

Perspective of IT in Hospital Information System

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1. Introduction:

The main objective of this presentation is to explain the role of Information Technologies (IT) in managing the Hospital Information System (HIS). As an area of medical informatics, the aim of an **HIS** is to achieve the best possible support of patient care and administration by electronic data processing. The information that is readily accessible, timely, complete, accurate, legible, and relevant is critical to health care providers for efficient patient care. In order to provide quality care cost containment, and ensure adequate access, the need for comprehensive information is much greater than today. The demand for information has increased due to unprecedented advances in information technology.

2. Information Technology: the term describes the combination of computer technology (hardware and software) with data and tele-communication technology (data, image, and voice networks)

2.1 Hospital: is an institution suitably located, constructed, organized, managed and personnel led to supply scientifically, economically efficiently and un-hindered, all or any recognized part of the complex requirements for the prevention, diagnosis and treatment of physical, mental and the medical aspect of social illness; with functioning facilities for training new workers in the many special professional, technical and economic fields essential to the discharge of its proper functions and with adequate contacts with physicians, other hospitals, medical schools and all accredited health agencies engaged in the better health program.

2.3 Information System: is an arrangement of information (data), processes, people, and information technology that interacts to collect, process, store, and provide a output the information needed to support organization.

3. Hospital is an institution for the medical, surgical, obstetrics, or psychiatric care and treatment of patients. It is an institution for health care providing treatment by specialized staff and equipment, and often but not always providing for longer-term patient stays.

3.1) Main function of the Hospital information system is to:

- Establish administrative control over functional activities
- Preparing operating budget
- Report generation for government and other agencies.
- Distribution of expenses while computing the cost of operations
- Planning of additional facilities, staff, equipment, training programs and quality of patient care.

3.2) who works in the hospital?

- Medical (Physicians, surgeons, Anesthetist, Pathologist, Micro-biologist, Radiologist)
- Nursing (Education, Quality assurance, Infection, Administration)
- Para-medical (physiotherapist, Occupation, Lab – Technicians, Radiographers, etc)
- Pharmacy dept staff; Dietary dept. staff;
- Support services (CSSD, House keeping, Laundry, Biomedical, Maintenance)
- Admin (HR), Finance, and HID.

3.3) what work is done in the Hospital?

- Care of Sick / Injured
- Conduct Medical Education
- Medical research and
- Other functions
- ✓ Demographic information
- ✓ Patient History
- ✓ Physical examination

- ✓ Progress notes
- ✓ Problem list
- ✓ Investigation
- ✓ Diagnosis
- ✓ Consultation
- ✓ Treatment –Medical and Surgical and end
- ✓ Results

3.4) why this kind of work is done?

When a patient is admitted in the hospital for any treatment, the following information is collected and documented in the record to provide effective and efficient care.

3.5) where is the work done?

Out-Patient clinics, ER, In-Patient wards, ICU, CCU, NICU,

3.6) when is the work done?

Whenever a person is sick / injured admitted to the hospital, depending on the condition of the patient, the necessary treatment is provided by the physician in order to get the patient condition stable i.e. in the OP, ER or IP.

3.7) how is the work done?

All the work is done by using the:

- ❖ Hospital infrastructure (OP, ER, IP)
- ❖ Building and Medical Equipment
- ❖ Expertise (Doctors, Surgeons, Nursing staff & Other staff)
- ❖ Support services etc.

3.8) Problems in Paper-Based Medical Records:

Primarily paper-based medical record system, in which information is often

Incomplete, illegible, or unavailable with minimal record security.

Lack of high quality healthcare information

Poor quality documentation

Patient safety affected lack of misinterpretation and incomplete information

Insufficient interoperability

Public safety a major component of public health is diminished by the inability to collect information in a coordinated, timely manner at the provider level in response to epidemics and the threat of terrorism.

Continuity of patient care: is adversely affected by the lack of shareable information among patient care providers.

Clinical research and outcomes analysis is adversely affected by a lack of uniform information capture that is needed to facilitate the derivation of data from routine patient care documentation.

- Slow work flow / rate
- In-accuracy
- Retrieval of data and information is difficult
- Information is dis-integrated
- Duplication of investigation, medication and efforts
- Man power is more
- Cost is more
- Difficult in accessing comprehensive information
- Decision making becomes slow and poor
- Information is incomplete
- Illegible or unavailable
- Complete output or treatment of a patient gets slow and poor.

4. Information Technology:

4.1 Computerized Patient Records:

Health care industry is one of the most information intensive and technologically advanced in our society. Thus, the information should be accessible easily, timely, complete, accurate, reliable and relevant information in making important strategic or patient care decisions.

The end objective of medical informatics is the integration of data, knowledge, and tools necessary to apply that data and knowledge in the decision-making process associated with patient care. The focus on the structures and algorithms necessary to manipulate the information separates medical informatics from other medical disciplines where information content is the focus.

To be more precise, the entire hospital system that is being practiced with the manual system has to be completely transformed into electronic by using the latest information technology for example; HIS which contains the domain functionality; flowcharts, screens, database that are developed, tested and produced as application software for implementation in order to convert a hospital into a computerized format.

Application Domain: The application layer to include: Patient management, Medical care, Nursing, Medical support, Administrative, Ancillary services. The information Bus deals with services. The middleware layer should include: Authorization component, Patient component, Activity component, Resource component, and Healthcare record and Knowledge component. The persistent layer related to Images, Bio-signals, alphanumeric data, Web pages.

While developing the electronic hospital information system, in order to achieve inter-operability, portability and data exchange health care information system must apply standards. Some of the standards are as follows:

ISO; HL7; HIPAA; ICD; PACS; DICOM; ASTM; SNOMED; CPT, etc

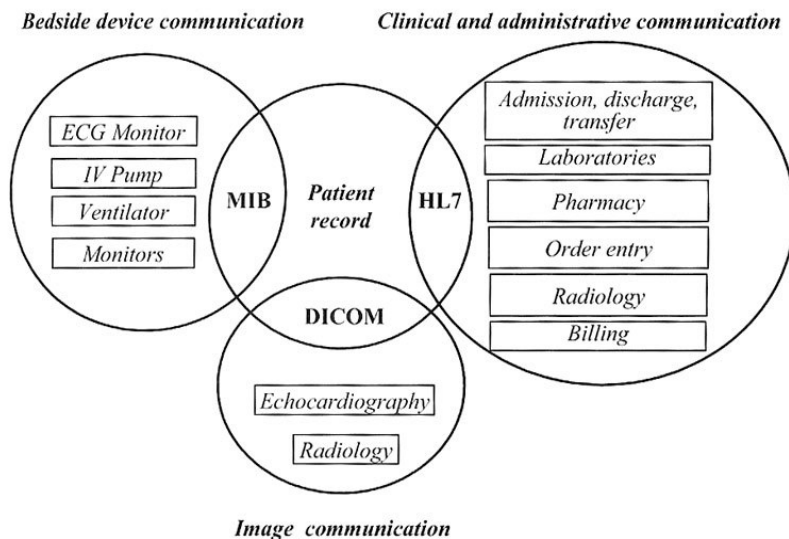


Figure 3.3: Standards dealing with data exchange in a healthcare setting: HL7, MIB, and DICOM.

The Health Information Portability and Accountability Act (HIPAA), the USA federal legislation that includes provisions to protect patient's health information from unauthorized disclosure, and to maintain Security, Privacy and Confidentiality of patient information. HIPAA standards have become almost international standards.

4.2 The software developed should include the following clinical alert and reminding system.

- i) Clinical alerts reminding system.
 - Drug – Drug; Drug -- Laboratory; Drug – Pregnancy;
 - Drug – Condition; Drug – pediatric; Drug – Duplication
- ii) Reminding

4.3 Passive Storage: Electronic Medical Record (EMR): Up until this point the medical record has served as a passive storage device while the EMR as an active tool that can provide the clinician with decision-support capabilities and access to knowledge resources, reminders, and alerts.

4.4 Signal processing (EEG, EMG, ECG)

Computers are useful devices for processing electrical signals from various sources, such as ECG for detection of heart dysrhythmias and EEG for analysis and detection of spike and sharp waves that can sometimes be missed by the neurologist.

4.5 Image Processing

Image processing (radiography, US, CT scanning, MRI/MRA, SPECT/PET scanning, cerebral angiography)

Image processing and pattern recognition are important fields in medical informatics, specifically in neuroinformatics as an emerging domain for CT scanning, MRI of the brain, and other new techniques such as SPECT and PET scanning and functional MRI (fMRI). For example, processing of spatially distributed patterns of brain activation in fMRI data sets using computerized analysis helps determine pathophysiology of many neurologic disorders and define functional structures of the brain.

For example, EMG expert systems such as EMG Assistant can help electromyographers through a sophisticated analysis of the input data and provide them with the most likely diagnosis that objectively best explains the findings. These programs can help doctors understand the readings as they develop the field experience to analyze the data themselves

4.6 Core functions: The 8 core functions that an EMR software system should have:

- Health information and patient data
- Computerized order management
- Laboratory results management
- Decision support system
- Electronic communication and connectivity
- Patient support and education
- Administrative processes
- Reporting

Additionally, the following functionalities help better adoption of the EMR by physicians:

- Transition or flexibility in moving from desktop to handheld computing devices
- Structured data entry to accommodate the diversity of specialized care
- Options to express findings and conclusions in free text or definition of normal
- Graphical data entry for body maps and radiology images
- Automatization and improvement of transcription and upload process
- Enhancement of faxback service and upgrade to electronic file transfer or Web access service
- Enhancement of decision support systems and implementation of artificial intelligence such as drug interaction service and various clinical guidelines

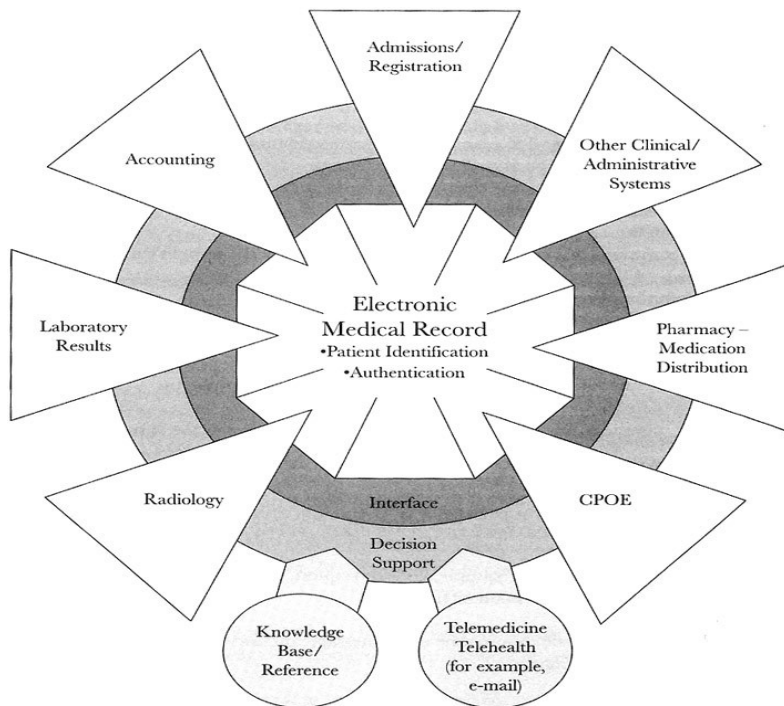
4.7 Decision Support System:

Decision support systems are real-time computerized algorithms that help physicians in their clinical practice. For example, when clinicians perform a task (e.g., order entry) using the EHR, they are warned if the task appears to be inappropriate on the basis of patient data. The system presents this warning automatically using consensus-based clinical decision support "rules" that are derived from medical knowledge (or financial data) and patient-specific information.

4.8 Provider Order Entry Systems:

Computer-based provider order entry (CPOE) systems help in improving the quality of patient care and reducing the costs. Studies have shown that CPOE system lead to better accuracy and completeness of medical orders, which in turn lead to reduced lengths of stay and costs and allow fast transmission of orders, legibility, and on-line tracking of the life cycle of an order.

FIGURE 5.9. EMR: THE HUB OF CLINICAL INFORMATION SYSTEMS.



5. Requirements for the Implementation of EHR Systems:

The transition from handwritten paper medical records to electronic health records is basically linked to the following challenging issues.

The development of a (standard) healthcare record structure within healthcare organization

Merging the EHR component with other health information system components

A common medical terminology; to avoid incompatibilities and to guarantee the consistency, reusability, and sharability of the different components of a larger system.

The increased availability of communication facilities to internal and external healthcare providers (e.g., GPs, other healthcare organizations).

An adequate formalization of medical knowledge to accommodate users with more intelligent features.

The availability of an audit trail to facilitate the detection of data alteration and to address potential security violations

Scalability: Multidisciplinary institutions require an HER system that can readily scale as the institution grows while maintaining local ownership of data.

The automatic availability of a central comprehensive information responsibility for healthcare policymakers (providers, hospital managers) to define future policies by analyzing the past on several levels.

6. Internet and Web-based Medical Communication:

The Internet is a means to improve health and health care delivery, its full utilization is not clear.

An increasing proportion of the public is using the Internet for health information. The advantages of the Internet as a source of health information include convenient access to a massive volume of information, ease of updating information, and the potential for interactive formats that promote understanding and retention of information. Health information on the Internet may make patients better informed, leading to better health outcomes, more appropriate use of health service resources, and a stronger physician-patient relationship.

More-informed patients often have a more favorable prognosis, and doctors can help make patients better informed by supplying reliable Internet sites.

In conclusion, the Internet and Web has had important impact in the practice of medicine. Physicians need to know the importance of this media and how to use it in a pragmatic and efficient way. They can have easy access to clinical guidelines, journal contents, and reference textbooks and even provide patients with educational materials. Physicians will be able to obtain information on state-of-the-art conferences and have direct communication with other physicians and specialists or practice telemedicine, thereby expanding the depth and extent of medical knowledge and providing better diagnosis and patient care.

7. Advantages of using Information Technology:

Information is available to patient and authorizes persons anytime and anywhere.

Information sharing for integrated health care.

Best practice in medicine.

Prompt in getting investigation results such as lab, radiology images, ECG images, etc.

Manual power is decreased and hence less prone to errors.

Eventually:

Improve cost control,

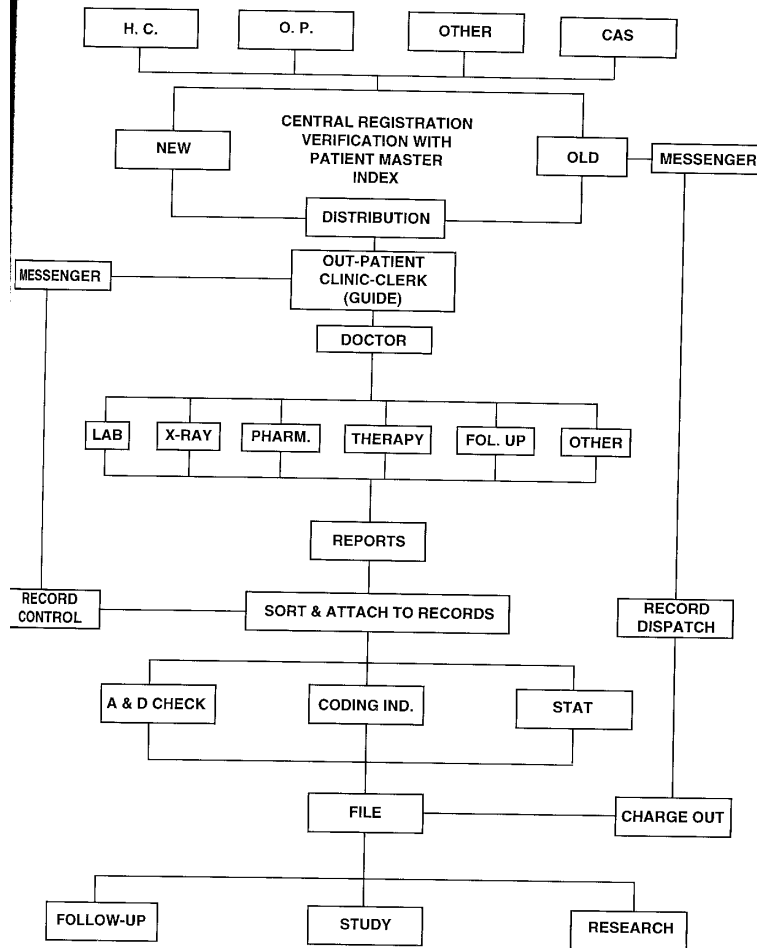
Increase the timeliness and accuracy of patient care and administration information,

Increase service capacity,

Reduce personnel costs and inventory levels, and

Improve the quality of patient care.

OUTPATIENT RECORD FLOW AND PROCESSING



IN-PATIENT TRAVEL FOR SERVICE

