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Evaluation of the Medical Imaging Services at Governmental Hospitals-Gaza Governorates

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Dedication

To the greatest man I have in my life, the light of my life... my lovely father

To the biggest heart with the most loving care, who sacrificed a lot for me to become what I am now, my mother

To my wife who supported me through each step of the way and for being the greatest source of inspiration for me...

To the light of my eye…my kids “Miasser, Kateralnada and Daher”

To all those who encouraged, supported, and helped me all the way.

I dedicate this research for all of them …

Maher Daher Suleiman

Declaration

I certify that this thesis submitted for the degree of master is the result of my own research, except where otherwise acknowledged, and that this thesis or any of its parts has not been submitted for higher degree to any other university or institution.

Signed:

Maher D. Suleiman

Date: --------/---------/---------

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Abstract

Medical imaging services are the key tool to diagnose many diseases and have an important role in monitoring treatment and predicting outcome. This field includes many modalities like Conventional Radiology, Fluoroscopy, Computed Tomography, Magnetic Resonance Imaging and Radioscintigraphy...etc. Since the discovery of X-ray by Roentgen in 1985, progressions of international standards seek to improve medical imaging services. Patient convenience and accessibility should be an integral part of the planning and design of departments. Availability of equipment and qualified staff increase safety, outcome and quality of patient's services.

Triangulated study design was used. For the quantitative part; 170 Radiologic Technologists completed questionnaires with 95.5% response rate. The researcher used arbitrated checklist to evaluate medical imaging facilities. Census study conducted on all Radiologic Technologists and medical imaging departments at six main governmental hospitals in the Gaza Strip. In addition, three key informant interviews with Radiologic Technologists manager were conducted.

Researcher have directly interviewed 170 participants (82% Males; 75% younger than 40; 85% have bachelor degree and 86.5% permanent employment). Findings revealed that 143 of Radiologic Technologists having Thermoluminescence Dosimeters, but only 80 holding it. The majority of participants have good training courses. There was shortage in number of radiographic equipment and Radiologic Technologists. Four of sixth of hospitals provided with Computed Radiography. Statistically significant relations between participants years' experience and holding Thermoluminescence Dosimeters ($p=0.033$); number of exams and patient waiting time in Conventional Radiography ($p=0.000$). Generally, medical imaging departments that followed standard in structure, occupational safety and reception services were 90%, 70% and 27%, respectively. In Conventional Radiography, 45%, 64% and 83% of structure, occupational safety and essential supplies of imaging rooms were adapted to standard, respectively. Regarding to fluoroscopic rooms, 79%, 82% and 68% of structure, occupational safety and essential supplies were followed the standard, respectively. The Computed Tomography and Magnetic Resonance Imaging departments showed that "60%, 78% and 91%" and "86%, 100% and 90%" followed standard regarding to their structures, occupational safety and essential supplies, respectively.

An improvement in human resources among medical imaging facilities was clearly observed after 1996. There is a good tendency to replace traditional radiography by Computed Radiography. Finally, frequent training courses were conducted in all medical imaging fields except Magnetic Resonance Imaging. On other side, *shortage in number of radiographic machines and Radiologic Technologists at all governmental hospitals was observed. All departments revealed clear defect in structure, design and essential supplies. Critical readings were observed respecting to insufficient radiation protection tools and holding of Thermoluminescence Dosimeters.*

Table of Contents

List of Tables

List of Figures

List of Annexes

List of Abbreviations

ALARA	As Low As Reasonably Achievable
ARRT	American Registry of Radiologic Technologists
ASRT	American Society of Radiologic Technologists
AusHFG	Australasian Health Facility Guidelines
BIR	British Institute of Radiology
CD	Compact Disc
CR	Computed Radiography
CT	Computed Tomography
EGH	European Gaza Hospital
ENT	Ear, Nose and Throat
ESWL	Extracorporeal Shock Wave Lithotripsy
GDP	Gross Domestic Product
GS	Gaza Strip
HCPC	Health and Care Professions Council
ICRP	International Commission on Radiological Protection
ICU	Intensive Care Unit
KII	Key Informant Interview
MIA	Medical Imaging Administration
MOH	Ministry of Health

MRI	Magnetic Resonance Imaging
NCRP	National Council on Radiation Protection
NGOs	Non-Governmental Organizations
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
OHS	Occupational Health Safety
PCBS	Palestinian Central Bureau of Statistics
PVC	Polyvinyl Chloride
RF coils	Radiofrequency coils
RPII	Radiological Protection Institute of Ireland
RT	Radiologic Technologist
SPSS	Software Statistical Package of Social Science
TLD	Thermoluminescence Dosimeter
UNRWA	United Nations Relief and Works Agency
WB	West Bank
WHO	World Health Organization

Chapter (1): Introduction

1.1 Background

After the discovery of X-ray by Roentgen in 1895, immersive growth was realized in medical imaging modalities. This progress facilitates detection and characterization of different diseases inside human body (Krupinski and Jiang, 2008). Medical imaging or radiography is a photographic process used to image anatomic structures. Instead of visible light, radiography utilizes X-ray energies, which penetrate the body. These energies are absorbed at different rates by different tissue densities and are particularly effective for imaging bone and dense tissues (Siegel et al, 2008).

New knowledge in radiographic imaging is being developed at an increasingly rapid rate and the medical imaging services have expanded dramatically (European Society of Radiology, 2010). Furthermore, the medical imaging services are now the key tool to diagnose many diseases and have an important role in monitoring treatment and predicting outcome. The medical imaging service can comprise methods relying on both ionizing and non-ionizing radiations, covering Conventional Radiography, Fluoroscopy, Nuclear Medicine, Computed Tomography, Mammography, Interventional Radiology, Bone Densitometry, Ultrasonography and Magnetic Resonance Imaging and others (Pereira et al, 2015).

The medical imaging services may be performed in several hospital areas, dependent upon the type or volume of examination required, and may be used in selected instances for imaging of patients. Patient convenience and accessibility should be an integral part of the planning and design of the medical imaging department. A high percentage of the volume of this service will consist of hospitals/flexibility and adaptability should be a main consideration when planning the facility in order to accommodate constant upgrades in equipment technology (Bowen et al, 2008).