HIPAA and Network Security Curriculum
This curriculum consists of an overview/syllabus and 11 lesson plans

Week 9

Developed by
NORTH SEATTLE COMMUNITY COLLEGE
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Seattle CENTRAL Community College
NORTH Seattle Community College
SOUTH Seattle Community College
SVI Seattle Vocational Institute

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Health informatics or medical informatics is the intersection of information science, medicine and health care. It deals with the resources, devices and methods required to optimize the acquisition, storage, retrieval and use of information in health and biomedicine. Health informatics tools include not only computers but also clinical guidelines, formal medical terminologies, and information and communication systems.

Information science (also information management, information studies) is an interdisciplinary science primarily concerned with the collection, classification, manipulation, storage, retrieval and dissemination of information. Information science studies the application and usage of knowledge in organizations, and the interaction between people, organizations and information systems. It is often, though not exclusively, studied as a branch of computer science or informatics and is closely related to the cognitive and social sciences.

Information science focuses on understanding problems from the perspective of the stakeholders involved and then applying information (and other) technology as needed. In other words, it tackles the problem first rather than technology first. Within information science, attention has been given in recent years to human–computer interaction, groupware, the semantic web, value sensitive design, iterative design processes and to the ways people generate, use and find information.

Information science should not be confused with information theory, the study of a particular mathematical concept of information, or with library science, a field related to libraries which uses some of the principles of information science.

Definitions of information science

Some authors treat informatics as a synonym for information science. Because of the rapidly evolving, interdisciplinary nature of informatics, a precise meaning of the term "informatics" is presently difficult to pin down. Regional differences and international terminology complicate the problem. Some people note that much of what is called "Informatics" today was once called "Information Science" at least in fields such as Medical Informatics. However when library scientists began to also use the phrase "Information Science" to refer to their work, the term informatics emerged in the United States as a response by computer scientists to distinguish their work from that of library science, and in Britain as a term for a science of information that studies natural, as well as artificial or engineered, information-processing systems.
Health informatics or medical informatics are sub domains of (bio)medical or health care informatics which include: clinical informatics, nursing informatics, imaging informatics, consumer health informatics, public health informatics, dental informatics, clinical research informatics, bioinformatics, and pharmacy informatics.

Aspects of the field

- architectures for electronic medical records and other health information systems used for billing, scheduling or research
- decision support systems (decision support systems are a class of computer-based information systems including knowledge based systems that support decision making activities) in healthcare, including clinical decision support systems
- standards (e.g. DICOM, HL7) and integration profiles to facilitate the exchange of information between healthcare information systems - these specifically define the means to exchange data, not the content
- controlled medical vocabularies such as the Standardized Nomenclature of Medicine, Clinical Terms, Logical Observation Identifiers Names and Codes – are used to allow a standard, accurate exchange of data content between systems and providers
- use of hand-held or portable devices to assist providers with data entry/retrieval or medical decision-making

Development

Medical informatics began to take off in the US in the 1950s with the rise of the microchip and computers.

Early names for medical informatics included medical computing, medical computer science, computer medicine, medical electronic data processing, medical automatic data processing, medical information processing, medical information science, medical software engineering and medical computer technology.

Since the 1970s the coordinating body has been the International Medical Informatics Association (IMIA)

Medical informatics in North America
The earliest use of computation for medicine was for dental projects in the 1950s at the United States National Bureau of Standards by Robert Ledley.

The next step in the mid 1950s were the development of expert systems such as MYCIN and INTERNIST-I. In 1965, the National Library of Medicine started to use MEDLINE and MEDLARS. At this time, Neil Pappalardo, Curtis Marble, and Robert Greenes developed MUMPS (Massachusetts General Hospital Utility Multi-Programming System) in Octo Barnett’s Laboratory of Computer Science at Massachusetts General Hospital in Boston. In the 1970s and 1980s it was the most commonly used programming language for clinical applications. The MUMPS operating system was used to support MUMPS language specifications. As of 2004, a descendent of this system is being used in the United States Veterans Affairs hospital system. The VA has the largest enterprise-wide health information system that includes an electronic medical record, known as the Veterans Health Information Systems and Technology Architecture or VistA. A graphical user interface known as the Computerized Patient Record System (CPRS) allows health care providers to review and update a patient’s electronic medical record at any of the VA’s over 1,000 healthcare facilities.

In the United States in 1996, HIPAA regulations concerning privacy and medical record transmission created the impetus for large numbers of physicians to move towards using EMR software, primarily for the purpose of secure medical billing.

In the US, progress towards a standardized health information infrastructure is underway. In 2004, the US Department of Health and Human Services (HHS) formed the Office of the National Coordinator for Health Information Technology (ONCHIT), headed by David J. Brailer, M.D., Ph.D. The mission of this office is to achieve widespread adoption of interoperable electronic health records (EHRs) in the US within 10 years.

The Certification Commission for Healthcare Information Technology (CCHIT), a private nonprofit group, was funded in 2005 by the U.S. Department of Health and Human Services to develop a set of standards for electronic health records (EHR) and supporting networks, and certify vendors who meet them. In July 2006, CCHIT released its first list of 22 certified ambulatory EHR products, in two different announcements.

MORE Definitions

**Biomedical informatics** is a discipline related to bioinformatics and has roots in medical informatics or healthcare informatics. It studies the use of information technology and advanced research computing in the practice of biomedical sciences and medicine.

**Health care informatics** has been defined as: “A field of study concerned with the broad range of issues in the management and use of biomedical information, including medical
computing and the study of the nature of medical information itself." Or "If physiology literally means ‘the logic of life’, and pathology is ‘the logic of disease’, then health informatics is the logic of healthcare. It is the rational study of the way we think about patients, and the way that treatments are defined, selected and evolved. It is the study of how clinical knowledge is created, shaped, shared and applied. Ultimately, it is the study of how we organize ourselves to create and run healthcare organizations." "The science that studies the use and processing of data, information, and knowledge applied to medicine, health care and public health."

**Clinical Informatics** is a sub-field of medical informatics. It focuses on computer applications that address medical data (collection, analysis, representation). Clinical informatics is a combination of information science, computer science, and clinical science designed to assist in the management and processing of data, information and knowledge to support the practice and delivery of clinical care.

**Nursing Informatics** is a specialty of Health care informatics which deals with the support of nursing by information systems in delivery, documentation, administration and evaluation of patient care and prevention of diseases.

**Public Health Informatics** has been defined as the systematic application of information and computer science and technology to public health practice, research, and learning.

**Dental informatics** is the name given to the application of information technology to dentistry. It is often considered a subset of medical informatics and biomedical informatics.

It is the understanding, skills and tools that enable the sharing and use of information to promote oral health and improve dental practice, research, education and management. It encompasses electronic health records, CAD/CAM technology, diagnostic digital imaging and administrative information for all dentistry disciplines.

**Bioinformatics** and **computational biology** involve the use of techniques including applied mathematics, informatics, statistics, computer science, artificial intelligence, chemistry and biochemistry to solve biological problems usually on the molecular level. Research in computational biology often overlaps with systems biology. Major research efforts in the field include sequence alignment, gene finding, genome assembly, protein structure alignment, protein structure prediction, prediction of gene expression and protein-protein interactions, and the modeling of evolution.

What does this mean? Let’s take a nurse, during the course of any day a nurse handles large amounts of data and information and applies knowledge. This is true whether the nurse provides direct care or is an administrator, educator, or research. Informatics provides tools to help process, store, retrieve, and analyze data and the information that have been collected for the purpose of documenting and improving patient care, as well
as the creation and support of knowledge that contributes to the scientific foundation for nursing.

Data are a collection of numbers, characters, or facts that are gathered according to some perceived need for analysis and possibly action at a later point in time. Examples of data include a client’s vital signs, length of hospital stay, race, marital status, next of kin, and so on.

A single piece of datum has little meaning. However, a collection of data can be examined for patterns and structure that can be interpreted. Information is data that have been interpreted. For example, individual temperature readings are data. When they are plotted onto a graph, the client’s change in temperature over time and comparison with normal values become evident, thus becoming information.

Knowledge is a more complex concept. Knowledge is the synthesis of information derived from several sources to produce a single concept or idea. It is based on a logical process of analysis and provides order to thoughts and ideas and decreases uncertainty.

Computers and information technology provide tools that aid data collection and the analysis associated with research to support the overall work of healthcare professionals. Information technology (IT) is a general term used to refer to the management and processing of information, generally with the assistance of computers.

Healthcare professionals need to know more today to perform their daily jobs than at any previous point in history. Healthcare delivery systems are knowledge-intensive settings. Advancements in knowledge, skills, interventions, and drugs are growing at an exponential rate. This makes it impossible for any one individual to keep up with all the knowledge needed to any of the healthcare disciplines without making use of available resources and continuing education. The present healthcare delivery system fails to consistently translate new knowledge into practice and to apply new technologies safely and appropriately. Several years elapse before new knowledge and advancements make it into the clinical setting. At the same time, the acuity level of clients continues to rise, making the work of the healthcare worker more difficult.

IT can support the healthcare practitioner in the many roles they assume during the course of their day. Roles including: data gatherer, Information user, Knowledge user, and knowledge builder. Computerized assessment and documentation forms facilitate data collection by including prompts to help healthcare personnel remember question they should ask and facts that should be recorded. These same tools strengthen the quality of clinical databases. The data gatherer role is also facilitated when input form monitoring devices is put directly into clinical documentation systems. The information user role is supported when computer capability quickly discerns patterns that help translate data into information. This saves time and labor for the healthcare worker and provides useful information in a timely fashion. Applications to support the knowledge
user have yet to be prevalent in the clinical setting; examples include making resources available at the point of care. Knowledge builders examine aggregate data for relationships among variables and interventions. This technology is present but not frequently used, as the current healthcare environment still fails to use technology well to streamline paperwork, transform data into information and knowledge, and eliminates redundancy.

Good information management ensures access to the right information at the right time to people who need it. Vast amounts of information are produced daily. This information may or may not be readily available when it is needed. Part of good information management ensures that care providers have the resources that they need to provide safe, efficient, quality care. Some examples of these resources include clinical guidelines, standards of practice, policy and procedure manuals, research findings, drug databases and information on community resources. IT can help to ensure access to the most recent versions of these types of resources. This solution eliminates the uncertainties of whether reference books are available in all clinical areas of any given facility and whether all areas have the correct version. Good information management also eliminates redundant data collection. Redundant data collection wastes time and irritates clients. Good time to talk to the class about what redundant data collection is, or redundancy in point of care (POC) could be, and what else could it do besides waste time and be irritating – i.e., it costs money to the company which can directly impact the employee.
Week 9 – Quiz 4

1. Give a definition of Health Informatics.

2. Name three types of specialty informatics.

3. What role does IT play in Health Informatics?

4. Explain the difference between data and information.

All answers should reflect lecture and research from this week’s lesson.
Lab for Lesson 9:

This week’s lab should look at a clinical information system. If your lab does not have it’s own software, download the VA’s VistA and use this software as an example. Have students do some data entry, look at some of the workflows, relate this to this week’s lecture of data, information, knowledge, and informatics.

Examples of data to be entered:

Name
DOB
SS#
Address
Employment
Insurance
Clinical Info – Temperature and Pulse

Look at workflow for the data entry, how would the healthcare provider use this? What is might their workflow look like? Does the information carry over? What trends might the healthcare worker be able to identify?