolving concept defined as a systematic collection of health information about individual patients or populations in digital format...
- capable of being shared across different healthcare settings, by being embedded in network-connected enterprise-wide information systems.
The Electronic Health Record (EHR)

“...a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR automates and streamlines the clinician's workflow. The EHR has the ability to generate a complete record of a clinical patient encounter, as well as supporting other care-related activities directly or indirectly via interface—including evidence-based decision support, quality management, and outcomes reporting.”

Health Information Management Systems Society’s (HIMSS):
“computer-based patient record”

CPR

• “...an electronic patient record that resides in a system specifically designed to support users through availability of complete and accurate data, practitioner reminders and alerts, clinical decision support systems, links to bodies of medical knowledge, and other aids”

R.S. Dick; E.B. Stein: “The Computer Based Patient Record; An Essential Technology for Health Care”; Institute of Medicine, National Academy of Science 1991
eMR Generations

1st: **The Collector** - simple systems that provide a site-specific solution for the need to access clinical data which is imported through scanning or other forms of aggregation

2nd: **The Documenter** - basic systems that clinicians use at the point of care to adequately document rather than merely access clinical data

3rd: **The Helper** - Systems that include episodic and encounter data and use decision support tools to assist clinicians, functional in at the minimum both ambulatory and inpatient settings

4th: **The Partner** - Advanced systems that provide more decision support capabilities and that are operational and accessible across the continuum of care, and providing sufficient credibility as to become the patient's legal medical record

5th: **The Mentor** - Complex and fully integrated systems that include all previous capabilities and that are a main source of decision support in guiding patient care for both clinicians and consumers
The pressure is growing

The public is using computers - why are their medical records on paper?
eMR and Preventable Error Reduction

- The Collector: Generation 1
- The Helper: Generation 2
- The Partner: Generation 4
- The Mentor: Generation 5

Figure 1: Error Impact of CPR Generations  Source: Gartner, Inc.
A Failure of Systems and Processes

Mortality

• “More than 98,000 Americans die and more than one million patients suffer injuries each year as a result of broken health care processes and system failures.” (IOM, 2000; Starfield, 2000);
A Failure of Systems and Processes

Morbidity

• “...little more than half of patients receive known ‘best practice’ treatments for their illnesses and less than half of physician practices use recommended processes for care” (Casalino et al., 2003; McGlynn et al., 2003)
A Failure of Systems and Processes

Waste

“...thirty to forty cents of every dollar spent on health care, or more than a half-trillion dollars per year, is spent on costs associated with “overuse, underuse, misuse, duplication, system failures, unnecessary repetition, poor communication, and inefficiency”

A Failure of Systems and Processes

An opportunity?

“...the cost of the failure to take advantage of the tools, knowledge, and infrastructure that have yielded quality and productivity revolutions in many other sectors of the economy has been enormous.”

Paper vs. Computers

It is hard to believe that this performs better than computer records.
“merely automating the form, content and procedures of the current patient records will perpetuate their deficiencies and will be insufficient to meet emerging user needs”

R.S. Dick; E.B. Stein: “The Computer Based Patient Record; An Essential Technology for Health Care”; Institute of Medicine, National Academy of Science 1991
A certified eMR?
We can turn this
Into this
Or we can build this

3D Patient Avatar for Clinical Information Representation in the Computable Medical Record

- 3D visualization linked to SNOMED terminology
The “Computable” Patient Record

• To get past the document manager EMR and achieve the “quality and productivity revolutions” seen elsewhere in society with computer technology we need machine “computation” of the medical record

S: (n) calculation, computation, computing (the procedure of calculating; determining something by mathematical or logical methods)
The “Computable” Patient Record

But

• Cancer is more complicated than a bank overdraft
• We are not born with an instruction manual and set of blue prints
• In fact the human being is the most complex entity in the known universe
eMR 2.0

• To achieve “machine computation” of the medical record it’s content must be captured and stored in a **semantic** form that is accessible to the machine.

• This is done by using information models and meta data; e.g. Web 2.0 uses extensible mark up language (XML)

• Medical records use HL7 clinical document architecture (CDA) and openEHR archetypes
Methods

A discovery and review of the eMR systems currently used in Canada was conducted and they were allocated to one of three categories;

• commercial,
• open source
• research and development.
An awareness of the state of the art in biomedical informatics and eMR was achieved through attendance at

- International Medical Informatics Association (IMIA)
- American Medical Informatics Association (AMIA)
- Canada Health Infoway Partnership

A review was conducted of the following standards

i. ISO 13606-5:2010 Health informatics -- Electronic health record communication – Part 5: Interface specification

ii. ISO 18308:2011 Health informatics -- Requirements for an electronic health record architecture

iii. ISO/HL7 10781:2009 Electronic Health Record-System Functional Model, Release 1.1

iv. ISO/CD 13940-1 Health informatics -- System of concepts to support continuity of care -- Part 1: Basic concepts
Baseline Process Discovery Interviews of those with particular perspectives on the roles of:

- Medical Director
- Clinical Scheduling
- Practice Secretary
- Information technology
- Archives
- Reception
- Billing
- Nursing
- Resident Evaluation
- Research
- Medical students
- Obstetrics
- Resident program
- Patient encounters
- Staff Physician
- Teaching office
Integration Definition (IDEFØ) Model
Evaluation Grids

Each candidate EMR was evaluated for:

1. RTSS (Ministry of Health LAN) certification (required for OACIS connectivity);
2. OACIS connectivity;
3. Availability of MSSS funding;
4. Support for Research and Academics;
5. Functionality.
Functional, Research and Education
Support Analysis Criteria

• PHYSICIAN Criteria
  – ePrescription 12
  – CPOE (Computerized Physician Order Entry) 17
  – Imaging 5
  – Clinical Note 11
  – Medical File (Demographics and Antecedents) 6
Functional, Research and Education Support Analysis Criteria

- **ADMINISTRATIVE**
  - Scheduling
  - Patient File Management (Case mix and Rostering)
- **RESEARCH and TEACHING**
- **PATIENT PORTAL**
- **TOTAL # CRITERIA**

10 6 4 5 10

78
Summary Scores

- Commercial EMR “1” 30%
- Commercial EMR “2” 54%
- Open Source 30%
- Research EMR “1” 61%
- Research EMR “2” 30%
The short falls found can be attributed to three domains:

a. MONEY: Providers and vendors are reluctant to expense the coding of applications for a small poorly defined market.

b. STANDARDS: The absence of national standards for the clinical information and process content of the eMR to which vendors and promoters can build with confidence that their investment is safe.

c. SYSTEMS MODELS: Formal systems models of the Family Medicine teaching center environment, and the healthcare delivery sector in general are required for coding complex integrated software applications.
To achieve the higher level eMR functionality and usability

• The eMR content must be semantically machine computable and hence we need a “computable” eMR.

• Physicians, as the clinical domain experts, must show leadership in the process of defining the clinical content standards for the “computable” eMR.

• The skills needed to define the clinical content and use of “computable” eMRs to the benefit of our patients must be taught to medical students and residents in training if we are to produce sophisticated physician consumers and users of eMRs.
As the auditors of the standards for teaching clinical medicine our national accreditation bodies are in a unique position to advance the necessary standards at a national level and contribute to the successful adoption and meaningful use of the “computable” eMR.
We recommend that the CFPC help start the process of clinicians setting the standards for the clinical content of the eMR by instantiating a working group in Family Medicine Informatics with a mandate to establish, in collaboration with other Canadian healthcare accreditation, certification and licensing bodies, the terms and conditions of a sustainable entity funded by Health Canada or other governmental agency to create and curate the standards for the clinical content of the computer based patient record.
INTERESTED?

Join us at the
ad hoc eMR Working Group
breakfast meeting
7 AM Thursday November 3rd
513e
Details and background documentation

http://hiriresearch.wordpress.com/
13th International Congress on Medical Informatics
September 2010
Cape Town, South Africa