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Welcome to *Health Management Information System: What is Health Informatics*. This is Lecture b.

The component, Health Management Information Systems, is a “theory” component that provides an introduction to health care applications and the systems that use them, health information technology standards, health-related data structures, and enterprise architecture in health care organizations.

Lecture b will define the informatics team, their skills, roles and responsibilities, and identify how health informaticians process data into information and knowledge for health care tasks with the support of information technology to improve patient care.

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The Objectives for *What is Health Informatics* are:

- Define information management, information system (technology) and informatics;
- Explain the basic theoretical concept that underlies informatics practice;
- Define the meaning of biomedical and health informatics as a field of study;

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Additional Objectives for this unit, What is Health Informatics? are to:

- Describe the biomedical informatics areas of applications;
- Summarize the informatics drivers and trends;
- State the professional roles and skills of health informaticians;
- Identify how health informaticians process data into information and knowledge for health care tasks with the support of information technology to improve patient care.
To begin to gain an understanding of the individuals involved with informatics applications and the type of work they do, let’s first settle on what is the practice of informatics?

According to the report Training the Next Generation of Informaticians, “The practice of informatics, most generally requires the presence of two components: (1) a set of skills and methodologic tools derived from knowledge of the basic informational and computing sciences and (2) knowledge, experience, and activity in one or more application domains. The coexistence of, and interactions between, these key components give meaning and significance to informatics as a field” (Friedman, et al., 2004, p.169)

For example, many practicing who practice informatics have training in the subject of human-computer interaction, an application domain covering how people use computers and how to design computer systems that help people use them more effectively.

Taking into consideration the first component, a set of skills and methodological tools derived from knowledge of the basic informational and computing sciences, let’s review the list of component sciences. Shortliffe & Blois (2001) state that the sciences biomedical informatics draws on and contributes to include computer science, clinical science, basic biomedical science, cognitive science, bioengineering, management science, epidemiology and statistics.

Individuals working in the informatics field possess cognitive skills in logical and analytical thinking and have a technical understanding of the computing environment that is the basis for informatics work.

The report Training the Next Generation of Informaticians also identified a second component to the practice of informatics as the knowledge, experience, and activity in one or more application domains. Some examples of domains identified by (Friedman, et al., 2004) include:

- Cognitive/human factors and interfaces
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- Data structures
- Database design
- Information retrieval
- Knowledge representation
- Networking/architecture
- Ontology/vocabulary
- Software engineering

For example, a review of coursework at several universities on knowledge representation indicated the course covers how knowledge can be represented in a computer system and what kinds of reasoning can be done with the use of the knowledge.

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So, given the definition of the practice of informatics, who would be involved in this field of study? Practitioners of informatics. These individuals are known as informaticians.

Members of the team vary in the types of skills, roles, and responsibilities which in turn are tied to their level of education and experience gained through stages of career progression.

For example, the team might consist of individuals with an Associate’s degree whose role is clinical data analyst; individuals with a Bachelor’s degree whose role is research and development scientist; an individual with a Master’s degree taking on the role of nursing informatics officer, and an individual with a Doctorate whose role is chief medical informatics officer.

Health informaticians use information technology to advance cost-effective care, high-quality care, and patient safety. Therefore, no matter their level of education or experience, all health informaticians need to know how to efficiently and responsibly use information and communication technology.

However, a professional with a Bachelor’s degree right out of school uses information differently, compared to a professional with the same degree who has been in the field for 10 years. Likewise, a professional with a two-year degree uses information differently compared to a professional with a Master’s degree.
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Just as there are subdisciplines of biomedical informatics there are subdisciplines of the informaticians. As expected, the informatics applications utilized and the type of work they do will vary. For example, the University of Minnesota’s Institute for Health Informatics Web site states “bioinformaticians develop, and apply computational tools and approaches for expanding the use of biological data, including those to acquire, store, organize, archive, analyze, or visualize such data” (University of Minnesota, 2011, para. 4).

The type of work would involve analysis/modeling of genomic datasets.

The health care industry requires all types of informaticians to meet the ever-increasing information needs.

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From a more general view, health informaticians are professionals in health care who acquire knowledge in the component sciences and skills in information processing and information and communication technology. To perform the duties of a health informatician, they must have training in the processes associated with the acquisition, storage, retrieval, privacy and security, presentation, and use of information in health and biomedicine.

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Health informaticians may have a varied assortment of responsibilities. Some of those functions include “health informaticians help to design software for patient care, build and maintain research systems for clinical research, purchase and implement information systems that support health care, provide training and assistance to health care providers in using health information technology, conduct analyses of large health datasets, conduct research and development to advance the science of health informatics” (University of Minnesota, 2011, para. 2).
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Health informaticians are in great demand and may work in many different environments including colleges and universities, research facilities, health care delivery organizations, local, state and federal government agencies, medical software firms, medical information services companies, and other private industries such as insurance or medical device companies to name a few.

Roles for the health informaticians in the first three environments are discussed in the next few slides.

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A role for health informaticians working in colleges and universities is that of a professor where the focus is on teaching and research. Health informaticians with an academic role have two main responsibilities. They are to:

- Educate those interested in the field of health informatics and
- Conduct research to improve the acquisition, storage, retrieval, representation, and use of information in health and biomedicine.

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While a health informatician working in a college or university may conduct research to improve the acquisition, storage, retrieval, and use of information in health and biomedicine, there is a research role outside of the academic setting.

Research facilities hire health informaticians to focus on informatics applications in clinical and translational research for the purpose of advancing medical science and public health. Other responsibilities for researchers include conducting research in informatics in order to:

- Expand the scope of the discipline of health informatics
- Research and evaluate new regions or domains in health informatics, and
- Lead interdisciplinary teams in the search for solutions to health informatics problems.

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As mentioned earlier, clinical informatics is often further broken down into specific fields or subareas. The term clinical informatician is usually associated
with physicians. Other clinical personnel involved in health informatics science are called informaticians as well, and their field of study distinguishes them from each other, that is, nursing informaticians, dentistry informaticians, or pharmacy informaticians.

The health care delivery role for clinical personnel focuses on the patient care domain. These individuals combine the knowledge of computer science, information science, cognitive science, and clinical science to assist in the management and processing of clinical data, information, and knowledge to support clinical practice.

For example, a role for an informatician whose background is in medicine might be a chief medical informatics officer who’s managing clinical data, information, and knowledge to support clinical practice and who’s involved in the design, implementation, maintenance, and the evaluation of EMRs.

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Other roles for clinical informaticians involve the use of their knowledge of patient care combined with their understanding of informatics science to:

- “Assess information and knowledge needs of health care professionals and patients;
- Characterize, evaluate, and refine clinical processes;
- Develop, implement, and refine clinical decision support systems; and
- Lead or participate in the procurement, customization, development, and implementation, management, evaluation, and continuous improvement of clinical information systems such as electronic health records and order-entry systems” (AMIA, 2011, para. 2).

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Besides clinical personnel, there are other health care professionals involved in informatics applications in relation to health care delivery. Sometimes referred to as applied health informatics, those often found in this subarea include, but are not limited to, health information management professionals, health information exchange specialists, programmers and software engineers, and privacy and security specialists. Individuals involved with applied informatics applications
provide a vital link between clinicians, technology designers, and information technology.

These health information professionals focus on the strategic and operational relevance and robustness of clinical information resources, workflow, end-user support, and connectivity within the health care industry and public health sectors. Their responsibilities include such things as:

- constructing computer health information systems by studying the needs of doctors, nurses, patients, and health care organizations;
- producing requirements and use case documents for EMRs/EHRs;
- building health networks that allow doctors and nurses to share knowledge and best practices;
- designing new methods of information delivery that motivate patients to follow treatment recommendations; and
- working with the vendor to implement the builds which form the documentation, order entry, and data repository system.

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In conclusion, let's take a final look at informatics as a field of study and how health informaticians process data into information and knowledge for health care tasks with the support of information technology to improve patient care.

First consider the application domains as described by the National Library of Medicine:

- "Health care/clinical informatics: Applications of informatics principles and methods to direct patient care, such as advanced clinical decision support systems and multimedia electronic health records, and to the provision of informational support to health care consumers.
- Bioinformatics and/or computational biology: Applications of informatics principles and methods to support basic research in such areas as genomics, proteomics, cheminformatics, systems biology, and simulation/modeling of biological systems.
- Clinical research and translational informatics: Applications of informatics principles and methods to “bench to bedside” translational research exploring genome-phenome relationships, to pharmacogenomics, to drug discovery, and to the support of clinical trials.
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Second, individuals working in the informatics field possess cognitive skills in logical and analytical thinking, and have a technical understanding of the computing environment that is the basis for informatics work. They also possess an awareness of privacy and security policies around health informatics such as the secure collection, management, retrieval, exchange, and/or analysis of information in electronic form. Given the different backgrounds, experience, and education, along with varied roles and skills described previously, who is better equipped to transform data into information and information into knowledge than health informaticians?

Third, health informatics is an interdisciplinary, interrelated discipline, undergoing rapid change. As issues in health care become more complex, the amount of data collected and stored escalates. There is a widespread, generally acknowledged need for health informaticians who understand data, information, and knowledge.

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This concludes What is Health Informatics. In summary, Lecture a defined information management, information technology, and informatics, described the fundamental theorem of informatics, explained the meaning of biomedical and health informatics as a field of study, and offered definitions of the major biomedical informatics areas of applications. It also provided an overview of informatics drivers and trends in the health care field.

Lecture b defined the informatics team, their skills, roles and responsibilities and identified how health informaticians process data into information and knowledge for health care tasks with the support of information technology to improve patient care.
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