Introduction to Health Informatics

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TFs: April Yang and Rena Wu

Course Slides courtesy of Dr. Andrew Taylor

Course Overview

Survey various fields of health informatics

Develop a vocabulary of health informatics

Highlight conceptual themes and intersections

Logistics

Slides available after class

Tim, Andrew & TFs = Office hours: by appointment

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Grading

(details to be provided soon)

10% participation
30% homework
30% midterm test
30% final project

Gen AI not allowed for assignments

https://canvas.yale.edu/login

Week One Learning Objectives

- Describe how information and knowledge management are a central issue in biomedical research and clinical practice
- Describe integrated information management environments, and how might we expect them to affect the practice of medicine, the promotion of health, and biomedical research
- Define common conceptual themes across informatics

WHAT IS HEALTH?

Absence of Disease

Interaction with Environment

Well-being

Quality of Life

Life-expectancy

HOW DO WE PROMOTE / IMPROVE HEALTH WITHIN HEALTHCARE?

Diagnosis

Treatment

Counseling

Care Coordination

Social

Environmental


Counseling
Care Coordination
Treatment
Social
Diagnosis
Information Management
Environmental

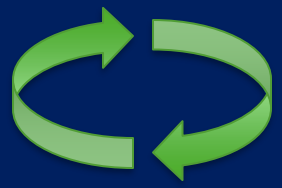
WHAT ARE KEY ASPECTS OF INFORMATION MANAGEMENT?

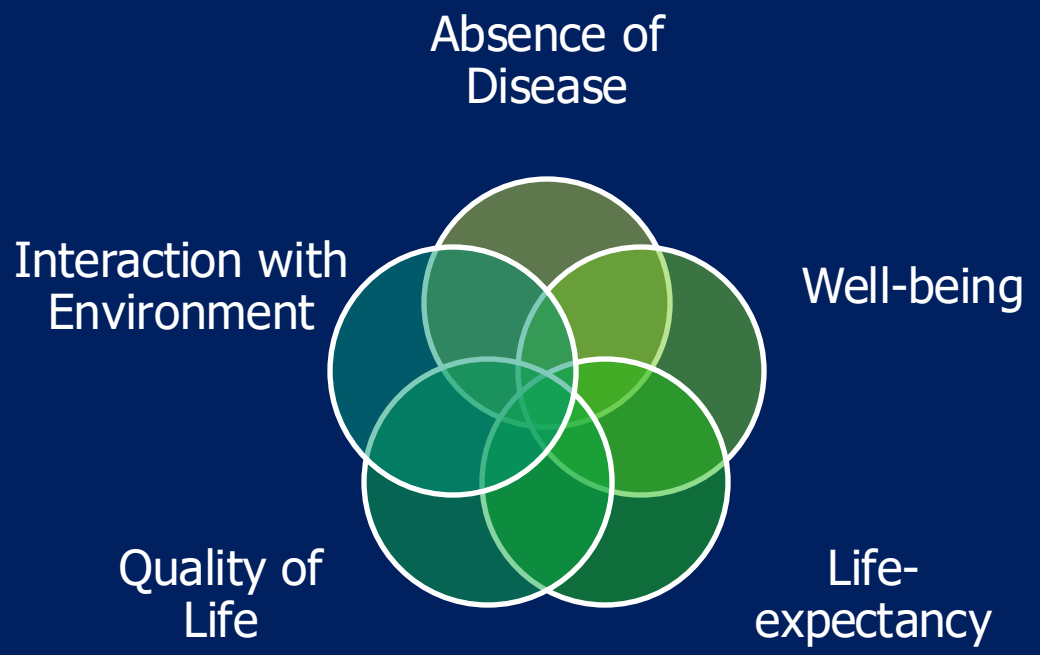
Information Management

- Data Storage
- Data Analysis → Information
- Human Interfaces into IT devices
- Messaging/Communication
- Implementation
- Decision Support
- Knowledge Representation and Storage

Learning Healthcare Environment

Learning Healthcare Environment



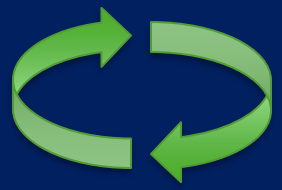


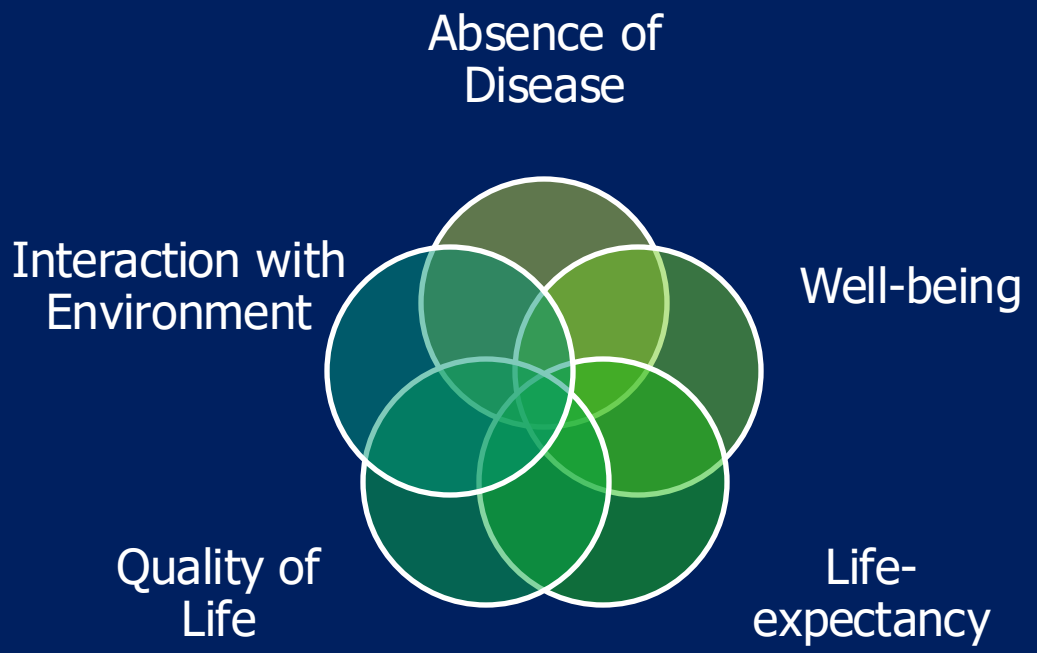
WHAT IS HEALTH INFORMATICS?

AMIA Definition

{Health} Informatics is the interdisciplinary scientific field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem-solving, and decision making, motivated by efforts to improve human health.

Learning Healthcare Environment

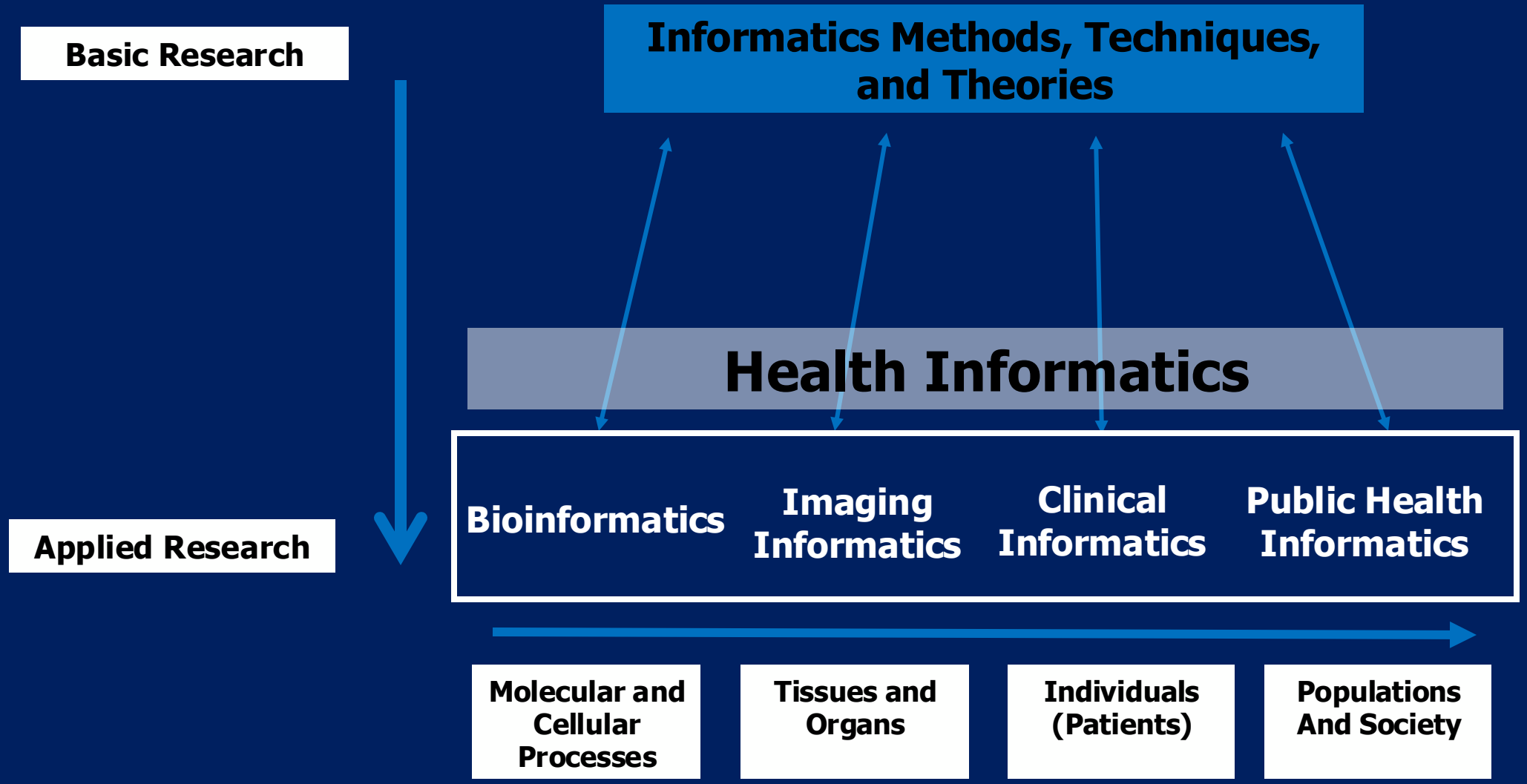




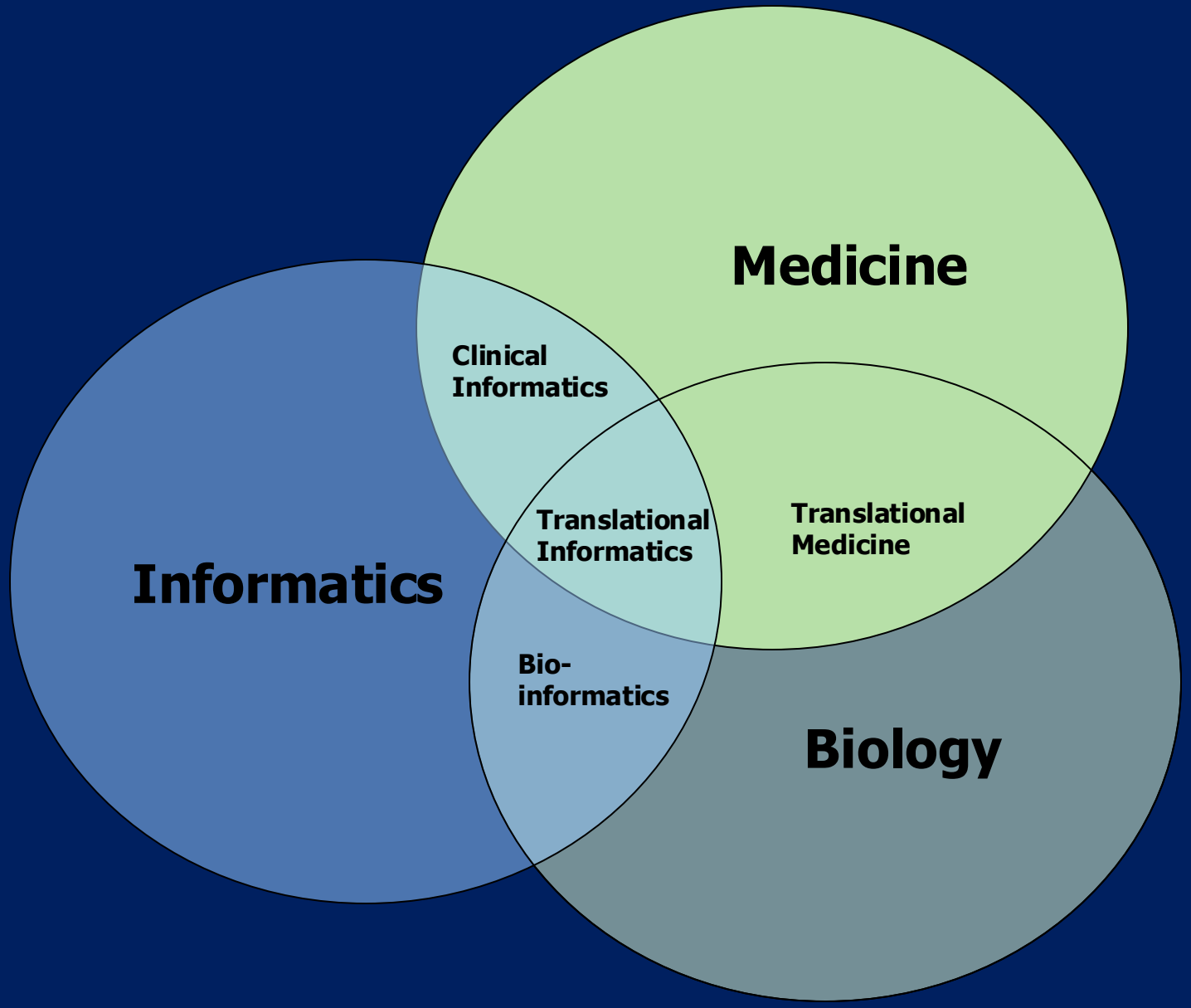
IT Tools

Patient Care

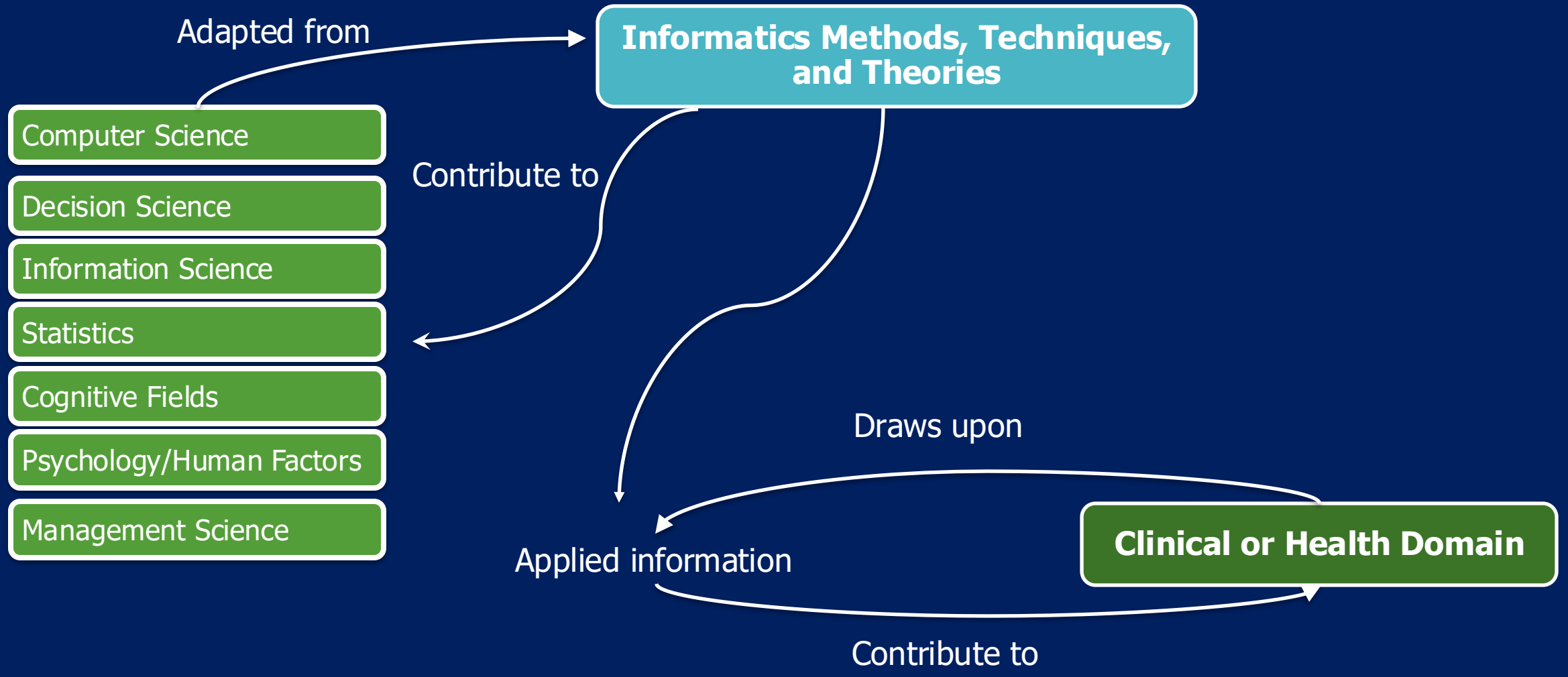
Health Informatics in Perspective



Health Informatics



Health Informatics as a Bridge



Adapted from Shortliffe et al.

(Modifier term-) Informatics

Medical-

Health- , Healthcare-

Biomedical-

Bio-

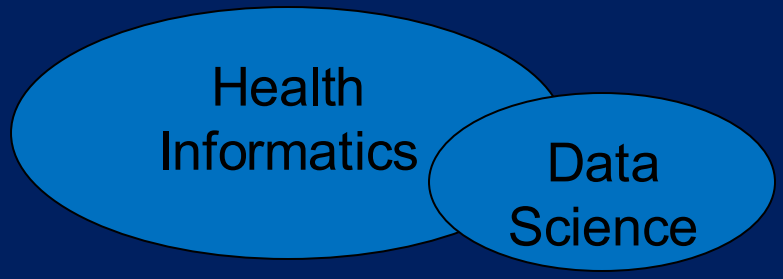
Clinical-

- Pediatric, dental, veterinary, nursing

Translational-

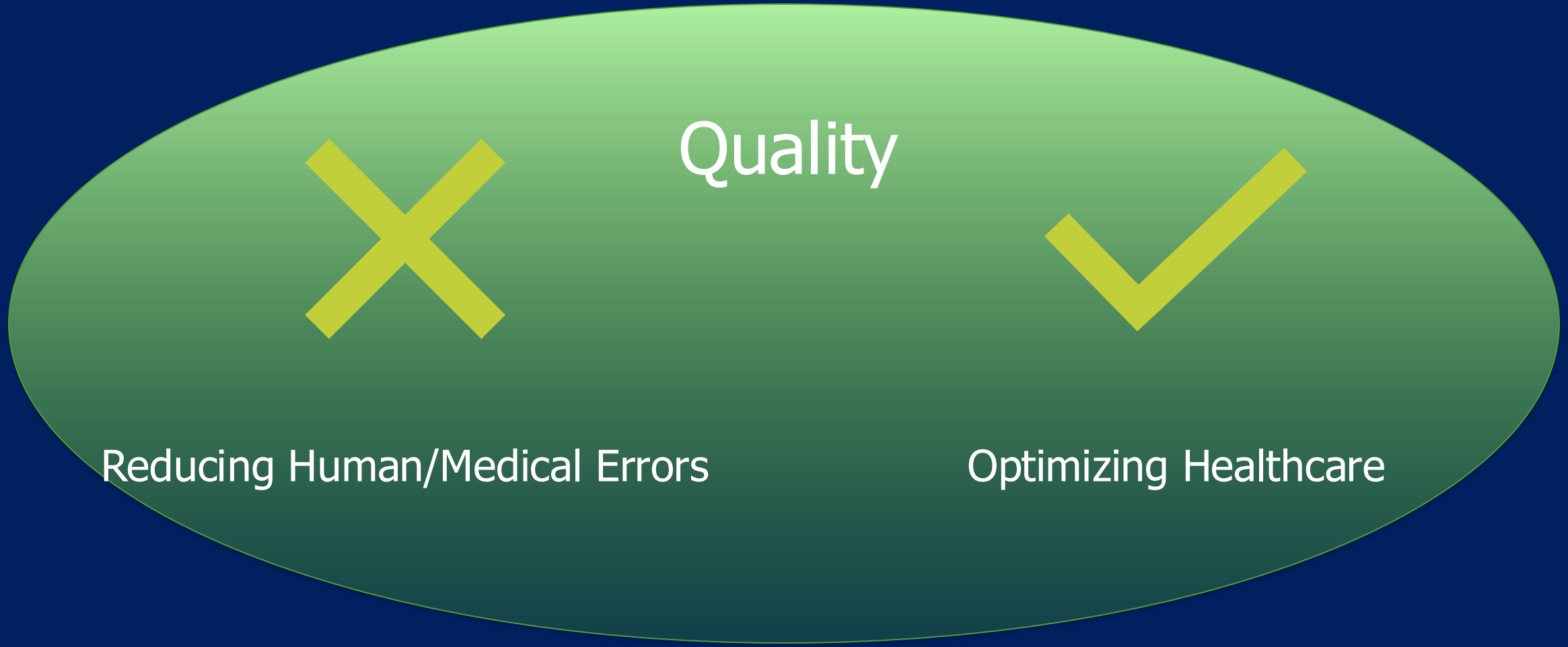
Additional Terminology

- **Data Science:** interdisciplinary field that concerns scientific methods, processes, and systems to extract knowledge or insights from data
- **Data Mining**: the science of collecting data and then searching for patterns in this data
- **Machine learning**: is the science of creating algorithms and programs that learn from data
- **Data analytics:** technologies and techniques that enable organizations to make more-informed business decisions and scientists and researchers to verify or disprove scientific models, theories and hypotheses.



MOTIVATING FACTORS FOR HEALTH INFORMATICS DEVELOPMENT

Motivating Factors for Health Informatics Development



Errors in Medicine

Medical error: "an act of omission or commission in planning or execution that contributes or could contribute to an unintended result."

Reducing Human Medical Errors

45,000–98,000 Americans die in hospitals every year because of medical errors

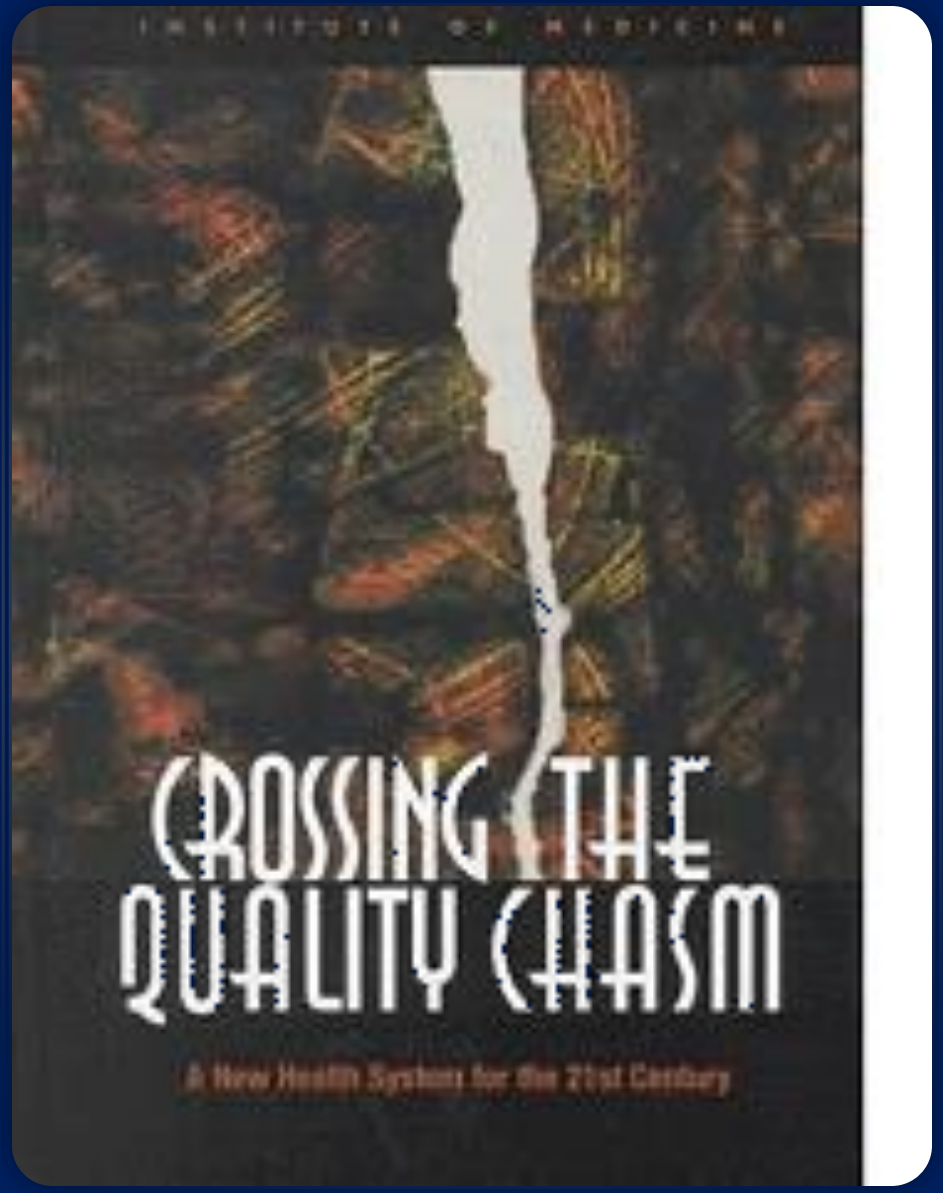
To Err is Human
Institute of Medicine
2000

Sources of Errors in Medicine

- Cognitive errors
- Information/Knowledge errors
- Communication errors
- Process errors

Optimizing Healthcare

- Timely
- Effective
- Efficient
- Equitable
- Patient-centered



Source: https://en.wikipedia.org/w/index.php?curid=58710963

"Information Technology (IT) has enormous potential to improve the quality of health care with regard to all six (quality components)…"

Quality Care

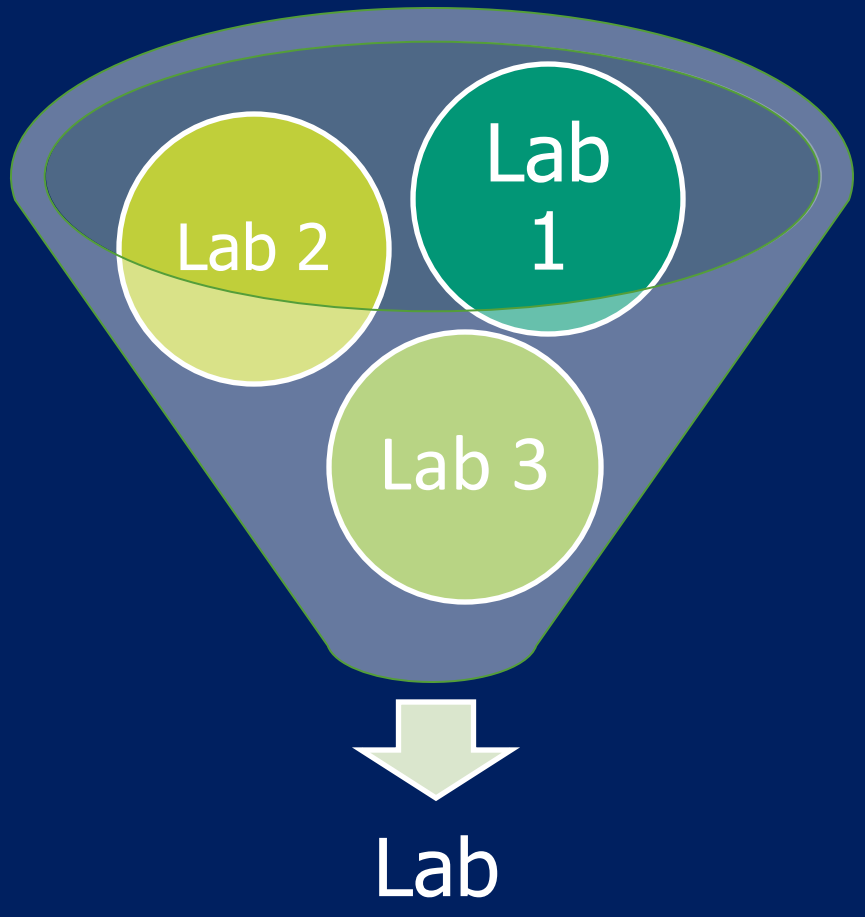
Safe	Avoid injuries from care intended to help	Computerized Provider Order Entry (CPOE)
Effective	Services based on scientific knowledge	Reminders, comp-assisted dx/tx
Patient-centered	Respectful care responsive to needs	Customized disease maangement, reliable websites
Timely	Reduced waits and delays	E-visits, telemedicine
Efficient	Avoiding Waste	Redundant testing
Equitable	Unvarying care despite gender, Socio-Economic Status (SES), ethnicity, geography	Internet based health communication

Conceptual Themes in Informatics

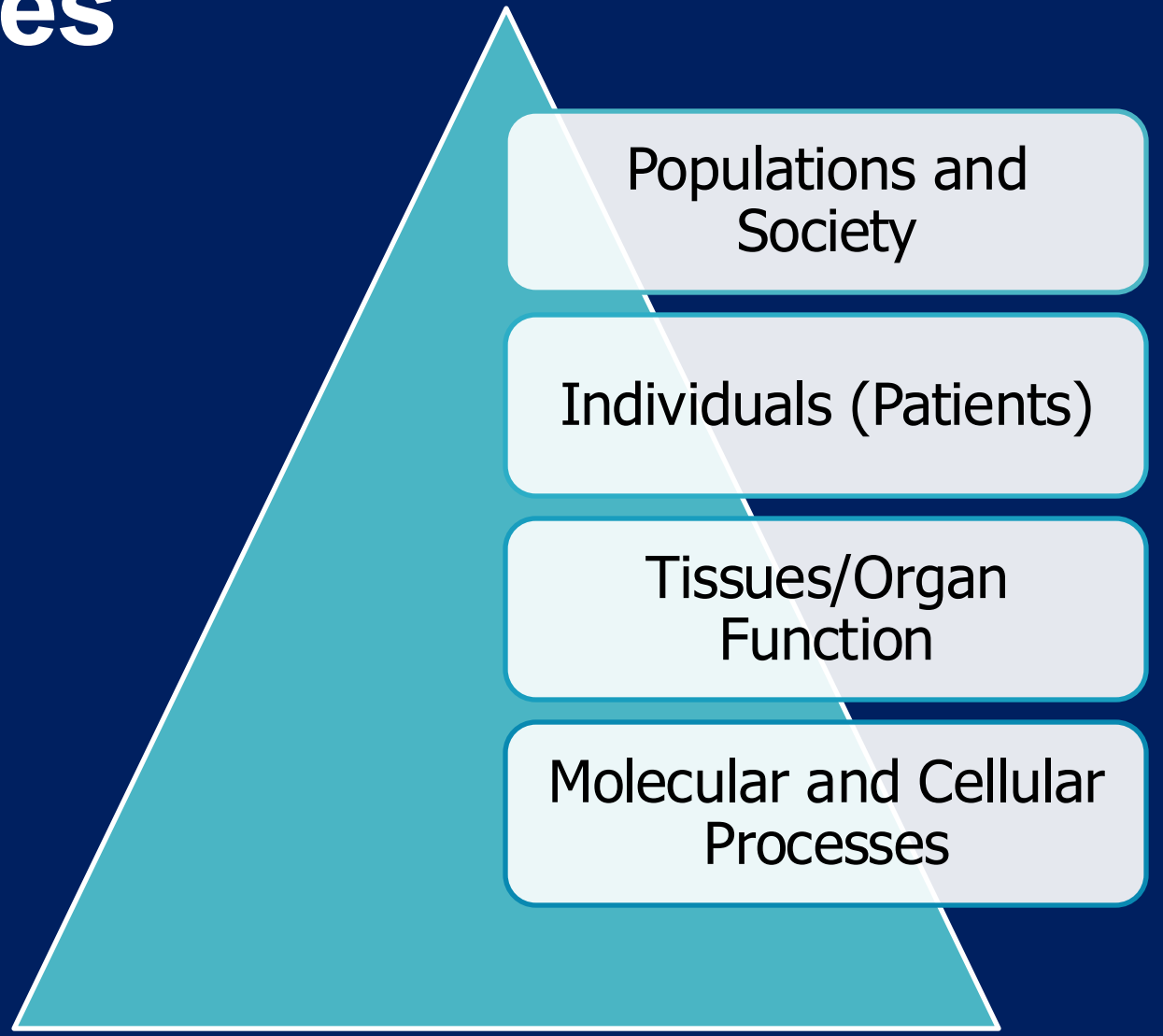
Conceptual Themes in Informatics

- Standardization
- Hierarchies
- Object Oriented Approaches
- Probabilistic/Fuzzy Thinking
- Integration/Synthesis
- Interaction/Networks
- Interfaces

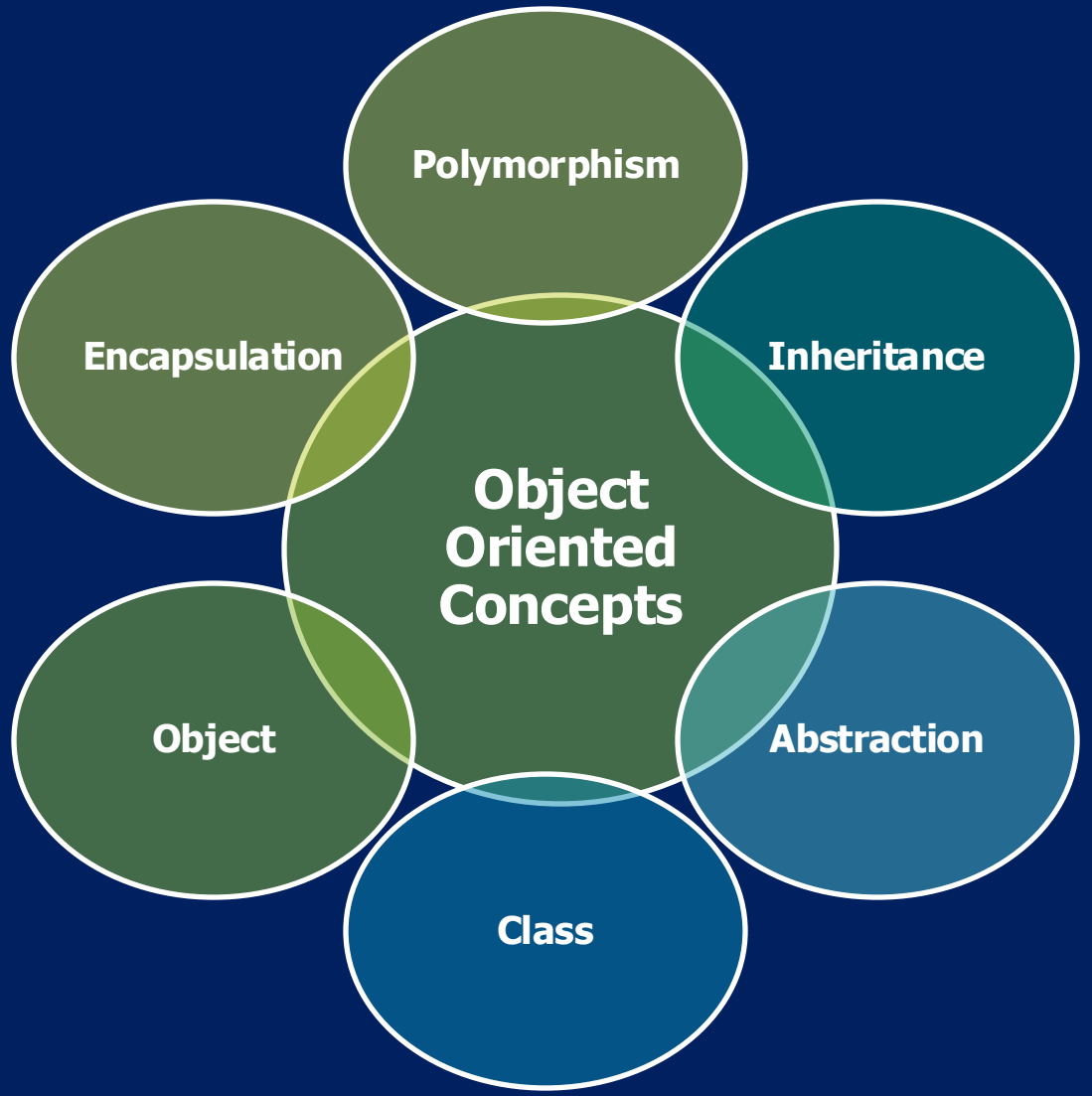
Standardization



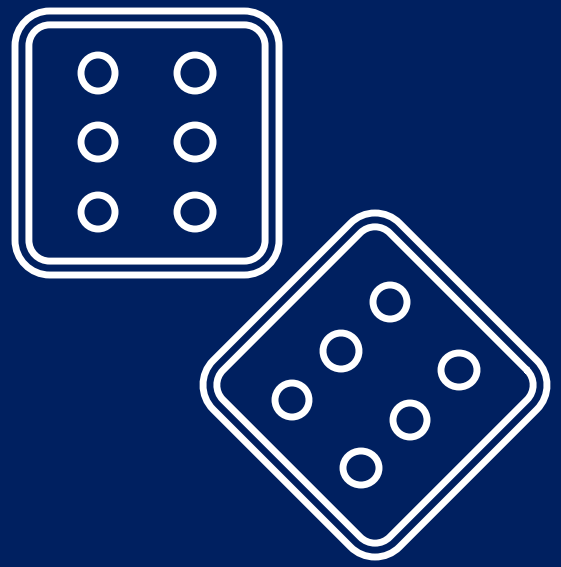
Hierarchies

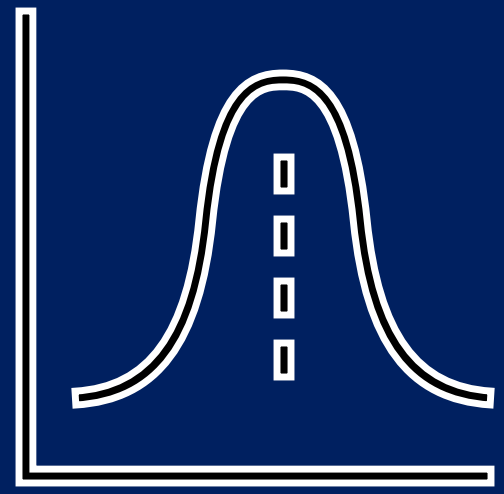


Object Oriented Approaches

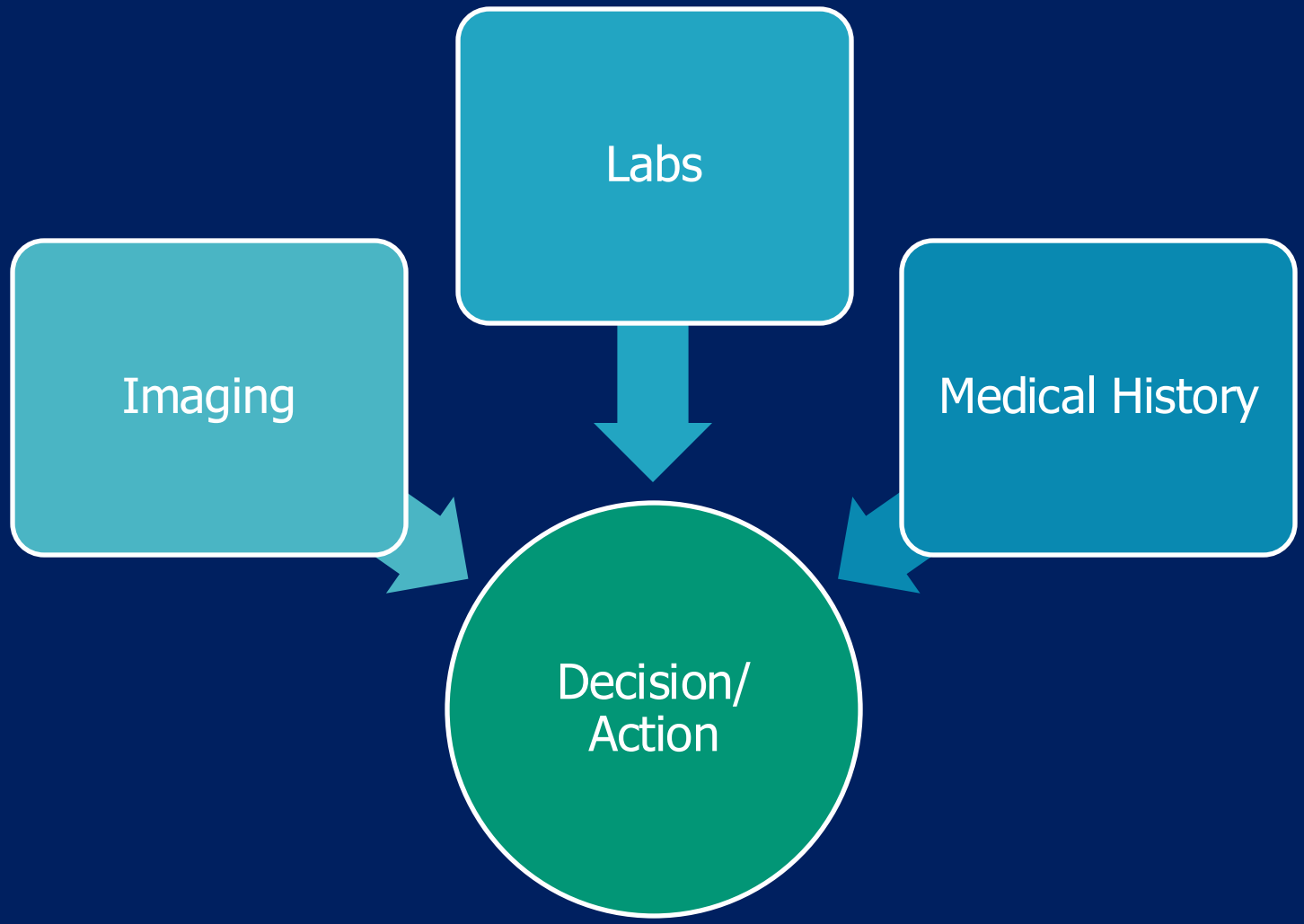


Probabilistic/Fuzzy Thinking

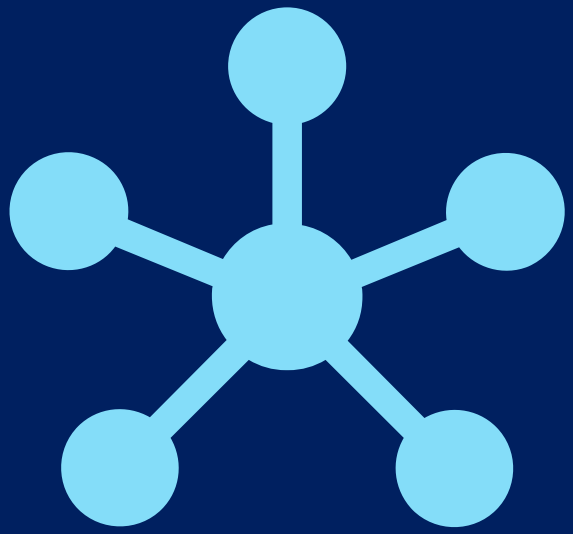




Integration/Synthesis



Interaction/Networks



Interfaces

Takeaway Points

Information Management is central to delivering high quality care

Informatics is a bridge discipline

Conceptual themes stretch across all of informatics

Questions