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**Health Informatics**

Application in Healthcare and Hospitals.

**INTRODUCTION**

The field of health informatics is relatively young if compared to other fields of medicine but its impact on healthcare and hospitals is relatively high. In todays technology friendly environment healthcare professionals are also encountered with computer applications to a large extent. But health informatics is not only limited to the application of computers but it involves processing of large information related to healthcare and hospitals. Health informatics not only help healthcare professionals to provide better care but also help in cost reduction, process optimisation and better adaptation to changing patient needs. Health informatics have potential to reshape the way we cater our patients and deliver care to meet demands of the increasing future population.

Health informatics is a multi-disciplinary field which includes intersection of information science, computer science, and health care. Health informatics is growing at a rapid pace and will continue to grow well into the future. Students must be introduced to the definitions and concepts of knowledge hierarchy: data, information, knowledge and wisdom, and the building blocks of Health Informatics: algorithms, medical decision-making, and clinical process modelings etc . This is clear that application of health informatics is wide it can be used in :

1. Improvement of Patients Portals
2. Creating cloud based healthcare systems
3. Making personalised care plans
4. Develop new medical technology
5. Improve efficiency of healthcare systems
6. Proper implementation of HMIS ( Hospital Management Information System)
7. Centralising Medical records
8. To support Digital health mission in India or developing countries

**DEFINITION OF HEALTH INFORMATICS**

Healthcare is a information intensive field where lot of data is generated on a daily basis. Imhoff (2001) defined “Health informatics as the development and assessment methods and systems for the acquisition, processing and interpretation of patient data with the help of knowledge from scientific research.”

As discussed, earlier Health informatics is an emerging branch of healthcare with no firm boundaries but the information processes and applications in various domains of healthcare define its scope. These processes and types encompass a broad spectrum of clinical, administrative, and managerial functions, for example, Clinical decision support systems (CDSS) are new logical extensions of the electronic health record, perhaps using Internet protocols to deliver historical and current information to plan treatment, maximize resource use and cost procedures (Norris 2002).

Medical information

Technology

Bernstam (2010) quoted several definitions of health informatics which are frequently cited:

• “science of information, where information is defined as data with meaning. Biomedical informatics is the science of information applied to, or studied in the context of biomedicine. Some, but not all of this information is also knowledge”o

• “scientific field that deals with resources, devices and formalised methods for optimising the storage, retrieval and management of biomedical information for problem solving and decision making”

• “application of computers, communications and information technology and systems to all fields of medicine - medical care, medical education and medical research

**HISTORY OF HEALTH INFORMATICS**

Information technology has been pervasive in the field of Medicine for only about three decades but its roots began in the 1950s(Sabbatini2013). Since the earlier days we have experienced advances in technology, to include, personal computers, high resolution imaging, the internet, mobile technology and wireless, and there impact on healthcare. In the beginning there was no strategy or vision as to how to advance healthcare using information technology. Now, we have the involvement of multiple federal and private agencies that are plotting future healthcare reform, supported by health information technology. The following are some of the more noteworthy developments related to health information technology:

1. Computer
2. Internet
3. Mobile technology
4. EHR
5. Artificial Intelligence

**SIGNIFICANCE**

The health informatics have 3 basic components Data , information and knowledge. The significance of health informatics is as follows

1. Health informatics helps to understand complex medical information and keep the data updated.

2. Make it easy to retrieve data and keep the information error-free.

3. Health informatics help to adapt clinical knowledge to the individual circumstances of patients

4. Structure and communicate messages in a manner

5. Health informatics makes it easy to search for information that is free from errors and is reliable as it is based on statistical and scientific evidence.

6. Health informatics store clinical data in a quantifiable form and make it easy to store, interpret and use in future clinical decision-making,

**USES OF HEALTH INFORMATICS**

Healthcare is a multi-dimensional system.  The aim of this is the prevention, diagnosis, and treatment of health-related issues or impairments in patients. In the healthcare system, there are various health professionals (physicians or nurses), health facilities (clinics, hospitals for delivering medicines and other diagnosis or treatment technologies), and a financing institution. Health professionals belong to various health sectors like dentistry, medicine, midwifery, nursing, psychology, physiotherapy, Laboratory and many others. Healthcare is required at several levels depending on the urgency of the situation. In the healthcare industry, various sources for big data include hospital records, medical records of patients, results of medical examinations, and devices that are a part of the Internet of Medical Things. Biomedical research also generates a significant portion of big data relevant to public healthcare. This data requires proper management and analysis in order to derive meaningful information. Health informatics emphasises information brokerage; the sharing of a variety of information back and forth between people and healthcare entities. Examples of medical information that needs to be shared include: lab results, x-ray results, vaccination status, medication allergy status, consultant’s notes and hospital discharge summaries. Medical informaticians harness the power of information technology to expedite the transfer and analysis of data, leading to improved efficiencies and knowledge.

**IMPLEMENTATION OF HEALTH INFORMATICS**

Doing A SWOT analysis before the implementation of health informatics can be an important part of the implementation process. It will help in Looking at this issue more deeply, it is clear that safe and effective design, development, implementation, and use of various forms of health IT require shared responsibility. To design a robust health informatics system in healthcare domain it is mandatory to identify changing requirements of stakeholders and incorporate recent advancements like artificial intelligence into this field. This will empower patients to gain more reliable health information and also improve quality of care delivered to them. Hospital administrators will be empowered by this technology because now they will be able to decentralise planning and management but at the same time they will be able to keep a track on the work.Multiple domains can be covered under health informatics such as Applied health informatics, Nursing Informatics,bioinformatics and Public Health informatics. Patients are the main beneficiaries of successful implementation of health informatics as they can now use healthcare facilities to full extent. They can make online appointments, get reminders about appointments, checking lab results online and they can easily retrieve health information. Use of social media platforms is also increasing various hospitals and healthcare professionals do live session on their social platforms and educate people. Doctors, Nurses and other support staff is also benefited with this in many ways listed in table 1.

Public health professionals are also benefited as data sources are available to them easily and they are reliable. Surveillance of disease becomes easily as there can be real time data generation and analysis.

|  |  |
| --- | --- |
| Various Data sources  | Clinical data Administrative data Financial data Geographic data  |
| Extraction  | Extract Organise Match Analyse  |
| Statistical processing  | Machine learning Artificial Intelligence Statistical tools (SPSS) |
|  output | Reports Article Case study  |

Steps in Analysis of data

| S.N | Stakeholders  | Benefits of health informatics  |
| --- | --- | --- |
| 1 | **Patients**  |  • First and Biggest beneficiary they can do Online searches for health information and can chose physician, hospital or insurance plan• Smartphone technology for reminders, health and fitness apps, internet access, etc.• Web portals for storing personal medical information, making appointments, checking lab results, e-visits, drug refills, etc.• Online patient surveys• Online chat, blogs, podcasts, live conferences and support groups and Web 2.0 social networking sites. • Personal health records (PHR). • Telemedicine and home tele-monitoring |
| **2** | **Physicians and Nurses** | • Patient web portals for easy access , secure e-mail and e-visits, etc • Physician web portals• Clinical decision support, e.g. reminders and alerts• Electronic medication administration record (eMAR) and bar coding medications• Electronic health records (EHRs)• Smartphones loaded with medical softwareand remote access to EHRs• Telemedicine • Online continuing medical education (CME) • Electronic prescribing• Disease registries |
| **3** | **Support Staff** | • Patient enrolment becomes easy • Electronic appointments are more accurate • Electronic coding and billing methods improve • EHRs• Web-based credentialing• Web-based claims clearinghouses• Telehomecare monitoring• Practice management software• Online educational resources and CME• Disease registries |
|  |  |  |
| **4** | **Public Health** | • Incident reports are generated on time • surveillance program become easy and Meaningful.• Establish link to all public health departments• Telemedicine• Disease registries as part of EHRs or healthinformation exchanges• Remote reporting using mobile technology |
| **5** | **Hospitals** | • Electronic health records• Electronic coding and billing ICD • Information systems to monitor outcomes, length of stay, disease management, etc.• Wireless technology• E-intensive care units (eICUs)• Patient and physician portals for easy information access • E-prescribing• Telemedicine |
| **6** | **Insurance Companies** | • Electronic claims transmission became easy• Trend analysis through data analytics• Physician profiling• Information systems for quality improvement initiatives• Monitor adherence to clinical guidelines• Monitor adherence to preferred formularies• Promote claims-based personal health records and information exchanges• Reduce litigation by improved patient safety through fewer medication errors |

Table 1. Various stakeholders and benefits by use of health informatics

**CHALLENGES IN HEALTH INFORMATICS IMPLEMENTATION**

 Health Informatics is a complex adaptive health system approach that has the potential to improve healthcare working but also introduces unintended consequences and new challenges

**a. Financial and structural hurdles:**

 Healthcare infrastructure in developing countries is irregularly distributed and resources are very limited due to this there are difficulties in the implementation of health informatics on a grassroots level.    These issues are more prevalent in rural areas. It is to be noted that the direct cost of health informatics implementation is very high which makes long-term commitments necessary to maintain them.

**b. Ethics and Legal Issues:**

 The process of implementing Health Informatics requires new explicit and broad legal regulations. Data privacy is a crucial aspect of this Patients enrolled in healthcare systems must trust those invested with the responsibility to safeguard their personal information. The lack of needed laws could delay the start of implementations, while countries wait for a framework to implement health informatics in their healthcare systems.

**c Lack of trained staff:**

 An appropriately trained workforce is an important factor for sustained progress to be achieved. There are only a few well-trained Health informaticians, and they have an inadequate geographic distribution to meet the needs and expertise necessary for health informatics implementations

**d. Privacy concerns.**

 The Health Insurance Portability and Accountability Act (HIPAA) of 1996 was created initially for the portability, privacy and security of personal health information (PHI) that was largely paper-based. HIPAA regulations were updated in 2009, and again in 2013, to better cover the electronic transmission of PHI. This Act has caused healthcare organisations to re-think healthcare information privacy and security. This will be covered in more detail in the chapter on privacy and security. In the past few years there have been a series of privacy breaches and stolen identities in healthcare organisations,

**FUTURE TRENDS**

Given the relative newness of health informatics it is not easy to predict the future but some trends seem worth noting, healthcare delivery models such as accountable care will be an experiment well worth watching. We anticipate more patient centric medical care and associated technologies; for example, more medical apps for smartphones and personalised genetic profiles. Mobile technologies will continue to be an important medical platform for patients and clinicians. Research in health informatics is being published at an increasing rate so hopefully new approaches and tools will be evaluated more often and more objectively. We can expect more artificial intelligence in medicine which will help to improve the quality of care and improve health informatics data.

There can be multiple advantages of using Health informatics technology for your healthcare needs, but nothing is perfect in life, certainly not a budding form of technology that has yet to reach its maximum potential. We have to be careful and ensure proper data protection systems while opting for health informatics and other such technologies.

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