

Healthcare Informatics

Foundations, Scope, and Strategic Value

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MHA 621
Healthcare Informatics

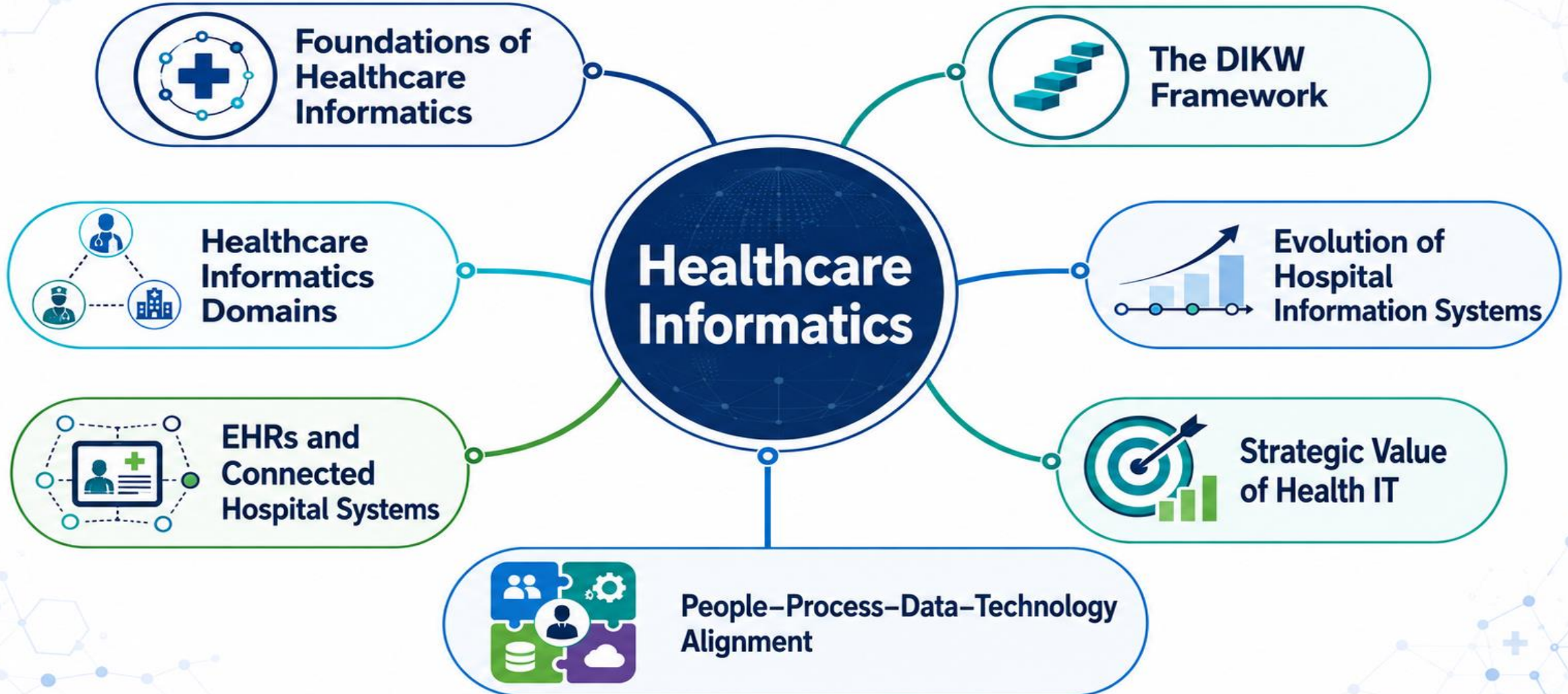
Lecture 1



Intended Learning Objectives

- **By the end of this lecture, you should be able to:**
- 1. Define healthcare informatics.**
 - 2. Explain how data become useful decisions.**
 - 3. Identify the main healthcare informatics domains.**
 - 4. Describe the main hospital information systems.**
 - 5. Explain the strategic value of health information technology.**

Lecture Roadmap



Abbreviations Used in the Lecture

DIKW

— Data–Information–Knowledge–Wisdom

EHR

— Electronic Health Record

EMPI

— Enterprise Master Patient Index

HIE

— Health Information Exchange

Health IT

— Health Information Technology

HIMSS

— Healthcare Information and Management Systems Society

HIS

— Hospital Information System

HITECH

— Health Information Technology for Economic and Clinical Health

LAN

— Local Area Network

LIS

— Laboratory Information System

NI

— Nursing Informatics

RIS

— Radiology Information System

What Is Healthcare Informatics?

- Healthcare informatics is the use of data, information, knowledge, people, and technology to improve healthcare. It combines:
- Healthcare knowledge
 - Information science
 - Computer technology
 - Healthcare informatics studies how information is collected, organized, shared, and used to support better healthcare decisions.

What Is Health Information Technology?

- **Health Information Technology (Health IT)** means the electronic systems and tools used to collect, store, process, share, and use health information.
- **Examples include:**
 1. Electronic health records
 2. Laboratory systems
 3. Pharmacy systems
 4. Patient portals
 5. Healthcare dashboards
 6. Healthcare informatics is the wider field. Health IT includes the technological tools used within that field.

Healthcare Informatics Is More Than Technology

- A computer system alone cannot improve healthcare.
- Healthcare informatics brings together:
 - **People:** patients, clinicians, and managers
 - **Processes:** the steps followed during healthcare work
 - **Information:** meaningful healthcare facts
 - **Technology:** the tools that manage information
- All four parts must work together.

Why Healthcare Informatics Is Needed

- **Healthcare produces large amounts of data every day.**
- **Examples include:**
 - **Patient information**
 - **Diagnoses**
 - **Medication orders**
 - **Laboratory results**
 - **Nursing assessments**
 - **Without informatics, these data may remain scattered and difficult to use. Informatics turns them into information that supports healthcare decisions.**

The DIKW Framework

- The **Data–Information–Knowledge–Wisdom (DIKW) framework** explains how basic facts lead to good decisions.
- **The four levels are:**
 1. **Data:** basic facts
 2. **Information:** organized facts with meaning
 3. **Knowledge:** understanding the information
 4. **Wisdom:** using knowledge to make a decision
 - **Data → Information → Knowledge → Wisdom**

1. Data

- **Data** are basic facts, measurements, or observations.
- **Examples:**
 - **Temperature:** 39°C
 - **Heart rate:** 120 beats per minute
 - **Blood pressure:** 85/55 millimetres of mercury
 - **Blood glucose:** 300 milligrams per decilitre
- **A single data item may not explain the whole situation. Data must be accurate, complete, and connected to the correct patient.**

2. Information

- Information is created when data are organized and placed in context.
- Example:
 - **Data:** temperature 39°C, heart rate 120, and low blood pressure.
 - **Information:** the patient has fever, a rapid heart rate, and low blood pressure at the same time.
- Information helps answer:
 - What happened?
 - When did it happen?
 - Is the patient improving or becoming worse?

3. Knowledge

➤ **Knowledge means understanding the importance of information.**

➤ **Example:**

- A healthcare professional knows that fever, a rapid heart rate, and low blood pressure may indicate a serious infection.

➤ **Knowledge comes from:**

- Education
- Clinical experience
- Research evidence
- Clinical guidelines

4. Wisdom

- **Wisdom means using knowledge correctly in a real situation.**
- **Example:**
 - The healthcare team recognizes that the patient may be seriously ill, assesses the patient, informs the responsible clinician, and starts appropriate care.
- **Wisdom requires:**
 - Understanding the patient's condition
 - Considering risks and benefits
 - Selecting the right action
 - Acting at the right time
- **Technology supports wisdom but does not replace human judgment.**

Complete DIKW Example

➤ Consider a hospitalized patient:

1. **Data:** oxygen saturation is 86%.
2. **Information:** it has fallen from 96% to 86%.
3. **Knowledge:** the patient may not be receiving enough oxygen.
4. **Wisdom:** assess the patient and begin the required response.
 - The system may record the value, show the trend, and produce an alert.
 - The healthcare professional must make the final clinical decision.

Main Domains of Healthcare Informatics

➤ The main domains include:

- Clinical informatics
- Nursing informatics
- Pharmacy informatics
- Public health informatics
- Administrative informatics

➤ They have different areas of focus, but all use information and technology to improve healthcare.

1. Clinical Informatics

- **Clinical informatics** applies information and technology to direct patient care.
- **It may support:**
 - **Electronic clinical documentation**
 - **Medication and laboratory orders**
 - **Test-result review**
 - **Clinical alerts**
 - **Communication among care-team members**
 - **Clinical informatics is used by physicians, nurses, pharmacists, and other healthcare professionals.**

2. Nursing Informatics

- **Nursing Informatics (NI) combines:**
 - Nursing science
 - Information science
 - Computer science
- Its purpose is to manage and communicate data, information, knowledge, and wisdom in nursing practice.
- NI supports patients, nurses, other professionals, and healthcare leaders.

2. Nursing Informatics

What Nurse Informaticists Do

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- A nurse informaticist connects nursing practice with technology.
- Major responsibilities include:
 - Studying nursing workflows
 - Designing electronic nursing documentation
 - Supporting system implementation
 - Training nurses
 - Improving system use and patient safety

The nurse informaticist acts as a translator between clinical users and technology specialists.

3. Pharmacy and Other Clinical Informatics Areas

Chapter

01

- Pharmacy informatics supports the safe and effective use of medications.
- Examples include:
 - Electronic medication orders
 - Medication databases
 - Allergy and interaction alerts
 - Automated dispensing systems
 - Electronic medication administration records

Other informatics areas support laboratory, radiology, surgery, and rehabilitation services.

4. Public and Consumer Health Informatics

- **Public health informatics uses information to improve the health of populations. Examples include:**
 - Disease surveillance
 - Outbreak monitoring
 - Vaccination records
- **Consumer health informatics supports patients through:**
 - Patient portals
 - Mobile health applications

5. Administrative Informatics

- Administrative informatics supports the management of healthcare organizations.
- Important applications include:
 - Patient registration
 - Appointment scheduling
 - Billing and insurance claims
 - Staff scheduling
 - Inventory control

Clinical and administrative systems should work together to support the whole organization.

Early Hospital Information Systems

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➤ **In the 1960s, hospitals with computers usually used large mainframe computers. These computers were:**

- Large
- Expensive
- Centrally controlled
- Shared by many users

Hospitals often used one central **Hospital Information System (HIS)**, mainly for registration, billing, and patient accounts.

Departmental Systems and Best of Breed

- During the 1970s, hospital departments began using their own specialized systems.
- Examples included:
 - Laboratory Information System (**LIS**)
 - Radiology Information System (**RIS**)
 - Pharmacy information system
- Using different specialized systems is called a best-of-breed architecture.
- Its main challenge is making the separate systems communicate correctly.

Personal Computers and Connected Systems

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➤ Personal computers became more common during the 1980s.

➤ They were:

- Smaller
- Less expensive
- More available
- Easier to use in hospital departments

Local Area Networks (LANs) connected computers within the same organization. This supported the development of many connected hospital systems.

Why Paper Records Were Not Enough

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01

- **Paper records created important problems:**
 - Records could be missing or difficult to find.
 - Handwriting could be unclear.
 - Only one person might use a record at a time.
 - Information was difficult to search and analyze.
 - Information could not easily be shared between organizations.
- **These limitations encouraged the development of electronic patient records.**

Patient Safety as a Major Driver

Chapter

01

- Preventable healthcare errors showed the need for safer systems.
- Major examples included:
 - Medication-related harm
 - Incorrect blood transfusions
 - Patient falls
 - Mistaken patient identity
 - Failures in communication
- Health IT became important for improving communication, detecting risks, and supporting safer decisions.

Payment Reform and Efficiency

Chapter

01

- **Changes in payment methods encouraged hospitals to use information systems.**
- **Hospitals needed better information to:**
 - Control costs
 - Monitor resources
 - Measure performance
 - Improve efficiency
 - Meet reporting requirements
- **Health IT connected clinical activities with operational and financial results.**

Growth of Electronic Health Records

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01

- An Electronic Health Record (EHR) is an electronic collection of a patient's health information that supports care over time.
- In the United States, the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 encouraged the use of certified EHR systems.
- According to the textbook, hospital EHR adoption in the United States increased from about 9% in 2009 to more than 95% in 2017.

Main Functions of an Inpatient EHR

➤ An inpatient EHR may support:

- Clinical and nursing documentation
- Medication and test orders
- Laboratory and imaging results
- Clinical alerts
- Admission and discharge information

➤ The EHR gives different healthcare professionals access to a shared patient record.

How Can Health IT Create Value in Healthcare?



What Does Value Mean?

- In healthcare, value means achieving better results from the resources used.
- Value may include:
 - Better clinical outcomes
 - Fewer errors
 - Faster services
 - Lower unnecessary costs
 - Better patient experience
- Value should be measured. It should not be assumed simply because a system has been installed.

1. Improving Quality and Safety

- **Health IT may improve quality and safety by:**
 - Making patient information easier to access
 - Supporting correct patient identification
 - Providing medication-allergy warnings
 - Showing abnormal results
 - Identifying high-risk patients
- **Poorly designed technology may create new risks. Therefore, systems must be monitored and improved.**

2. Improving Efficiency

- **Efficiency** means reducing wasted time, effort, and resources while maintaining quality.
- **Health IT may improve efficiency through:**
 - Faster information retrieval
 - Less repeated data entry
 - Electronic ordering
 - Faster reporting of results
 - Better patient scheduling
- **Automation should reduce unnecessary work without removing human judgment.**

3. Improving Financial Performance

- **Health IT may improve financial performance by:**
 - Supporting correct billing
 - Reducing unnecessary tests
 - Reducing preventable harm
 - Improving patient flow
 - Supporting better use of resources
- **Example:** A hospital that uses a predictive model to reduce the number of emergency patients who left before being seen. This improvement may recover important revenue.

4. Patient Engagement and Technology-Enabled Care

- **Patient engagement** means involving patients as active partners in their care.
- **Technology may help patients:**
 - Access their health information
 - Review test results
 - Communicate with the care team
 - Monitor health measurements
 - Take part in shared decisions
- **Telehealth** provides healthcare from a distance using communication technology.

Health IT Maturity

- **Health IT maturity** describes how far an organization has progressed in using technology effectively.
- The **Healthcare Information and Management Systems Society (HIMSS)** developed maturity models that:
 - Include eight stages, from Stage 0 to Stage 7.
 - Measure an organization's current level.
 - Guide future improvement.
 - Examine areas such as electronic records and analytics.
 - Are not tied to one technology vendor.
- **Stage 7 represents highly advanced and integrated technology use.**

Technology Alone Does Not Create Value

- Technology alone does not improve healthcare.
- Value requires alignment between:
 1. **People:** users must understand and accept the system.
 2. **Processes:** workflows must be safe and effective.
 3. **Technology:** systems must be suitable and reliable.
 4. **Data:** information must be accurate and usable.
 5. **Leadership:** goals and responsibilities must be clear.
- Healthcare technology is a **sociotechnical system** because people, work processes, and technology affect one another.

Wrap up

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1. Healthcare informatics combines healthcare, information, people, processes, and technology.
2. The **Data–Information–Knowledge–Wisdom (DIKW)** framework explains how facts become decisions.
3. Hospitals use connected clinical, departmental, and administrative systems.
4. Health IT can improve quality, safety, efficiency, and financial performance.
5. Technology produces value only when it is correctly connected with people, processes, data, and organizational goals.



Thank You