

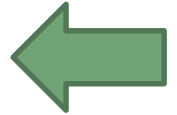
Topic 01

Introduction to Health Informatics

Kevin Robertson, MBA

ACS-2816-050 Health Information Systems
Winter 2020

Topic 1 Outline



- General Information
- Course Overview
- Health Informatics (HI) Introduction
 - What is HI?
 - HI Relation to Other Sciences & Sub-disciplines
- Medical Charts & Electronic Health Records (EHR)
- EHR Expansion & Integration
 - Clinical Trials / Evidence Based Medicine
 - Integration with Other Health Information Sources
 - Public Health Networks

General Information

- **Instructor:** Kevin Robertson, MBA, B.Sc. Applied Comp
- **Office:** 3C07
- **Office Hours:** Tue 16:45 pm – 17:45 pm
- **E-mail:** ke.robertson@uwinnipeg.ca

- **Course Name:** Health Information Systems
- **Course Number:** ACS-2816-050
- **Course Web Page:** www.acs.uwinnipeg.ca/2816-050
- **Class Meeting Time:** Tue 18:00 pm – 21:00 pm
- **Class Room:** 3D03

Important Dates

- **First Class:** Tuesday Jan 7th
- **Midterm Exam:** Tuesday Feb 25th
- **Final Withdrawal Date w/o Academic Penalty:**
Fri March 13th (A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date)
- **Last Class:** Tuesday March 31st
- **Final Exam:** Tuesday April 7th @ 6:00 pm

Evaluation Criteria

- Assignments 15%
- Term Paper 10%
- Midterm Exam 30%
- Final Exam 45%

Evaluation Criteria - Assignments

- **Assignments (15%)**
 - There will be 3 assignments worth 5% each
 - All assignments are to be completed **individually**
 - May include any or combination of the following:
 - Theory or analysis homework exercises
 - Close-book in-class quizzes
 - Due at the beginning of class on due dates. Handwritten assignments will not be accepted.
 - No late assignment will be accepted, or under special circumstances accepted with **20% off for each late day**
 - Multiple submissions are not permitted. Students may submit a partially completed assignment, and will receive credit for those attempted problems
 - **If** electronic hand in is requested, students are responsible to review their assignments before submission to make sure the correct files are attached to the email

Evaluation Criteria – Term Paper

- **Term Paper (10%)**

- Team Presentation (generally 2 per students per team)
- Study a current article related to the course
- Prepare a PowerPoint presentation
- Present article summary in class by using the PowerPoint presentation
- Schedule Presentations

- **Marks Distribution**

- Content 40% including section compliance and content quality
- Presentation style 20%
- Question period 20%
- Time precision 20% including material delivery compliance and ppt format

Evaluation Criteria - Exams

- **Midterm Exam (30%)**
 - Closed-book in-class midterm exam
- **Final Exam (45%)**
 - Closed-book final exam
- **Exam Requirements**
 - Photo ID at exam is required
 - You are expected to write the exam on its given day
 - No electronic devices (e.g. cell phone, laptop, scientific calculators, translators, etc) are permitted
 - **Simple calculators can be used though. Subject to approval.**
 - Unless a medical certificate is provided, no accommodation is made for missed exams

Text Book (Required)

Required Text Book:

Biomedical Informatics,
Computer Applications in Health Care
and Biomedicine

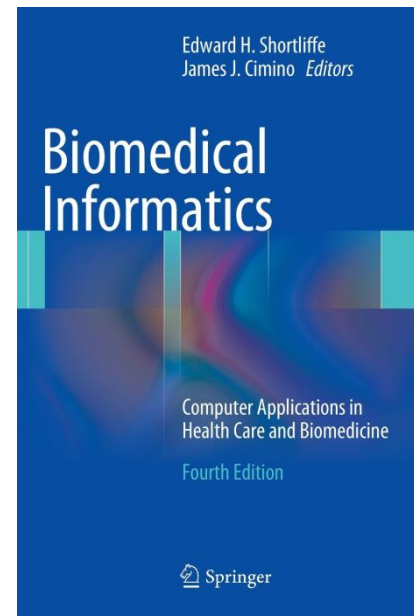
Shortliffe, E. & Cimino, J. (Eds)

Springer

4th Edition 2014

ISBN 978-1-4471-4473-1 (Hardcover)

ISBN 978-1-4471-4474-8 (eBook)

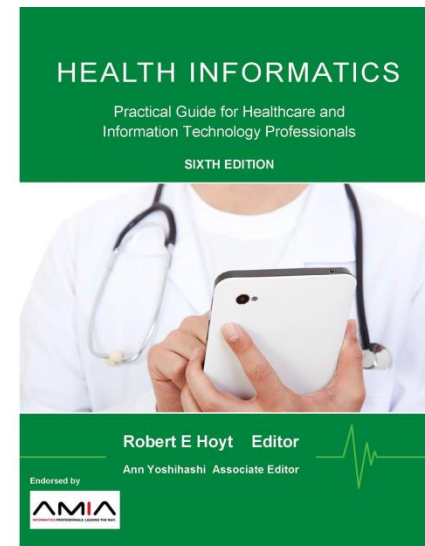


Text Book (Optional)

Complementary Book (optional)

Health Informatics,
Practical Guide for Healthcare and
Information Technology Professionals
Holt, Robert & Yoshihashi, Ann (Eds)
Informatics Education
6th Edition 2014

ISBN 978-1-3047-9110-8 (Paperback)
ISBN 978-0-9887-5292-4 (eBook)



Email Communication

- It is recommended Email from accounts at uwinnipeg.ca be used in electronic communication related to the course
- Email from other accounts have greater risk to be filtered by UofW email system spam filters

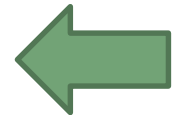
Three Questions

- How is the course organized and managed?
- What is Health Informatics about?
- Why are Electronic Health Records important?

Reading: Biomedical Informatics, 4th Ed Chapter 1

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Course Overview - Objectives

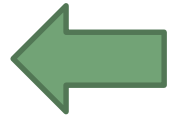
- Introduction to health informatics concepts and their applications.
- It provides an overview of foundational and current themes in health informatics, central to the understanding of the field.
- It is intended for those who wish to get sufficient background to follow progress and potentially carry out development activities in the field.

Course Outline (Tentative)

- I. Foundational Health Informatics
 - Introduction to Health Informatics
 - Medical Data: Acquisition, Storage and Use
 - Medical Decision Making
 - Health Systems Design and Basic Concepts
 - Standards in Health Informatics
 - Integration and Interoperability
 - Ethics, Privacy and Confidential in Health Informatics
 - Evaluation and Technology Assessment
- II. Applied Health Informatics
 - Electronic Health Record Systems
 - Management of Clinical Information
 - Consumer Health Informatics
 - Patient Monitoring Systems
 - Medical Imaging Informatics
- III. Health Informatics Ahead
 - Future of Computer Applications in Health Care

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What is Health Informatics?

- **Health informatics** is the field of information science concerned with management of healthcare data and information through the application of technologies
 - Interdisciplinary field
 - Assists caregivers and patients with decisions and actions
 - Improves patient outcomes by better use of information
- AKA Medical Informatics, Clinical Informatics, **Biomedical Informatics** among others

Emergence of a Discipline

- Technology advances (a sample)
 - Graphical user interfaces
 - Data storage
 - Internet
 - Mobile technologies
- Health care system
 - Needs and requirements to evolve to 21st century
 - Slow to understand & adopt technology

Health Informatics

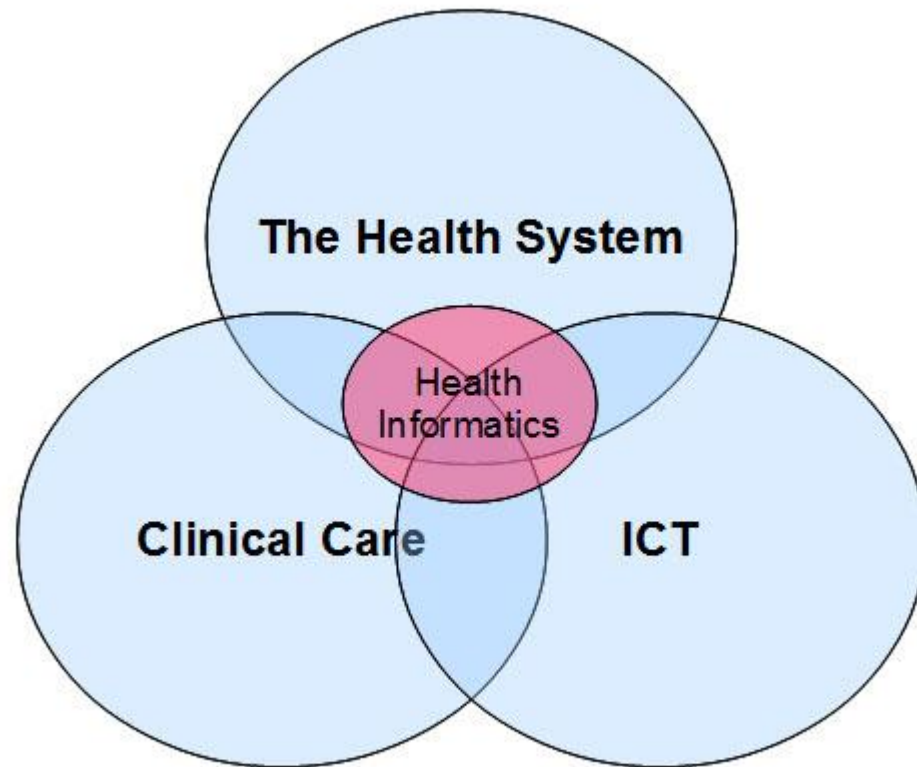


Figure source: austemrs.com.au/page/health.html

HI in Relation to Other Sciences

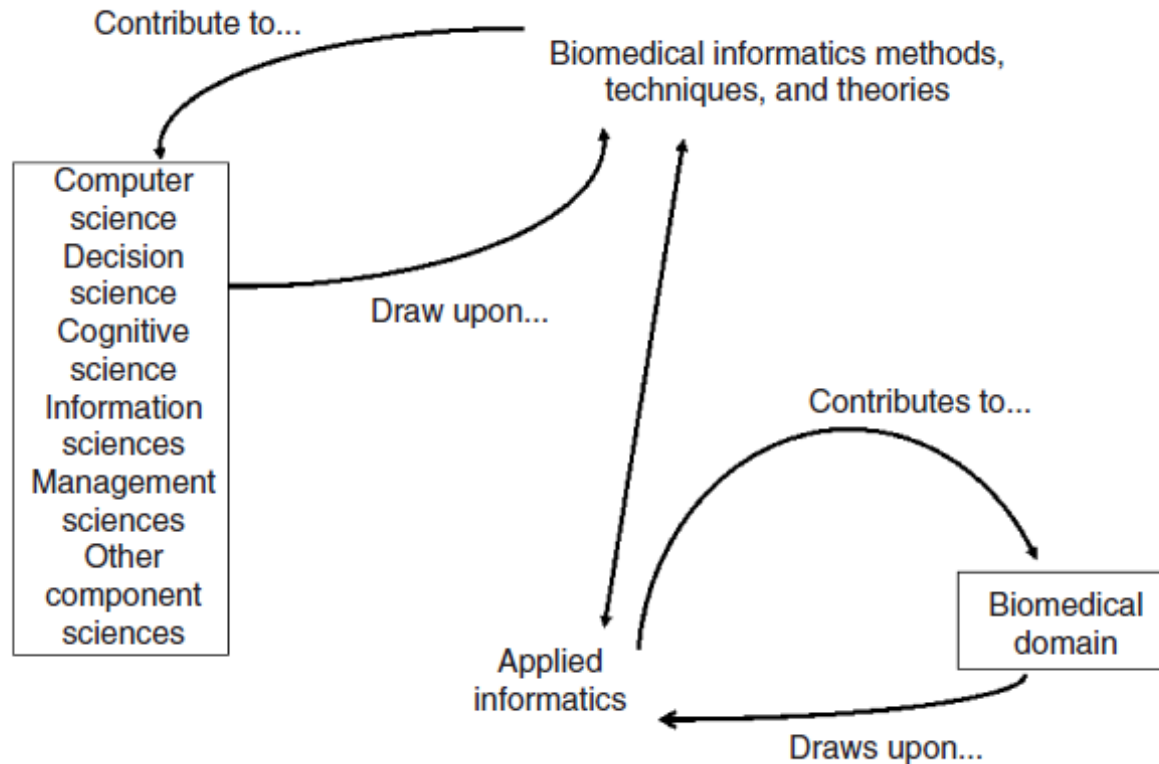


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.22, p37

HI in Relation to Other Sciences – Radiology Case



Diagnostic Imaging / Radiology Reading Station

Figure source: usa.healthcare.siemens.com/medical-imaging-it/radiology-information-systems/syngo-workflow

HI in Relation to Other Sciences – Radiology Case

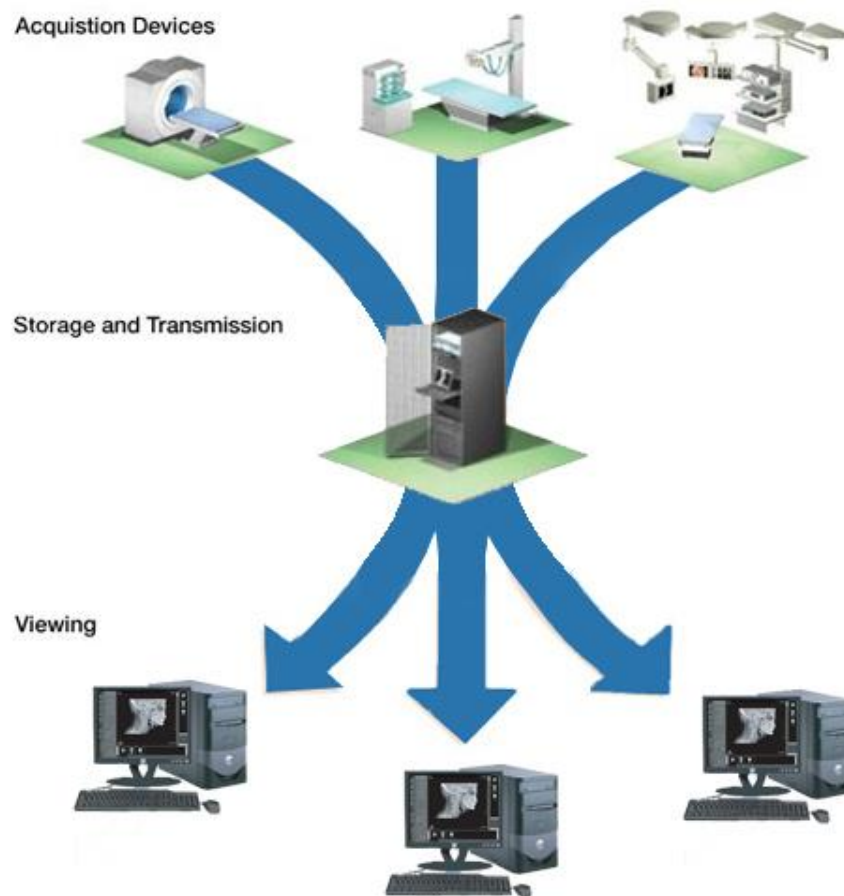
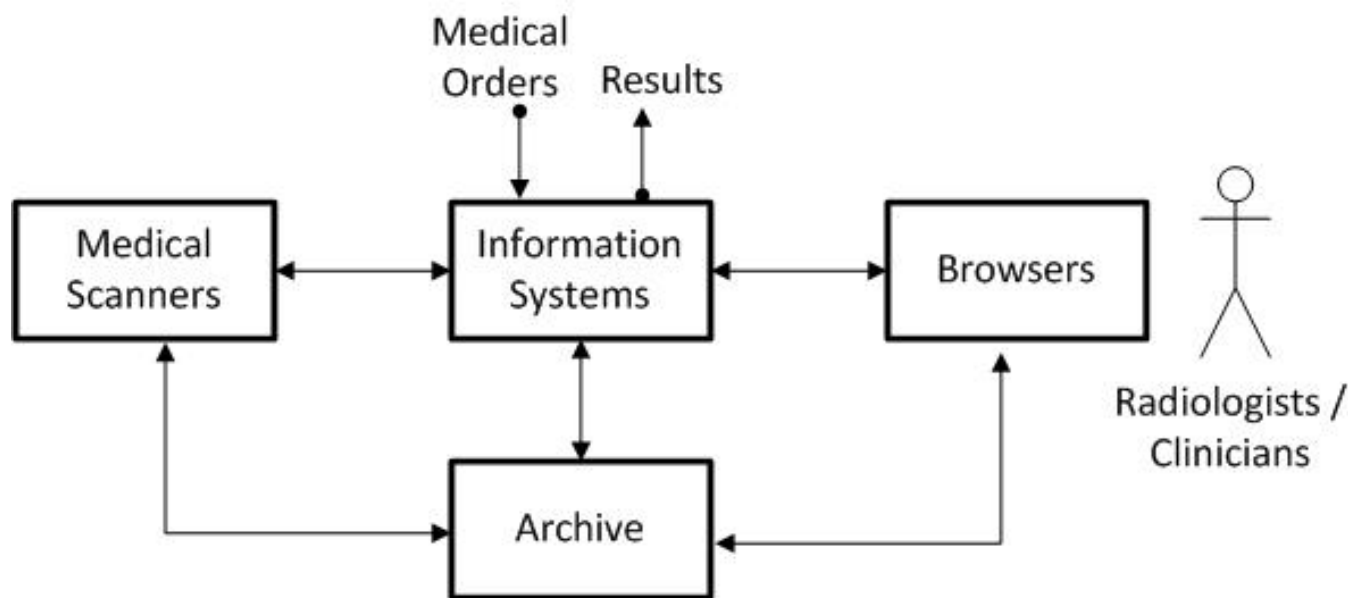


Figure source: www.flatpaneldr.com/index.php/category/human-medical-dr/

HI in Relation to Other Sciences – Radiology Case



Generic Workflow for Diagnostic Imaging / Radiology Services

Health Informatics Sub-Disciplines

- Radiology Informatics,
- Diagnostic Informatics
- Medical Imaging Informatics,
- Nursing Informatics,
- Consumer Health Informatics,
- Telehealth Informatics,
- Public Health Informatics,
- Bioinformatics,
- Infectious Disease Informatics,
- Dental Informatics, etc.

Health Informatics Sub-Disciplines

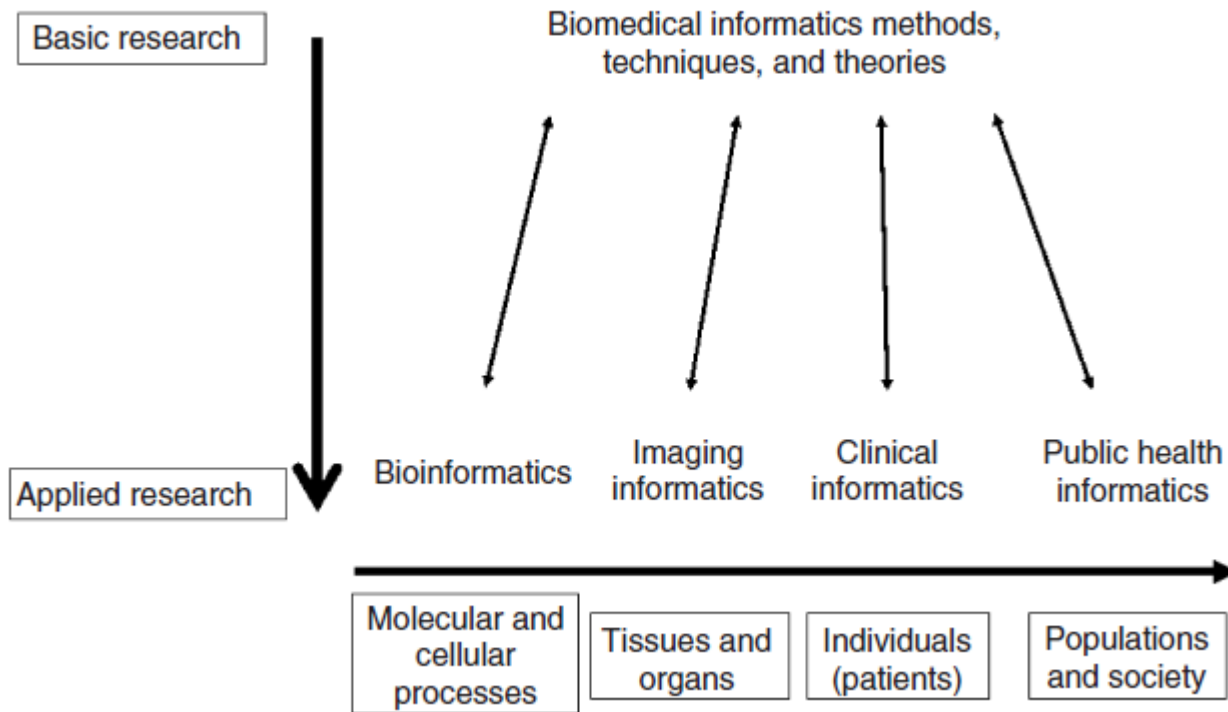
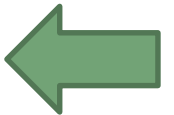


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.21, p34

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Medical Chart / Medical Record

- Issues with paper records
 - Integration challenges
 - Medical silos
 - One copy
- Old way to practice medicine
- Continuity of care
- Patient safety
- Quality of care



Figure source: people.howstuffworks.com/electronic-medical-record-implementation.htm

Medical Record Inputs

- Challenges
 - Multiple sources
 - Limited capabilities
 - Workflows
 - Automation processes
 - Data integration
 - System integration

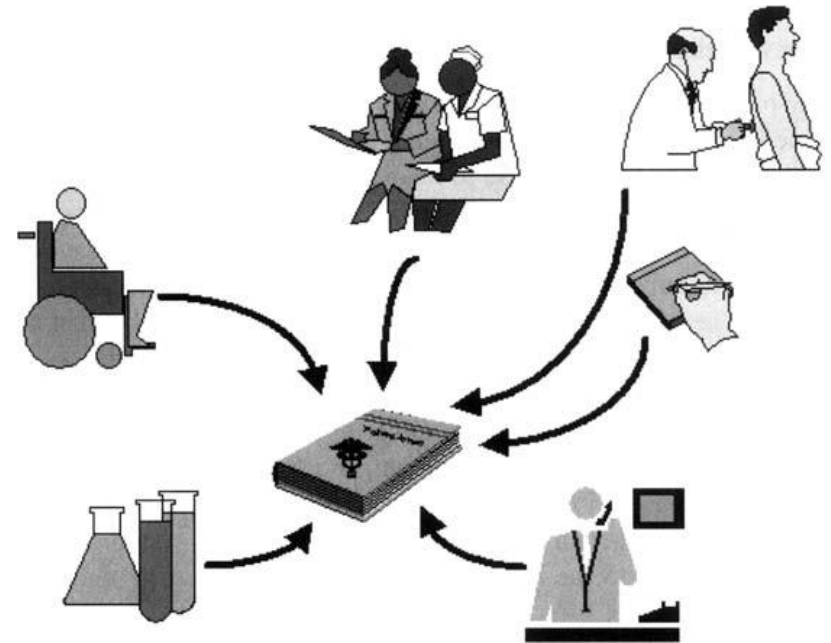


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.1, p6

Medical Record Outputs

- Challenges
 - Multiple users
 - Workflows
 - Automation processes
 - Data access
 - Security / Privacy
 - System integration

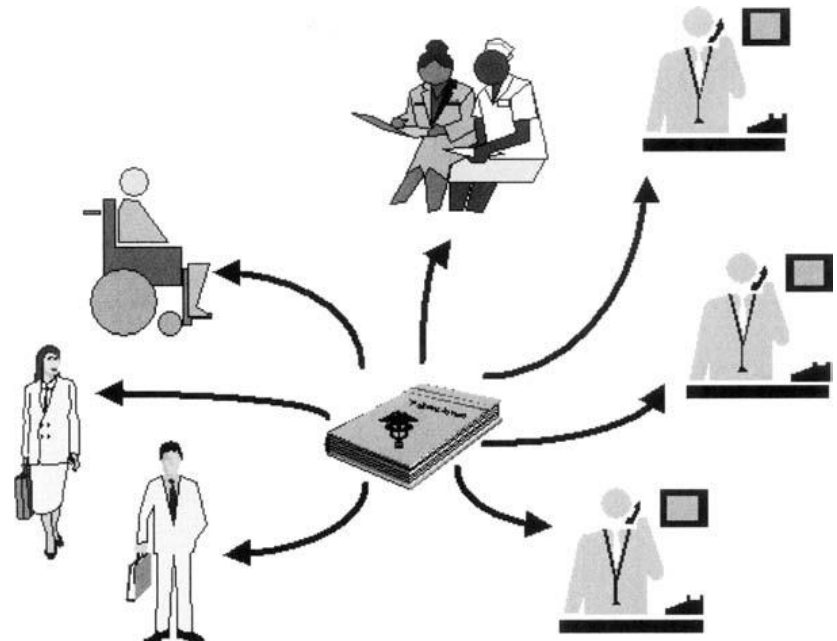


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.2, p7

Electronic Health Records

- Electronic Health Record (EHR)
 - *“A longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting”¹*
 - Includes patient demographics, progress notes, problems, medications, vital signs, medical history, immunizations, lab and radiology data, etc.
- Electronic Medical Record (EMR)

¹Healthcare Information and Management Systems Society website www.himss.org, accessed Dec/2012

EHR Sample - Patients

The screenshot displays the eCHR web application interface. The browser address bar shows the URL [Sergio Camorlinga] - Patients - My Patients. The application header includes a welcome message for Sergio Camorlinga, a sign-out link, and navigation tabs for Activity, Patients (selected), Admin, and More. Below the header, there are links for My Patients, Inpatients, Diabetes Registry, Asthma Registry, Hypertension Registry, and More. The main content area features a table of patients with columns for Name, DOB, Age, and Sex. A 'New' button and a 'Filter' input field are located above the table. The table lists 15 patients, with a '101 items' indicator at the bottom. A 'Download Patient List' link is positioned below the table. The footer of the application includes a 'More' link, a 'Feedback' link, and a status bar showing 'Internet | Protected Mode: On' and a zoom level of '100%'.

Name	DOB	Age	Sex
Pistone, George Bruce	4 Mar 1984	24y	Male
Pistone, Georgette Kathleen	26 Oct 2004	4y	Female
Pistone, Sarah Rochelle	14 Aug 2004	4y	Female
Pistone, Veronica Carol	9 Dec 1986	22y	Female
Reager, Carol Adele	11 Jun 1998	10y	Female
Reager, Denis Aaron	26 Dec 1961	47y	Male
Reager, John Benny	25 Jun 1993	15y	Male
Reager, Rose Lillie	21 Oct 1960	48y	Female
Reager, Tiffany Linda	11 Aug 2002	6y	Female
Rihn, Derrick Gary	30 Jan 2004	5y	Male
Rihn, Elizabeth Kerry	11 Sep 2007	16m	Female
Rihn, Mark Andrew	23 Jun 1982	26y	Male
Robbins, Deborah Marcella	14 Mar 1918	90y	Female
Robbins, Frank James	22 Mar 1920	88y	Male
Schultz, Alan James	23 Feb 1912	96y	Male

EHR Sample – Patient John

The screenshot displays the eCHR (Electronic Clinical Health Record) interface for Patient John Winther [Male 78y]. The browser address bar shows the URL [Sergio Camorlinga] - John Winther [Male 78y] - The interface includes a navigation bar with tabs for Activity, Patients, Admin, and a dropdown menu for John Winther [Male 78y], Donald Smith [Male 61y], and More. Below the navigation bar, there is a section for Allergies with a link to Click Here for Details. The main content area is divided into several panels: Overview, Problems, Medications, Allergies, Results, Appointments, Encounters, Diagnoses, Observations, Reminders, Plans, and More. The Overview panel is currently selected, showing a Summary, Timeline, and Calendar view. The Summary view displays a list of Problems, Active Medications, Allergies, Results, Appointments, Treatment Plans, Encounters, and Observations. The Problems list includes Diabetes Mellitus (Active), Hypertension (Active), and Hay Fever (Active). The Active Medications list includes tolbutamide 500 mg tablets, glucophage 500 mg tablets, captopril 25 mg tablets, and chlorothiazide 500 mg tablets. The Allergies list includes Leaf Mold, Cedar Pollen, and Ragweed. The Results list includes urine albumin, Lipid Panel, Creatinine, hemoglobin A1C test, urine albumin, and Lipid Panel. The Appointments list includes an Office Visit Smith on 08/12/08. The Treatment Plans and Encounters sections are currently empty. The Observations section is also empty. The interface includes a Settings button in the top right corner and a Feedback link in the bottom right corner. The browser status bar at the bottom shows Done, Internet | Protected Mode: On, and 100% zoom.

Problems

Year	Problem	Status
1972	Diabetes Mellitus	Active
1942	Hypertension	Active
1934	Hay Fever	Active

Active Medications

Date	Medication
06/07/72	tolbutamide 500 mg tablets
06/07/72	glucophage 500 mg tablets
11/07/42	captopril 25 mg tablets
11/07/42	chlorothiazide 500 mg tablets

Allergies

Year	Allergy
1934	Leaf Mold
1934	Cedar Pollen
1934	Ragweed

Results

Date	Test
Jan-1998	urine albumin
Jan-1998	Lipid Panel
Jan-1998	Creatinine
Jan-1998	hemoglobin A1C test
Jun-1997	urine albumin
Jun-1997	Lipid Panel

Appointments

Date	Appointment
08/12/08	Office Visit Smith

Treatment Plans

Date	Treatment Plan
------	----------------

Encounters

Date	Encounter
------	-----------

Observations

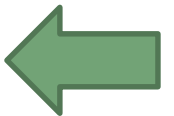
Date	Observation
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EHR Recurring Issues

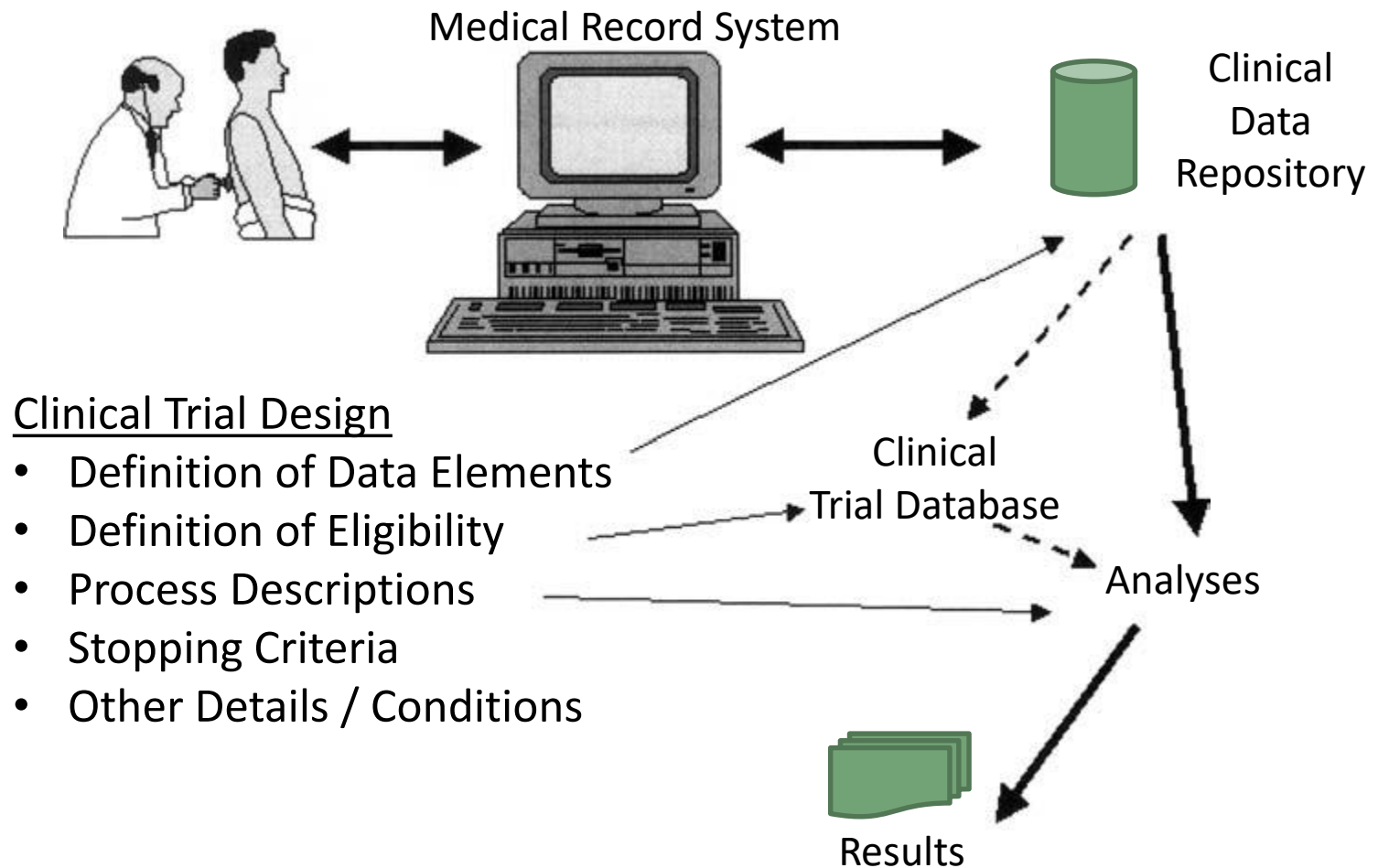
- Standards and interoperability
- Data privacy and security
- Data entry and usability
- Quality and patient safety
- Information integration

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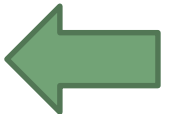


Evidence Based Medicine / Clinical Trials



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Integration with Other Information Resources

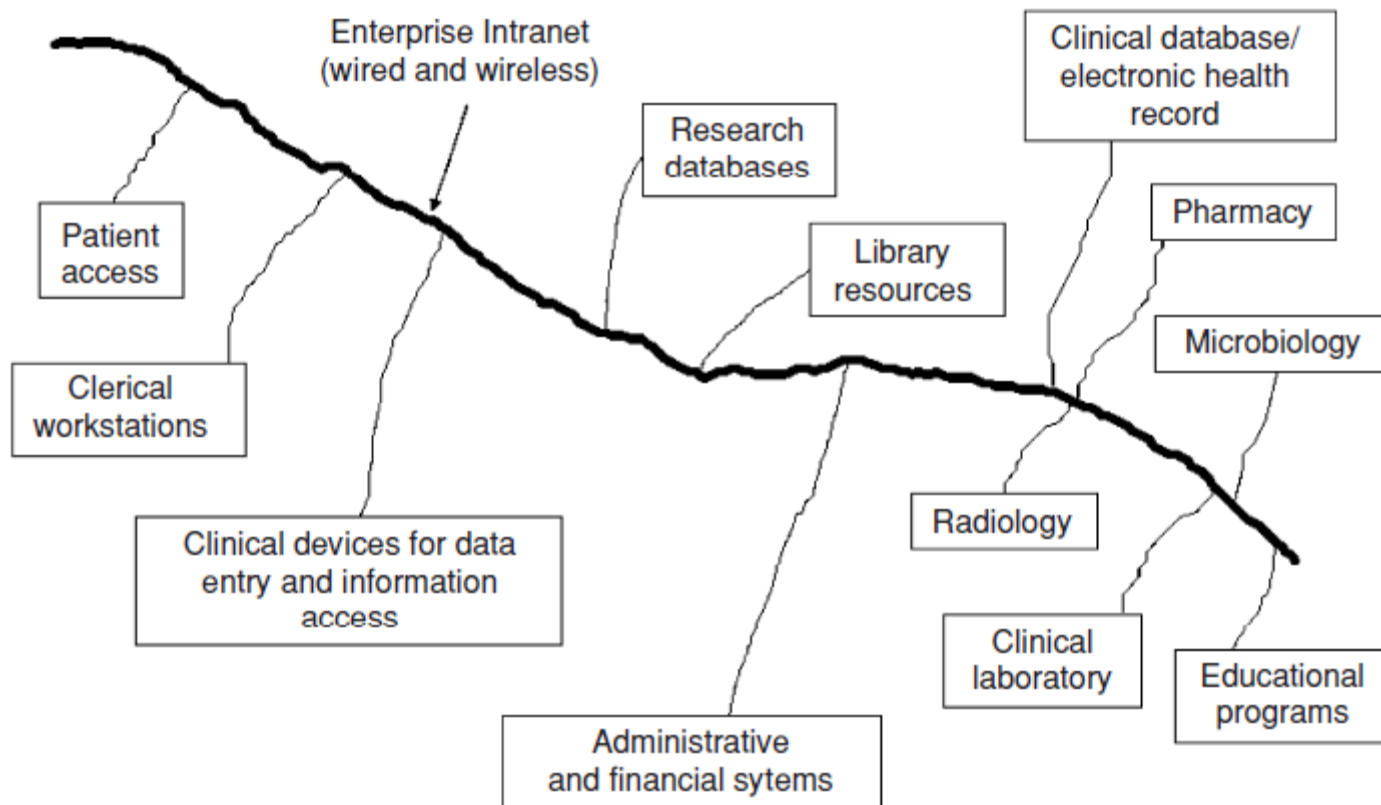


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.6, p11

Integration with Other Information Resources – MB eChart Example

- eChart Manitoba
 - Secured electronic system that connects authorized health-care providers with a summary of an individual's key health information
- Info Sources
 - Prescriptions filled – Drug Programs Info Network (DPIN)
 - Immunization – MB Immunization Monitoring System (MIMS)
 - Demographics – MB Provincial Client Registry (CR) system
 - Lab results – several private/public labs
 - Diagnostic imaging reports – MB Radiology System (RIS)
 - Encounter info – St. Boniface Hospital

Source: eChart Manitoba <http://www.connectedcare.ca/echartmanitoba/>

Integration with Other Information Resources – MB eChart Example

Goodspeed, Annabel
Clinical View with Override
Logout
eChart MANITOBA

Name: SMITH, Freda Jean
PHIN: 955500001
Age: 54 Years
Gender: Female

Summary ▼
Medications
Laboratory ▼
Pathology
Immunizations
Clinical Documents

Medications

☐ From Date 9/20/2009 ▼ To Date ▼
☐ Show Cancelled
Show Show All

☒ Last 2 ▼ Units Year ▼
Grouped By Medication ▼
Expand All Collapse All
Reset

Medications 12 Records

Date ▼	Form	Medication	SIG	Duration	Prescriber ▼	End Date	Status ▼	Facility ▼	Dispense	Refill	Source ▼
[-] FUROSEMIDE (2)											
7/19/2011	Tablet	APO FUROSEMI...		30 D	SCOT BARFIELD		Unspecified	CANADA S...	30		CANMB-MB...
3/8/2011	Tablet	APO FUROSEMI...		30 D	SCOT BARFIELD		Unspecified	CANADA S...	30		CANMB-MB...
[+] INSULIN GLARGINE (1)											
[+] INSULIN LISPRO (1)											
[+] OTHER PRODUCTS (2)											
[-] RABEPRAZOLE (1)											
5/8/2011	Tablet ...	RAN-RABEPRAZ...		30 D	TAMEKA MONT...		Unspecified	CANADA S...	30		CANMB-MB...
[-] VALSARTAN (2)											
7/17/2011	Tablet	DIOVAN 80MG TA...		30 D	SCOT BARFIELD		Unspecified	CANADA S...	30		CANMB-MB...
3/6/2011	Tablet	DIOVAN 80MG TA...		30 D	SCOT BARFIELD		Unspecified	CANADA S...	30		CANMB-MB...
8/3/2011	00870...	RATIO-DOCUSA...		10 D	SILVIA KINTNER		Unspecified	CANADA S...	30		CANMB-MB...
6/15/2011	02042...	OS-CAL 250 TAB ...		30 D	SILVIA KINTNER		Unspecified	LYNN LAK...	100		CANMB-MB...
5/28/2011	02237...	ASPIRIN DAILY L...		50 D	SILVIA KINTNER		Unspecified	STONEWA...	50		CANMB-MB...

Figure source: © WRHA & MB eHealth eChart <http://www.connectedcare.ca/echartmanitoba/>

Integration with Other Information Resources – MB eChart Example

Goodspeed, Annabel Clinical View with Override Logout eChart MANITOBA

Name: SMITH, Freda Jean PHIN: 955500001 Age: 54 Years Gender: Female

Summary Medications Laboratory Pathology Immunizations Clinical Documents

Labs ☐ From Date 9/20/2010 To Date
☒ Last 1 Units Year

Labs 19 Records

Collected	Resulted	Report	Status	Lab Type	Test	Specimen	Ordered By	Facility	Source
7/15/2011 9:30 AM	7/16/2011 9:34 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		MATILDA MCNI...	Health Scie...	DS-DSM-LI...
7/15/2011 8:30 AM	7/17/2011 9:25 AM		Final	MICROBIOLOGY	Midstream Urine: Culture		FERNANDA OR...	St. Boniface...	DS-DSM-LI...
7/15/2011 8:20 AM	7/16/2011 10:30 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
7/15/2011 8:01 AM	7/15/2011 11:20 AM		Final	HEMATOLOGY	Complete Blood Count		CURTIS FROG...	Health Scie...	DS-DSM-LI...
7/7/2011 9:30 AM	7/8/2011 9:34 AM		Final	CHEMISTRY	Glycosylated Hemoglobin		JONI KORMAN	Health Scie...	DS-DSM-LI...
6/28/2011 10:20 AM	7/1/2011 9:52 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
6/23/2011 8:30 AM	6/25/2011 9:53 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
6/15/2011 8:40 AM	6/18/2011 9:52 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
6/7/2011 10:10 AM	6/9/2011 9:53 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
5/28/2011 9:10 AM	6/1/2011 9:34 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		MATILDA MCNI...	Health Scie...	DS-DSM-LI...
5/17/2011 10:15 AM	5/19/2011 10:35 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
4/17/2011 9:00 AM	4/18/2011 9:52 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		SUSANNAH SP...	Health Scie...	DS-DSM-LI...
4/10/2011 10:05 AM	4/13/2011 10:35 AM		Corrected	CHEMISTRY	Glycosylated Hemoglobin		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
4/10/2011 10:05 AM	4/13/2011 10:35 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
3/25/2011 9:05 AM	3/27/2011 9:52 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
2/24/2011 8:00 AM	2/27/2011 9:52 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
12/30/2010 1:30 PM	1/1/2011 9:30 AM		Final	CHEMISTRY	Glycosylated Hemoglobin		JONI KORMAN	Health Scie...	DS-DSM-LI...
12/30/2010 1:00 PM	1/1/2011 9:30 AM		Final	CHEMISTRY	PLASMA/SERUM CHEMI...		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...
10/15/2010 9:40 AM	10/16/2010 9:50 AM		Final	CHEMISTRY	Glycosylated Hemoglobin		BRITNI DAMPE...	Health Scie...	DS-DSM-LI...

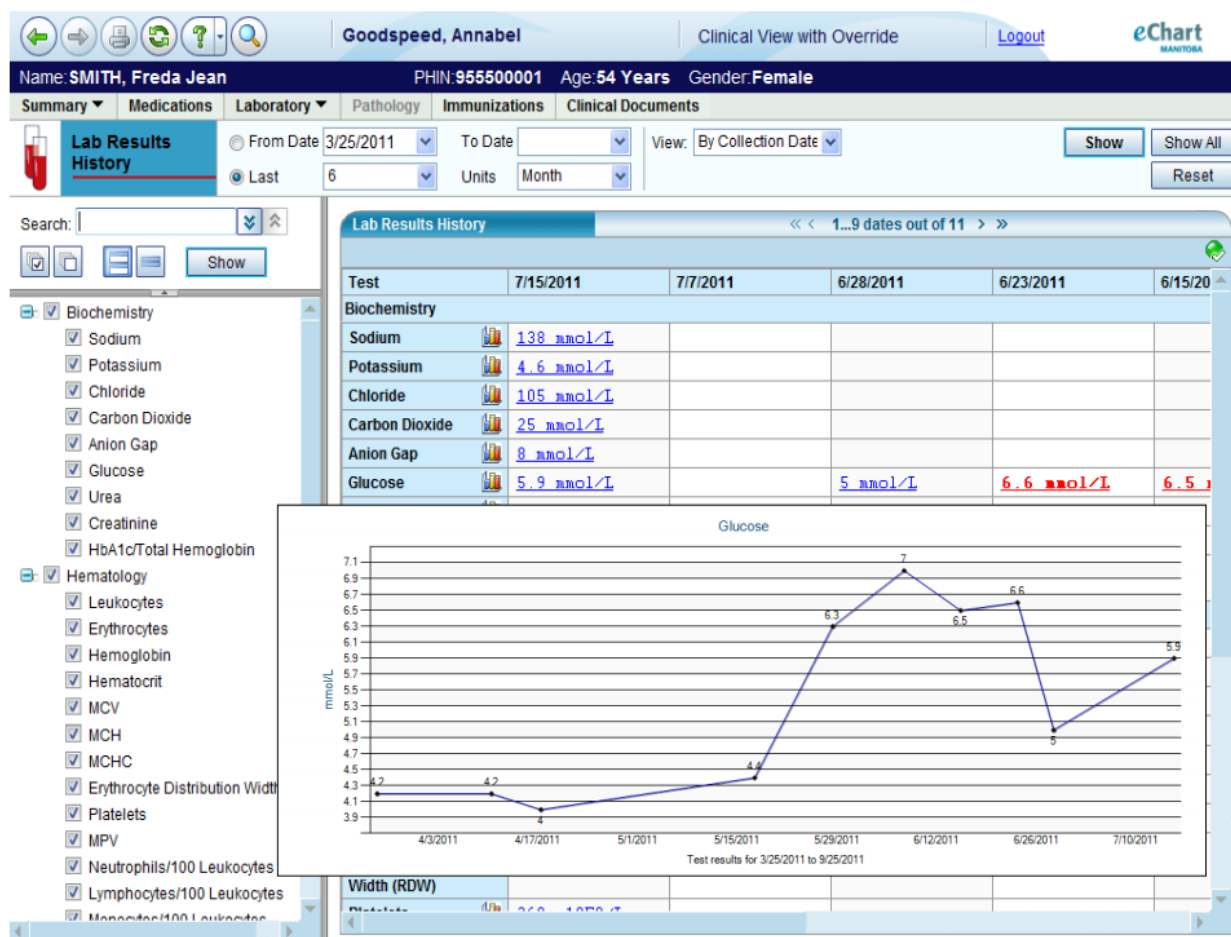
Integration with Other Information Resources – MB eChart Example

The screenshot displays the MB eChart interface for patient Annabel Goodspeed. The top navigation bar includes icons for navigation and a search function. The patient's name, PHIN, age, and gender are shown. Below this, a tabbed interface allows switching between Summary, Medications, Laboratory, Pathology, Immunizations, and Clinical Documents. The 'Lab Results' tab is active, showing a summary of the lab type, collection date, ordered by, facility, specimen, and status. A table below lists 7 records of lab results under the 'Biochemistry' category. The table columns are Test, Result, Range, H/L, Status, Facility, and Remarks. The 'Creatinine' result is highlighted in red, indicating a high value.

	Test	Result	Range	H/L	Status	Facility	Remarks
<input type="checkbox"/>	Sodium	138 mmol/L	135-147		Final	Health Sciences Cen...	
<input type="checkbox"/>	Potassium	4.6 mmol/L	3.5-5		Final	Health Sciences Cen...	
<input type="checkbox"/>	Chloride	105 mmol/L	97-106		Final	Health Sciences Cen...	
<input type="checkbox"/>	Carbon Dioxide	25 mmol/L	22-30		Final	Health Sciences Cen...	
<input type="checkbox"/>	Anion Gap	8 mmol/L	8-16		Final	Health Sciences Cen...	
<input type="checkbox"/>	Urea	6.9 mmol/L	2.8-7.1		Final	Health Sciences Cen...	
<input type="checkbox"/>	Creatinine	100 umol/L	35-97	High	Final	Health Sciences Cen...	

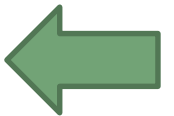
Figure source: © WRHA & MB eHealth eChart <http://www.connectedcare.ca/echartmanitoba/>

Integration with Other Information Resources – MB eChart Example



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 - Public Health Networks



Public Health National Network

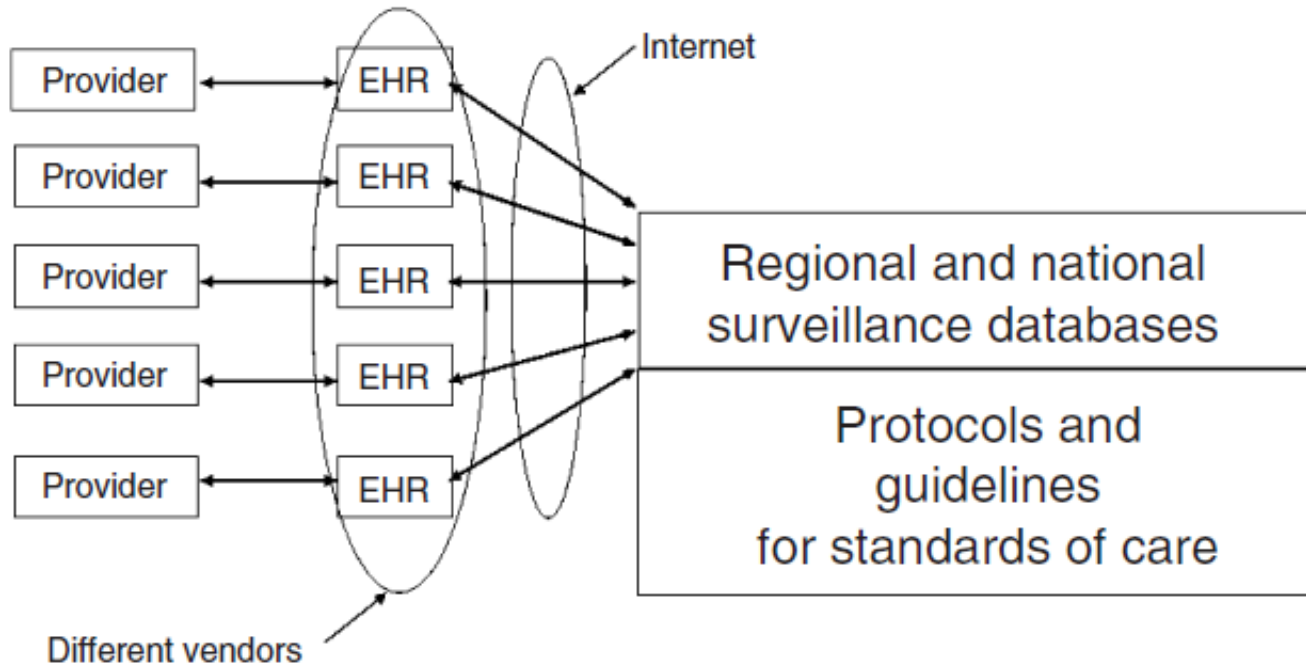


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.7, p14

Public Health National Network

- Issues
 - Data encryption
 - Privacy government policies
 - USA - Health Insurance Portability and Accountability Act (HIPAA)
 - MB - Personal Health Information Act (PHIA)
 - Standards for data transmission and sharing
 - E.g. Health Level 7 standard
 - Standards for data definitions
 - E.g. International Classification of Diseases (ICD 9, ICD 10)
 - Quality control
 - Regional & National Surveillance Databases

Public Health Agency of Canada – Surveillance Sample

- Canadian Chronic Disease Surveillance System
- Canadian Paediatric Surveillance Program
- Chronic Disease Infobase
- FluWatch
- HIV/AIDS Surveillance
- Tuberculosis Prevention and Control Surveillance
- West Nile Virus Surveillance

Source: Public Health Agency of Canada <http://www.phac-aspc.gc.ca/surveillance-eng.php>

Why Is EHRs' Expansion & Integration Important?

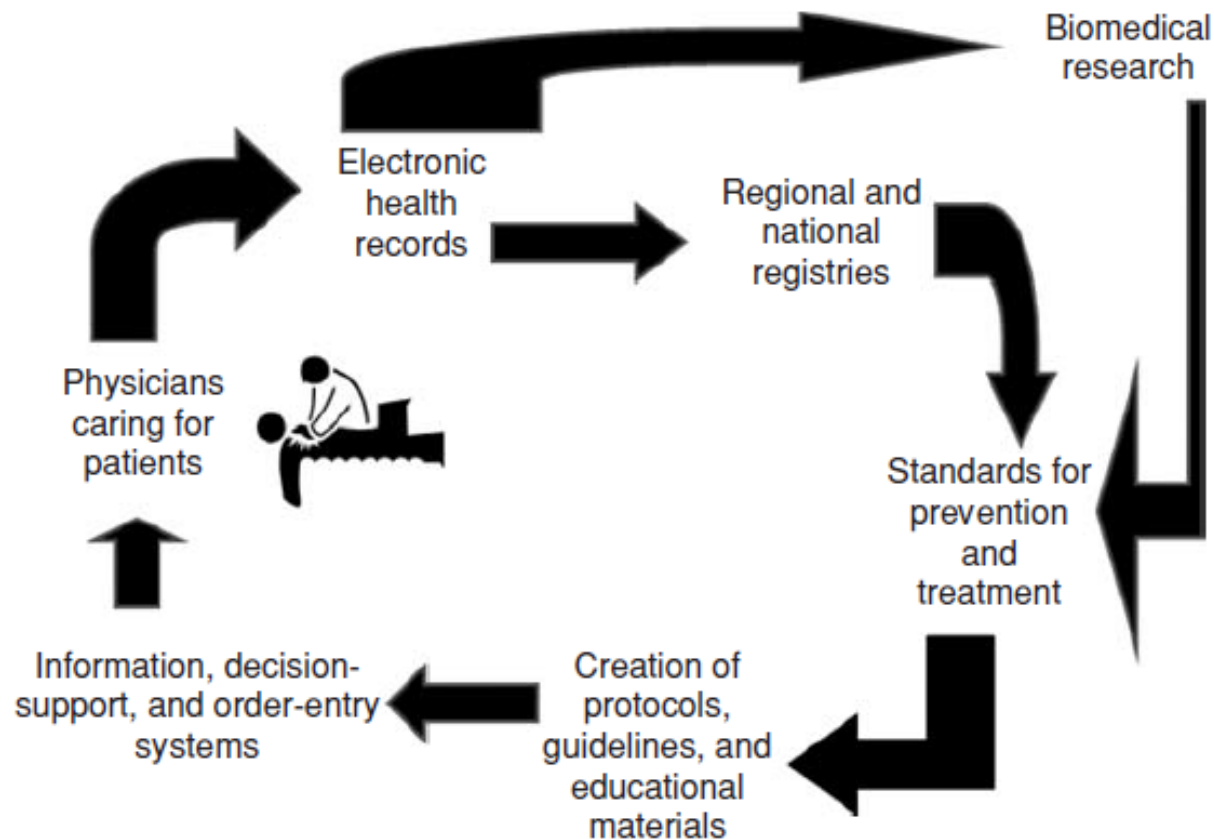


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.10, p18

Cycle of Improvement

- The more data and information collected leads to improved areas of research
- Accurate data supports better analysis
- Improves methods, processes and outcomes
- Improves available information and increases knowledge

Why Is EHRs' Expansion & Integration Important?

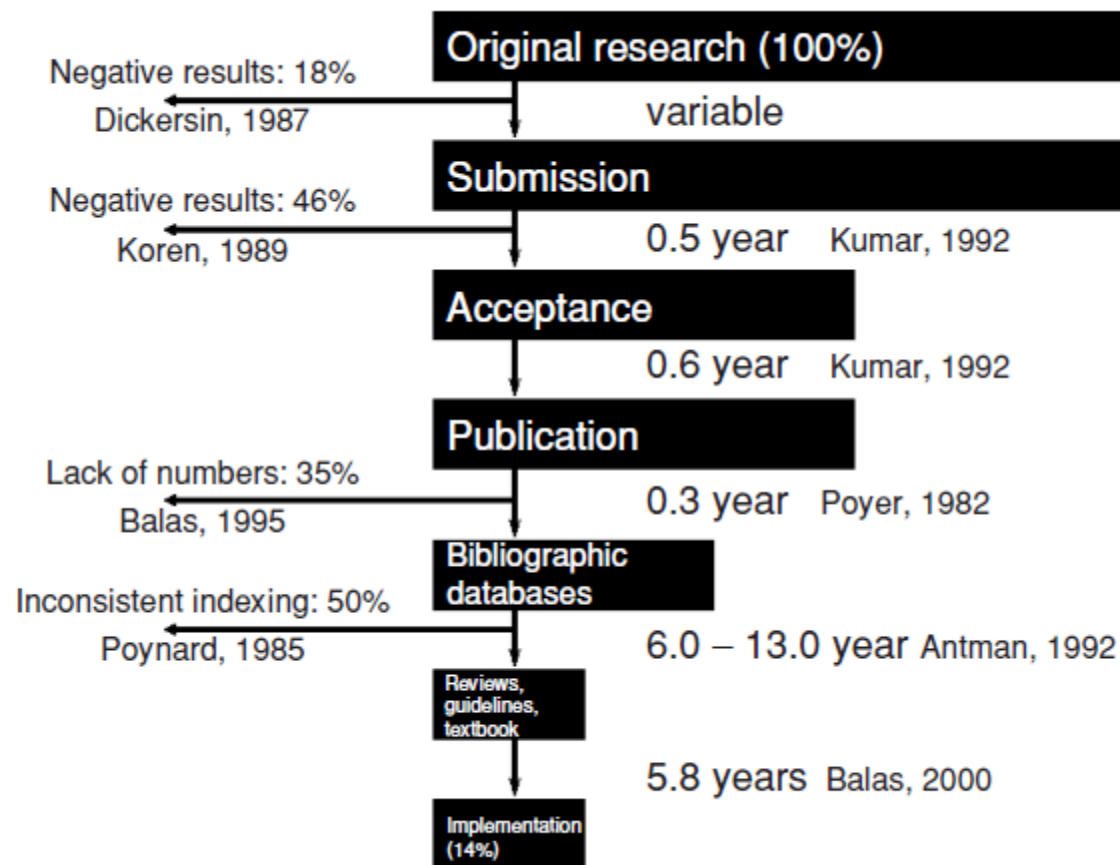


Figure source: Shortliffe et al, 'Biomedical Informatics', 3rd Edition, Figure 1.20, p33

Integrating HI and Medical Practice

- Information management is fundamental to medical practice
 - Factors affecting rate of adoption of HI into medical practice
 - Advances in hardware & software applications
 - Professional awareness of HI and medical needs
 - Healthcare costs containment
 - Information management needs
- ➔ There is a need to demonstrate financial and clinical value for HI systems

Three Questions (Recap)

- How is the course organized and managed?
- What is Health Informatics about?
- Why are Electronic Health Records important?

Term Paper – Step 1 – Due Tues 14th

- Find a partner to team up with
- Select a topic to present
- Develop your plan (work distribution, deadlines)
- Select your date you want to present
 - Preliminary submission – March 3rd
 - Presentations March 10th – 31st
 - 2-3 presentations per class