MEDICAL INFORMATICS
A Course for Health Professionals

Educational Objectives and Outlines

What is Medical Informatics?

J. Cimino

Objectives

- To provide open discussion among the participants on the definitions and scope of medical informatics
- To identify the component disciplines witin the field of biomedical informatics
- To introduce a clinical case summary that will be used throughout the the course to show how theoretical and practical aspects of informatics relate to health care

At the conclusion of the session, participants should:

- Have a basic understanding of the components of medical informatics
- Be able to characterize these components as technologies, concepts and skills

Outline

I. What is Medical Informatics - An open discussion
II. Component Disciplines
III. Concepts, Technologies and Skills
IV. External Forces
V. Case Presentation
VI. Course Overview

Current Issues in Medical Informatics

D. Lindberg

Objectives

Outline

Principles of Controlled Terminology

J. Cimino

Objectives

- Describe terminology concepts and characteristics
- Provide examples of coding clinical data
- Examine the state of the art with respect to current standards
- Examine case studies of use and reuse of coded data

At the conclusion of the session, participants should:

- Understand the motivation for coding clinical data
- Understand the "desiderata" for high-quality controlled terminologies
- Be familiar with currently available terminologies

Outline

This pair of lectures is organized into six "threads" that will be woven together concurrently:

I. Clinical case

II. Use and reuse of data
III. Coding clinical data
IV. Available terminologies
V. Terminology concepts and desiderata
VI. Practical considerations

Personal Web Pages

C. Dematos

Objectives

Outline

Decision-Analytic Methods for Evidence-Based Practice I

Suzanne Bakken, RN, DNSc

Objectives

At the conclusion of the workshop, the learner will be able to do the following:

- Describe the informatics foundation for evidence-based practice.
- Identify the components of expected value decision making.
- Construct and solve a decision tree using a decision analysis software package
- Use DXplain for differential diagnosis

Outline

- Definitions of Evidence-based Practice
- Information Foundation for Evidence-based Practice
- Introduction to Probabalistic Reasoning
- Expected Value Decision Making
- Building and solving a decision tree using DATA
- Web-based utility assessment
- DXplain

Principles of Database Design

J. Cimino

Objectives

- Define "database"
- Review the history of database architectures
- Teach the princples of database normalization
- Identify the basics for object-oriented database design
- Reinforce principles with a design exercise.

At the conclusion of the session, participants should:

- Understand the evolution of modern database architecture
- Understand some of the principles behind choices to be made when designing a database
- Have a basic understanding of database normalization

Outline

I. Definition
II. History of Database Architectures
III. Database Normalization
IV. Object-Oriented Table Design
V. Exercise: Database for Medline Records
VI. Exercise: Clinical Database

Digital Library Principles

Alexa T. McCray, Ph.D.

Objectives

This lecture presents the basic principles and practices involved in designing and implementing a digital library, as well as the research issues that need to be addressed. Three case studies, ClinicalTrials.gov, Genetics Home Reference, and Profiles in Science are introduced, and participants are given an opportunity to do a short exercise.

By the end of the session students will:

- Understand the basic principles that underlie the design, implementation, and maintenance of a successful digital library.
- Have an understanding of digital library research issues.
- Have pointers to useful resources in digital library research.

Outline

- Basic Principles in the Design and Implementation of a Digital Library
  - System Design Principles and Practices
  - Content and Collection-based Principles and Practices
  - Human Factors Principles and Practices
- Case Studies
  - ClinicalTrials.gov
  - Genetics Home Reference
  - Profiles in Science
- Hands-on Exercise

Principles of Web Page Design

C. Dematos

Objectives

Outline

Visible Human Project: More that Pretty Pictures

Michael J. Ackerman, Ph.D.

Objectives

This lecture will provide a prospective on NLM's Visible Human Project as an entry point into understanding the fundamentals of digital imaging, medical imaging, multi-dimensional informatics, image processing, virtual reality, open source software and extreme programming.

At the completion of the session, the participant will:

- Be familiar with the history and goals of NLM's Visible Human Project
- Understand digital imaging fundamentals and their consequences in image processing and medical imaging
- Be familiar with the concepts associated with open source software and open source data and an appreciation for the controversies associated with their use
- Be familiar with modern software development methodologies
- Gain an appreciation for the use and potential of the Insight Tool Kit (ITK)

Outline

- History of the Visible Human images
- Digital image representation
- Visible Human applications
- Haptics
- Beyond the images
- Open source software

- Extreme programming
- Segmentation & Registration
- ITK applications

Telemedicine: Lessons in Healthcare and Networking

Michael J. Ackerman, Ph.D.

Objectives

This lecture will approach the subject of telemedicine from the perspective of an information process. The lecture will start with NLM's historical involvement in telemedicine. Technical, regulatory and societal impediments to the utilization of telemedicine will be discussed. Modern telemedicine is dependent on digital networking. After a brief Internet history the lecture will summarize current and next generation networking concepts. The federal interagency Next Generation Internet (NGI) program and the academic Internet2 Project will be discussed. The application of NGI technology to healthcare will be demonstrated through examples funded by the NLM.

At the completion of the session, the participant will:

- Understand telemedicine as an information process
- Understand the technical, regulatory and societal impediments to the utilization of telemedicine
- Understand the national need for next generation network and its relevance to healthcare
- Be familiar with the federal Next Generation Internet Program and the academic Internet2 Program, and how the two are inter-related
- Be familiar with next generation networking concepts
- Be familiar with the NLM programs as a demonstration of the relevance of advanced networking technology in telemedicine and healthcare
- Gain an appreciation of the current and future networking challenges and opportunities

Outline

- NLM's involvement in telemedicine
- Definition of telemedicine
- Impediments to telemedicine
- History of the Internet
- Networking concepts
- Connection methods
- NLM's National Telemedicine Initiative
- Telemedicine lessons learned
- Next generation networking - federal and academic
- Quality of Service - QoS - concepts
- Next generation network health examples
- Scalable Information Infrastructure

Clinical Information Systems

E. Hammond

Objectives

Outline

Evaluation Methods in Medical Informatics

George Hripcsak, MD, MS; Joan Ash, PhD, MLS, MBA

Objectives

Outline

What separates medical informatics from methodological disciplines like computer science is its focus on applying methods and its emphasis on evaluation. In this session, we will introduce the basic concepts of evaluation in medical informatics. By the end of the session, the participants will be able to

- appreciate the need for evaluation and the role of stakeholders
- recognize what is difficult about evaluation in medical informatics
- apply a framework for selecting what to evaluate
- describe the relation between quantitative and qualitative evaluation
- define basic concepts in quantitative evaluation, such as metrics, reference standards, measurement versus demonstration, and reliability versus validity
- enumerate the main steps in qualitative evaluation based on ethnographic methods

Care Provider Order Entry

K. Johnson

Objectives

Outline

PubMed and the NLM Gateway

K. Canese

Objectives

Outline

Introduction to Personal Databases

D. Remsen

Objectives

Outline

Building Web Interfaces to Databases

D. Remsen

Objectives

Outline

Bioinformatics: Past, Present and Future Perspectives

P. Miller

Objectives

Outline

Public Health Informatics

R. Kukafka

Objectives

Outline

Education Informatics

C. Cimino

Objectives

Outline

Managing Technological Change

J. Ash

Objectives

This session presents an overview of the issues that must be addressed to effectively manage technological change. It will include a case study.

Educational Objectives:

- To become aware of the non-technical issues connected with technological-informatics changes.
- To understand several of the reasons for system failure
- To review a case to determine what non-technological issues could have been addressed initially.
- To review what change agents need to do to facilitate organizational success

Outline

- Systems" in broader context
- A system is not just technology
- Begins with a perception of the overall need for change
- Developing a definition of the specific needs/requirements
- Begin to prepare the staff for change
- Development/selection--the technical system
- Implementation preparation, includes training
- Implementation
- Support--of users and to repair deficiencies
- Why Systems Often Fail
- What Is Failure?
- Failure Issues
- Communication
- Culture
- Underestimation of complexity
- Scope creep
- Organizational
- More organizational issues
- Technology Training
- Leadership issues

The Internet: Reflections on What's Coming

L. Kingsland

Objectives

Outline