Digital Imaging And Communication In Medicine (DICOM): the old, the new and the future.

Essay

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Dr. Alaa Wahba Gad El Manzalawy

Supervisors

Prof. Sameh A.Z. Hanna
Professor of Radiodiagnosis
Faculty of Medicine
Cairo University

Dr. Manal Halim Wahba
Lecturer of Radiodiagnosis
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University
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Abstract

PACS (Picture Archiving and Communication System) is an Information management system for archiving and managing images in radiology department .It is a computerized electronic system, which entirely replaces conventional x-ray and hard copy films by acquiring, archiving, transmitting and displaying digital images on a network of workstations throughout the hospital.

DICOM, which stands for Digital Imaging and Communications in Medicine, is a standard that was developed to "promote communication of digital image information, regardless of device manufacturer" within a radiological environment.

Key Words :

Compate Aided Diagnosis – Cothode Ray Tube – Altrasound .

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LIST OF ABBREVIATIONS

ACR	American College of Radiology
CAD	Computer Aided Diagnosis
CARDS	Computer Aided Radiological Decision Support System
CCD	Charged Couple Device
CD-ROM	Compact Disk-Read Only memory
CPU	Central Processing Unit
CR	Computed Radiography
CRT	Cathode Ray Tube
CT	Computed Tomography
2D	Two Dimensional
3D	Three Dimensional
Dicom	Digital Imaging and Communication in Medicine
DQE	Detective Quantum Efficiency
DR	Digital Radiography
DVD	Digital Video Disk
EMR	Electronic Medical Record
HL7	Health Level 7
HIPAA	Health Insurance Portability and Accountability Act
HIS	Hospital Information System
HTML	Hypertext Markup Lamguage
IHE	Integrated Healthcare Enterprise
IODs	Information Object Definitions
ISO	International Standards Organization
IT	Information Technology
LAN	Local Area Network
LCD	Liquid Crystal Display
MDCT	Multidetector Computed Tomography
MIP	Maximum Intensity Projection

MinIP	Minimum Intensity Projection
MRI	Magnetic Resonance Imaging
MRN	Medical Record Number
MTF	Modulation Transfer Factor
NEMA	National Electrical Manufacturers Association
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
RAID	Redundant Array of Inexpensive disks
RAM	Randon Access Memory
RIS	Radiology Information System
RSNA	Radiological Society of North America
SARS	Severe Acute Respiratory Syndrome
SCP	Service Calss Provider
SCU	Service Class User
SOP	Service Object Pair
SQL	Structured Query Lannguage
TCP/IP	Transmission Code Protocol/Internet Protocol
US	Ultrasound
WS	Workstation

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Introduction:

With the introduction of computed tomography (CT) followed by other digital diagnostic imaging modalities in the 1970's, and the increasing use of computers in clinical applications, the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) recognized the emerging need for a standard method for transferring images and associated information between devices manufactured by various vendors. These devices produce a variety of digital image formats. The American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) formed a joint committee in 1983 to develop a standard to:

— Promote communication of digital image information, regardless of device manufacturer

— Facilitate the development and expansion of picture archiving and communication systems (PACS) that can also interface with other systems of hospital information

— Allow the creation of diagnostic information data bases that can be interrogated by a wide variety of devices distributed geographically **(HL7, 2000-NEMA, 2003)**.

The digital imaging and communication in medicine (DICOM) Standard is an evolving standard and it is maintained in accordance with the Procedures of the DICOM Standards Committee. Proposals for enhancements are forthcoming from the DICOM Committee member organizations based on input from users of the Standard. These proposals are considered for inclusion in future editions of the Standard. A requirement in updating the Standard is to maintain effective compatibility with previous editions**(NEMA, 2003)**.

For example, one of the recent supplements to the DICOM standard is supplement 23 which is an introduction to the structured reporting (SR) classes **(NEMA, 2000)**, which are used for transmission and storage of clinical documents. The SR classes fully support both conventional free text reports and structured information, thus enhancing the precision, clarity, and value of clinical documentation. In addition, the SR standard provides the capability to link text and other data to particular images or waveforms and to store the coordinates of findings **(NEMA 2003-Hussein et al, 2004)**.

Also, some software tools throughout the radiology community have been extended to incorporates features of a DICOM viewer. For example, the Microsoft power point. Although PowerPoint has become a ubiquitous presentation tool in medical imaging, it does not support the Digital Imaging and Communications in Medicine (DICOM) standard. Users must go through a laborious conversion process that includes guessing the appropriate brightness and contrast to convert 16-bit DICOM images into 8-bit formats. A PowerPoint add-in was developed that incorporates features of a DICOM viewer into a presentation. Users can interactively manipulate large series of 16-bit images in stack mode with scroll, crop, zoom, and window width and level functions, as well as sort through images by location or series. Multiple DICOM image series can be placed on a single slide, and one can interactively scroll through stacks of images during a presentation to demonstrate imaging findings. The problem created by the varying contrast and brightness of different projector systems is overcome by interactively adjusting the image window level during presentations. Bone and lung window views can be shown without having to create separate images. Combining DICOM images into stacks as part of a PowerPoint presentation can result in a more effective and higher-quality presentation of medical images (**Haider, 2003-Corl et al 2002)**.

Aim of work

The aim of this work is to provide an overview of the expansions of DICOM standard's scope, either the new supplements added to the DICOM standard or corrections made to maintain the standard. Also media (as DVD-R and E-mail attachments) or objects (as multi-frame MR or multi-frame CT) added to the DICOM standard. Also to explain how Advances in DICOM standard development and employment have paved the way to full-field digital community.

Review Of Literature

TECHNICAL ISSUES:

- *INTRODUCTION*
- *DIGITAL IMAGING FUNDAMENTALS*
- *IMAGE ACQUISITION*
- *PACS ARCHITECTURE*
- *PACS ADVANTAGES*
- *THE DICOM STANDARD*
- *TELERADIOLOGY*

INTRODUCTION

For more than 25 years the vision of the all-digital radiology department has been a beacon guiding radiologists, computer scientists, and industrial developers in creating the equipment and the standards necessary to achieve this goal. Many all-digital or mostly digital radiology departments exist today **(Siegel EL et al, 2003)** and serve as testimonies of the many

breakthroughs that have been required to meld historically disparate imaging and information systems together under