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Medical Informatics- Exchange of Clinical Knowledge and Interoperability for Better Healthcare

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Abstract

Medical Informatics incorporates the utilization of informatics tools and softwares for processing of data derived from clinical medicine. It is the discipline of exploration, storage, navigation, monitoring and amalgamation of medical information aimed to improve health care system for better care of the patients.

Key Words: Teledermatology, Teleopthalmology, Teleobstetrics, Telepathology, Teleoncology.

Introduction

Medical informatics is an emerging informatics discipline that is based on the employment of information technology tools for the management of medical information (Musen and Jan 1997). It enables to store, evaluate, manipulate medical data to assist in comprehending human health related issues (Greenes and Shortliffe 1990). Medical informatics began in the 1950s with the arrival of computers (Collen 1986) for sharing health care information such as x-ray results, lab results, vaccination status, allergy status, consultant's notes, hospital discharge summaries between people and healthcare entities (Gardner *et al.*, 2009). Applications of Medical Informatics includes in communication such as in telemedicine (Hoffman *et al.*, 2013; Perednia

and Ace Allen 1995). Data management such as medical databases (Chen *et al.*, 2006) and Decision making such as diagnostic expert systems (Bates *et al.*, 2003).

Applications of Medical Informatics

- **Telemedicine:** With the passage of time, rapid advancement in technology has changed telemedicine into a complicated integrated system from which hospitals, homes, private clinics etc has been benefited (Roine *et al., 2001*).With the development of health apps and incipient medical contraptions ,patients can easily monitor and track their health status (Field 1996). Such as by monitoring their vitals, glucose levels, blood pressure etc without the need to go to a doctor's office (Güler *et al.*, 2002). Telemedicine is a necessity where there is shortage of quality care, constrained access to consultants/patients in remote areas (Krupinski *et al.*,2002). Examples of Telemedicine includes teledermatology (Eedy and Wootton 2001), teleopthalmology (Gonzalez *et al.*, 2001), teleobstetrics (Norum *et al.*, 2007), telepathology (Eide and Ivar Nordrum 1994), teleoncology (Allen *et al.*, 1995) etc. Some applications of Medical Informatics are enlisted in Table 1.

Table 1: Applications of Medical Informatics

Medical databases	Purposes
iHRIS	Data repository developed by IntraHealth International and set out in more than 20 countries in the world (Cline *et al.*, 2001)
HRHIS	Data repository established by University of Dar es Salaam (Tursunbayeva *et al.*, 2016)
CamBA	Repository of neuroimages (Nielsen 2004)
dcm4che	Assembly of Java applications and healthcare services (Warnock *et al.*, 2007)
Drishti	Visualization tool for viewing computer tomography data (Perdomo *et al.*, 2017)
Endrov	Image data viewer and editor (Valeri *et al.*, 2015)
GIMIAS	Based on biomedical image computing and simulation (Backhaus *et al.*, 2010)
Ginkgo CADx	DICOM viewer and dicomizer (Haak *et al.*, 2015)
ImageVis3D	Interactive visualization tool (Bíscaro *et al.*, 2016)
InVesalius	3D medical imaging rebuilding tool (Oliveira, Marcelo, *et al.*)

ITK-SNAP	Tool for 3D image triangulation, annotation, and automatic segmentation (Skounakis *et al.*, 2010)
MITK Medical Imaging Interaction Toolkit	Image processing tool (Jiang *et al.*, 2010)
OncoImmuno Quantifier	Windows app for tumor infiltrating lymphocytes quantification in standard immunohistochemical slides (Kawiak *et al.*, 2017)
Orthanc	Tool for medical imaging (Wideł *et al.*, 2016)
OsiriX	Medical viewer for Mac operating system X (Choudhri and Martin 2011)
ParaView	Visualization tool (Procter *et al.*, 2013)
3DSlicer	Platform for medical image visualization and algorithm development (Pieper *et al.*, 2006)
Voreen volume rendering engine	A library used in medical and electron data microscopy visualization (Ip 2013)
Bika	Combines web content management and workflow processing (Fearn *et al.*, 2007)
Caisis	Repository of cancer patients data (Garla *et al.*, 2011)
cTAKES (clinical text analysis knowledge extraction software)	Tool for extracting information from electronic medical record (Kato 2010)
Breathing Games	co-created games to prevent, diagnose and treat chronic respiratory diseases(Donthula and Sushmitha 2016)
Glucosio	Phone app to track glucose levels (McLoughlin *et al.*, 2006)
Medic Mobile	Server for SMS messaging, data collection, and analytics for health workers and health systems (Mondal *et al.*, 2016)
Ushahidi	Allows people to submit crisis information through electronic media (Gray and Letitia 2003)
DARE	Database of abstracts of reviews of effects (Batnitzky *et al.*, 1990)

- **Teleradiology:** It aimed to increase access to diagnosticians of x-rays (Boland 1998).it enables an easy transfer of patient's x-rays and medical records to an eligible radiologist at another location (Dongier *et al.*, 1986).

- **Telepsychiatry:** it sanctions qualified psychiatrists to provide treatment to patients remotely (Szolovits *et al.*, 1998).

Current and future scope in medical informatics

- **Medical Artificial Intelligence**: it involves with the designing of Artificial Intelligence programs that is used for the diagnosis of a disease and for its recommendations (Kulikowski 1980). Medical AI programs are based on representative models of diseases and their relationship to patients clinical manifestations (Wolfram 1995).Examples of Medical AI includes expert systems such as Internist-I/QMR- internal medicine (Graber and VanScoy 2003), Dx Iliad (Musen *et al.*, 1996), EON- guideline based therapy (Evans & Stanley 1986), MYCIN- for infectious diseases (Shortliffe 1986), ONCOCIN- support application of oncology protocols (Dogangil *et al.*, 2010) etc
- **Robotic Surgery:** Robot-abetted surgery was developed to overcome restrictions of minimally invasive surgery (Liu *et al.*, 2003). Surgeon uses a computer console to manipulate the instruments attached to multiple robot arms which translates the surgeon's movements, which are then carried out on the patient by the robot (Lin *et al.*, 2005). Robotic Surgery ensures minimally invasive surgery with increased precision and three-dimensional magnification (Székely *et al.*, 1999)
- **Virtual reality:** Computer-simulated environments allows users to interact with the computer-generated virtual environment (Hersh 2004)

Improvement in health care

Medical informatics improves patient's health care by providing managed health care systems, advanced methods with increased knowledge, maintained electronic patient records, and improved ability to self-diagnose and manage illness (Hersh 2002)

Conclusion

Medical Informatics employed computer technology in support of medical research, education and also for promoting health care delivery. The field focuses on the biomedical information, patient data, and also acquisition, storage, retrieval and optimal use of information to solve problem and decision making. The goal of medical informatics is to help health care workers improve their way of working and the outcome of their performances. Medical informatics can contribute to better outcomes in patient care and decrease the costs of health care services

through error reduction, providing patients with their needed information and supporting physicians with updated information and related knowledge.

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