

Course Description:

The course will cover fundamental theories and principles of health informatics including: an overview of the health care system, computer systems (hardware & software), communications and information technologies, data types, data acquisition, data standards, data quality and data uses and users. The course will introduce students to the wide range of health informatics applications and uses of computers in health care with an emphasis on various clinical support and clinical information systems and the electronic health record and its achievability. This course will also develop an appreciation of how data are collected, processed and used in healthcare settings and the role that data play in decision making (including an understanding of the complexities involved in transforming data into information and knowledge).

Course Goal:

To become familiar with the field and practice of health informatics and the range of activities it encompasses. To understand how data are collected, processed and used in health care settings. To appreciate the complexities involved in transforming data into information and knowledge. To be familiar with various clinical support and clinical information systems. To understand how decision support systems are modeled and used within the health care system to assist in decision making in an administrative or clinical setting.

Major Objectives:

Upon the completion of the course, the students should:

1. Have a general understanding of the health care system in Canada; its governance, administration, personnel, and financing.
2. Have a general level of computer literacy and understand the terminology used in describing computer hardware, software and networks.
3. Have a general level of information literacy and understand how to assess and evaluate information needs, information sources, and information quality.
4. Appreciate the number of different types of data that are collected and measured within the health care system and the complexity of transforming data into information and knowledge.
5. Have an understanding of how health data and clinical information are collected, recorded and analyzed in an electronic format, including text, biosignals and images, structured and unstructured data.
6. Appreciate the different health system uses and users of health data and information within the health care system; differentiate between primary (care, diagnosis and therapy) and secondary uses (disease surveillance, research, policy, management and decision making).
7. Understand the need for a variety of data standards for optimum utilization of data across disparate systems, i.e., data technology standards, data terminology standards, data transmission standards, data privacy and security standards.
8. Identify and describe the general characteristics of clinical support and clinical information systems.
9. Understand and critique the use of decision support systems (e.g., mobile health applications, clinical guides) in various health care settings.
10. Discuss the status and implications of applying information and communication technology in health care delivery and management, in particular how the EHR, telehealth, public health informatics, consumer health informatics and bioinformatics will shape the future health system.
11. Be aware of new and emerging technologies and their potential impact in health care.

Lectures/tutorials will be supplemented by guest lecturers who will share their experiences and knowledge, and demonstrations of various digital applications. An interactive class environment will be encouraged and occasionally in-class exercises will be conducted and based on material from the suggested readings.

Course outline, assignments and presentations will be placed on OWL (<https://owl.uwo.ca/portal>) which you can access using your UWO user name and password. Links to web sites and additional reading material that pertain to each week's lesson will also be posted there. You are also expected to actively take part in discussions in the Forum.

Assignments and Grading

The final grade will be based on marks obtained in five assignments and on participation in class and in the on-line discussion forum.

Assignment #1 – Definition of Health Informatics 15%

Explore the definition of health informatics/medical informatics and how the field intersects with health information management and health information science.

Assignment #2 – What is ‘Big Data’ and how will it affect Health Care 20%

Data analytics and the use of high volumes of data are having an impact in medicine as well as business, purchasing habits, etc. What are the implications of this ‘big data’ movement for health care service delivery and improvement, clinical diagnostics and treatments? What factors need to be in place for optimal use of data in health care (e.g., fully electronic, interoperable systems; data analysts; high quality data, privacy and security of data). How can data be used to improve health care delivery and health status?

Assignment #3 – The Impact of Technology 20%

An opportunity to practice communication skills (interview and presentation) based on an interview with someone working in health care and an assessment of how they use technology and how it has changed or shaped their job.

Assignment #4 - Critique of a Selected Decision Support System or the Development of a Decision Support Tool 25%

You may select an existing decision support tool/system or mobile health application to critique or alternatively submit a proposal and/or prototype of a decision support tool for clinical, administrative or consumer use.

Assignment #5 - Emerging Trends in Technology 10%

What do you see as the emerging trends in technology over the next 5 years; what will have the greatest impact on health care. Essays will be expected to show evidence of independent research, insight and foresight, and accompanied by a reference list.

Participation Mark – Discussion Board 10%

Topics for discussion will be posted weekly on the discussion board and students will be marked on the basis of both quantitative and qualitative participation in the forum and in class discussions.

Readings:

There is no required text for the course. Several good books on health informatics are available but deal either with the American health care system or approach the subject with a medical/clinical emphasis. I have listed readings from two books in the outline, the textbook by Enrico Coiera, "Guide to Health Informatics" Third edition (2015) and the text of "Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Fourth Edition " by Edward H. Shortliffe and James J. Cimino (2014). There are a number of excellent health informatics journals, many available online, and journal articles that supplement the course notes will be posted to the OWL course site for download. A variety of sites related to the field of health informatics and health information management are also listed below.

Biomedical Informatics: Computer Applications in Health Care and Biomedicine (BMI)

Fourth Edition

Edward H. Shortliffe & James J. Cimino

Springer, 2014

ISBN

(indicated as *BMI* in reading list)

An excellent reference text on (bio)medical informatics edited by one of the pioneers in the field of informatics in US health care system (Shortliffe). Very good overview of the field and some in depth consideration of specific components of informatics research and development (imaging, natural language processing, decision support, bioinformatics).

Note: A free e-copy of the Shortliffe text is available to students for download through Western Libraries through the library portal and using your Western account.

1- <http://guides.lib.uwo.ca/az.php?a=s>

2- Find "Springerlink Archive - computer science" and click on it .

3- Once in Springerlink, click on Springerlink logo on top left to remove existing search filters.

4- Search for the book title and download it .

Alternatively here is a direct link for the book :

<https://link.springer.com/book/10.1007%2F978-1-4471-4474-8>

The Guide to Health Informatics (HI)

Third Edition

Enrico Coeira

CRC Press, 2015

(indicated as *HI* in reading list)

Another good, authoritative text that covers most of the field, but again with a heavy emphasis on 'medical' informatics. Good overview of the field, clinical implications, etc.

Informatics is now considered a necessary competency for nursing and pharmacy students. The national organizations in Canada, CASN – the Canadian Association of Nurses and AFPC – the Association of Faculties of Pharmacy of Canada have developed health informatics competencies and resource guides. The online 'book' for pharmacy students is particularly helpful and is accessed through Moodle via a free registration.

Informatics for Pharmacy Students - <http://afpc-education.info/moodle/>

A new book has just been published (August 2018) & available through Canadian Scholar's Press:

An Introduction to Health Informatics: A Canadian Perspective

Christo El Morr

<https://www.canadianscholars.ca/books/introduction-to-health-informatics>

Journals

See general resources in the Research Guides through Western's Taylor Library – under Undergraduate Medical Education → <http://guides.lib.uwo.ca/undergraduatemedicaleducation>
AND

Health Information Sciences → <http://guides.lib.uwo.ca/healthinformationscience/>

You may also find the resources under Clinical Outreach useful as well
<http://guides.lib.uwo.ca/clinicaloutreach>

BMC Medical Informatics and Decision Making
<http://www.biomedcentral.com/bmcmmedinformdecismak>

Health Care Innovation
<https://www.hcinnovationgroup.com/>

JAMIA (Journal of the American Medical Informatics Association)
<https://academic.oup.com/jamia>

Journal of Medical Internet Research (JMIR)
<http://www.jmir.org/>

Modern Healthcare
<http://www.modernhealthcare.com/>

Canadian Healthcare Technology
<http://www.canhealth.com/>

Electronic Healthcare
<http://www.longwoods.com/articles/electronichealthcare/>

Health Information Management and Communications Canada
<http://www.healthcareimc.com/>

Canadian Organizations

Centre for Global eHealth Innovation
<http://www.ehealthinnovation.org/>

CHI (Canada Health Infoway)
<http://www.infoway-inforoute.ca/en/>

CHIMA (Canadian Health Information Management Association)
<http://www.echima.ca>

Digital Health Canada (Canada's Health Informatics Association; formerly COACH)
<https://digitalhealthcanada.com/>

CIHI (Canadian Institute for Health Information)
<http://www.cihi.ca>

Ontario Telemedicine Network
<https://otn.ca/>

EHealth Ontario
<https://www.ehealthontario.on.ca/en/>

Connecting South West Ontario
<https://www.ehealthontario.on.ca/en/regional-partners/south-west-ontario>

American Organizations

AHIMA (The American Health Information Management Association)
<http://www.ahima.org>

AMIA (American Medical Informatics Association)
<http://www.amia.org/>

American Telemedicine Association
<http://www.americantelemed.org>

HIMSS (Healthcare Information and Management Systems Society)
<http://www.himss.org/ASP/index.asp>

The Office of the National Coordinator for Health Information Technology (ONC)
<https://www.healthit.gov/> and <https://www.healthit.gov/topic/about-onc>

International Organizations

IMIA (The International Medical Informatics Association)
<http://imia-medinfo.org/wp/>

IFHIMA (The International Federation of Health Information Management Associations)
<http://ifhima.org/>

Blogs

Life as a Healthcare CIO - <http://geekdoctor.blogspot.com/> [John Halamka]

The Informatics Professor - <http://informaticsprofessor.blogspot.com/> [William Hersh]

Twitter

AMIA@amiainformatics

#WhyInformatics

MHI 4100F/9100F – HEALTH INFORMATICS

Course Outline

Weekly two hour lecture – Wednesday, 8:30 – 10:30 am, MSB M190

Weekly one to two hour lab/tutorial session – Friday, 9:30 – 11:30 am, MSB M190

Course Instructor: Candace Gibson, PhD, CHIM

Date	Topic	Readings	Web Sites
Health Informatics – Introduction & Overview			
Week 1 Sept 11	Introduction & Overview of Course <ul style="list-style-type: none"> ◆ Goals, Objectives, Introductions, Resources Health Informatics <ul style="list-style-type: none"> ◆ Definitions, Examples; Overview 	<i>HI</i> Introduction to health informatics – the systems science of healthcare https://coiera.com/textbook-resources/overview-of-informatics-topics/ <i>BMI</i> Chapter 1: Biomedical Informatics: The Science and the Pragmatics <i>Additional Readings:</i> Eysenbach, G. JMIR 3: e20, 2001. What is e-health? Hersh, W. BMC Medical Informatics and Decision Making 9: 24, 2009. A stimulus to define informatics and health information technology.	CIHI – http://www.cihi.ca Canada Health Infoway - http://www.infoway-inforoute.ca/en/ AMIA – http://www.amia.org See statement on definition of “biomedical informatics” - http://www.amia.org/about-amia/science-informatics IMIA - http://imia-medinfo.org/wp/ And IMIA Year Book - https://imia.schattauer.de/contents/archive.html Canadian Healthcare Technology - http://www.canhealth.com/ CHIMA - http://www.echima.ca Digital Health Canada – https://digitalhealthcanada.com NIHI – http://www.nihi.ca

Sept 13	Health Informatics/Health Information Science: A Personal View	Guest - TBD	CHIMA - http://www.echima.ca Digital Health Canada – https://digitalhealthcanada.com NIHI – http://www.nihi.ca
Foundations of Health Informatics			
Week 2 Sept 18	Context - Canada's Health Care System A review and general overview of Canada's health care system.	Health Canada - http://www.hc-sc.gc.ca/index-eng.php <i>BMI</i> Ch. 12 – Electronic Health Record Systems Ch. 14 – Management of Information in Healthcare Organizations	Unleashing Innovation – Executive Summary; Full Report - http://www.hc-sc.gc.ca/hcs-sss/innovation/index-eng.php MOHLTC, Ontario - http://www.health.gov.on.ca/en/ CIHI – http://www.cihi.ca
Sept 20	Computer Systems/Computer Literacy <ul style="list-style-type: none"> ◆ Computing Hardware <ul style="list-style-type: none"> ○ Input / Output / Mobile Devices ◆ Computing Software <ul style="list-style-type: none"> ○ Operating systems / Applications ◆ Networks <ul style="list-style-type: none"> ○ Web 2.0, Medicine 2.0, Health 2.0 ○ Social networks ◆ Adoption of New Technologies <ul style="list-style-type: none"> ○ Change Management 	<i>HI</i> ..Ch. 18 – Communication Systems Basics ..Ch. 19 – Information and Communication Networks Ch. 10 – The Electronic Health Record Ch. 11 - Designing and evaluating information and communication systems <i>BMI</i> Ch 5 – Computer Architectures for Health Care and Biomedicine Ch. 6 – Software Engineering for Health Care and Biomedicine Ch 12 – Electronic Health Record Systems Ch 13 – Health Information Infrastructure Ch. 14 – Management of Information in Health Care Organizations	Canada Health Infoway - https://www.infoway-inforoute.ca/en/ Change Management Toolkit - https://www.infoway-inforoute.ca/en/resource-centre/toolkits/change-management
Week 3 Sept 25	Information/Communication Systems <ul style="list-style-type: none"> ◆ Information Literacy 	<i>HI</i> Part 2 – Informatics skills	

	<p>Consumer Health Informatics</p> <ul style="list-style-type: none"> ◆ Health Information Needs and Resources ◆ Personal Health Records ◆ The Quantified Self <p>Evaluating Health Information Resources</p>	<p><i>HI</i> Ch. 32 – Consumer health informatics</p> <p><i>BMI</i> Ch. 17 – Consumer Health Informatics and Personal Health Records Ch. 12 – Evaluation of Biomedical and Health Information Resources</p>	
Sept 27	<p>Information Searching Skills</p> <ul style="list-style-type: none"> ◆ Clinical Queries ◆ Research Questions ◆ Mobile Health Applications and General Health Information Resources 	<p><i>Session will be held at Weldon Library - TBC</i></p> <p><i>HI</i> Part 2 – Informatics skills Ch. 4 – Communicating Ch. 5 – Structuring Ch. 6 - Questioning Ch. 7 - Searching Ch. 8 – Making Decisions</p> <p><i>BMI</i> Ch. 21 – Information Retrieval and Digital Libraries</p>	UWO Library Databases by Subject – see Under Health Information Science
Assignment 1 Due – by Friday, September 27 at 5 p.m.			
Data in Health Care			
Week 4 Oct 2	<p>Health Information Framework – Why we collect data</p> <ul style="list-style-type: none"> ◆ Primary and Secondary Uses of Data – Health System Use of Data ◆ Big Data in Health Care <p>Types of Data</p> <ul style="list-style-type: none"> ◆ Text, Numeric, Images, Biosignals ◆ Structured versus Unstructured Data <p>Data Collection & Measurement</p> <ul style="list-style-type: none"> ◆ Data Quality & Data Integrity 	<p><i>BMI</i> Ch.2 – Biomedical Data: Their Acquisition, Storage, and Use</p> <p>Ch. 11 – Evaluation of Biomedical and Health Information Resources</p>	<p>CIHI – http://www.cihi.ca (see section under “Data Collection”)</p> <p>eHealth Ontario - http://www.ehealthontario.on.ca/en/</p>

Oct 4	Databases in Health Care and the challenges of 'big data' in health care <ul style="list-style-type: none"> ◆ A look at some of the current databases in use in the Canadian health care system (at regional, provincial, and national level). 	Guest - TBD	
Week 6 Oct 9	Data Standards <ul style="list-style-type: none"> ◆ Technological ◆ Data (Coding & Classification) ◆ Security, Privacy & Confidentiality The Standard Setting Process	<i>HI</i> Part 6 - Language, coding and classification Ch. 22 - Terms, codes and classification Ch. 23 - Healthcare terminologies and classification systems <i>BMI</i> Ch. 2 – Biomedical Data: Their Acquisition, Storage, and Use Ch. 7 – Standards in Biomedical Informatics	CIHI – http://www.cihi.ca (see section under “Standards”) MOHLTC – OHISC - http://www.health.gov.on.ca/en/public/programs/ohisc/endorsed-standards.aspx Canada Health Infoway - https://www.infoway-inforoute.ca/en/ (see Health Information Standards - https://www.infoway-inforoute.ca/en/solutions/clinical-interoperability/health-information-standards)
Oct 11	Data Standards (cont'd)		
Assignment 2 Due – Friday, October 18, 5 p.m.			
Applications of Technology in Health Care			
Week 7 Oct 16	Clinical/Research Information Systems <ul style="list-style-type: none"> ◆ Clinical Support Systems <ul style="list-style-type: none"> ○ Biosignal and Image Analysis 	<i>BMI</i> Ch. 9 – Biomedical Imaging Informatics Ch. 20 – Imaging Systems in Radiology Ch. 19 – Patient Monitoring Systems	Southwest Ontario Digital Imaging Project - http://swodin.com/
Oct 18	Clinical Information Systems <ul style="list-style-type: none"> ◆ Clinical Support Systems ◆ Clinical and Administrative Departmental Systems 	<i>HI</i> Ch. 28 – Patient monitoring and control <i>BMI</i>	Canada Health Infoway - https://www.infoway-inforoute.ca/en/ eHealth Ontario - http://www.ehealthontario.on.ca/e

		Ch. 14 – Management of Information in Health Care Organizations Ch. 19 – Patient Monitoring Systems	n/ and http://www.ehealthontario.on.ca/en/initiatives/view/diagnostic-imaging-program
Week 8 Oct 23	Health Information Systems Electronic Health Record Background & Overview	<i>HI</i> Part 3 - Information systems in healthcare Ch. 9 - Information management systems Ch.10 - The electronic health record Ch. 11- Designing and evaluating information and communication systems Ch. 12 - Implementation Ch. 13 - Information system safety Ch. 14 - Information economics <i>BMI</i> Ch. 12 – Electronic Health Record Systems Ch. 13 – Health Information Infrastructure Ch. 14 – Management of Information in Health Care Organizations	Canada Health Infoway - http://www.infoway-inforoute.ca/ eHealth Ontario - http://www.ehealthontario.on.ca/en/ Canadian EMR – http://www.canadianemr.ca
Oct 25	cSWO Regional HIS	Guest Speaker: TBC Ted Alexander VP, eHealth Centre of Excellence	
Week 9 Nov 4 - 8	Reading Week		
Week 10 Nov 13 & Nov 15	Student Presentations – The Impact of Technology		
Week 11 Nov 20	Decision Support Systems ♦ Models & Systems ♦ Supporting Evidence-Based Practice & Management Clinical and Administrative Support Systems	<i>HI</i> Part 7 - Clinical decision support and analytics Ch. 25 - Clinical decision support systems Ch. 26 - Computational reasoning methods Ch. 27 - Model building for decision support, data analysis and scientific discovery	

		<i>BMI</i> Ch. 3 – Biomedical Decision Making: Probabilistic Clinical Reasoning Ch. 22 – Clinical Decision Support Systems	
Nov 22	Decision Support – Decision Making	Guest Speaker - TBC Dr. Dan Lizotte Assistant Professor, Computer Science/Epidemiology & Biostatistics	
Week 12 Nov 27	Decision Support – Mobile Apps ♦ Mobile Applications – Evaluation Telehealth ♦ Definitions, Examples	<i>HI</i> Ch. 21 - Telehealth and mobile health <i>BMI</i> Ch. 18 – Telehealth	http://www.otn.ca Some additional links there for telehealth resources.
Nov 29	Bioinformatics ♦ The application of computing technologies to biological/biochemical problems.	Guest Speaker: TBC <i>HI</i> Ch. 30 – Bioinformatics Ch. 31 - Clinical bioinformatics and personalized medicine <i>BMI</i> Ch. 24 – Bioinformatics	
Assignment 4 Due – Wednesday, Dec 4 by 5 p.m.			
Week 13 Dec 4	The Future of Health Technology	<i>BMI</i> Ch. 28 – The Future of Informatics in Biomedicine	
Final Assignment 5 Due – Friday, December 6 by 5 p.m.			