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Al-Quds University**



**Evaluation of Diagnostic Imaging Services at  
Non-Governmental Organizations in Gaza Governorates**

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# **Evaluation of Diagnostic Imaging Services at Non-Governmental Organizations in Gaza Governorates**

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## **Dedication**

My mother and father with love and gratitude.

My wife with love, and deep appreciation.

And my beloved children Khaled, Malak, Lmaa and Lana.

## **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:**

**Mohammed A. Balousha**

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

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## Abstract

*Diagnostic imaging encompasses different imaging modalities such as X-ray, Ultrasound, Computed Tomography, Magnetic Resonance Imaging.....etc.; that cover diagnostic purposes and follow up of diagnosed cases. It is considered one of the fastest growing areas within medicine at present especially for imaging based on the ionizing radiation. This study aimed to evaluate diagnostic imaging services at Non-Governmental Organizations in Gaza Governorates.*

*Triangulated study design was used; census sample of Non-Governmental Organizations was selected to cover all Gaza Governorates. Regarding the quantitative part; a random sample of 319 clients completed interviewed questionnaire to evaluate imaging services from client's perspective with 94% response rate. Cronbach Alpha scores for this questionnaire were high (0.829). The researcher used arbitrated checklist to evaluate medical imaging facilities. In addition, seven key informant interviews were conducted for qualitative part.*

*Findings revealed that from clients point of view; reception, time factor, communication, accessibility, respect & privacy and staff characteristics have the highest scores which were 85.8%, 85.8%, 85.6%, 84.5%, 84.18% and 81% respectively. While affordability, service place characteristics, and safety measures have the lowest scores which were 76.6%, 76.34%, and 71.2% respectively*

*Inferential analysis shows that there was a statistical significant difference at ( $P$ -value  $< 0.05$ ) between respondents who had more than bachelor degree and other education levels regarding accessibility to imaging services. Also, there was a statistical significant between respondents who had less than secondary school and other education levels regarding to imaging staff characteristics. Finally, a statistical significant difference between males and females respondents regarding to imaging staff characteristics, in favor to males, was observed.*

*Checklist findings revealed that 92% of imaging machines are working well. But there was a shortage in advanced imaging machines specifically at Mid-zone and South governorates. Most imaging departments had one machine for each type of the imaging modalities, so, any sudden breakdown of imaging machines lead to stop the services without providing any alternatives.*

*The imaging room spaces, shielding and structure of imaging departments are accepted to some extent, but there was a clear defect in designing the waiting area. Also, some imaging rooms contain more than one imaging machine, mostly conventional radiography and panorama.*

*Regarding to radiation protection, Thermoluminescence Dosimeters that measure radiation dose for imaging staff were absent and there were insufficient radiation protection tools for imaging staff and clients.*

*Lack of a qualified maintenance and spare parts for immediate faults were observed. Finally, imaging staff is qualified in most NGOs and most of them working by temporary contract employment with limited training programs.*

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## List of Abbreviations

<b>ALARA</b>	As Low As Reasonable Achievable
<b>CDC</b>	Centers for Disease Control and Prevention
<b>CT</b>	Computed Tomography
<b>DIS</b>	Diagnostic Imaging Service
<b>FDA</b>	Food and Drug Administration
<b>GG</b>	Gaza Governorate
<b>GS</b>	Gaza Strip
<b>ICRP</b>	International Commission on Radiological Protection
<b>IR</b>	Ionizing Radiation
<b>kVp</b>	kilovolts peak (unit to describe X-ray tube voltage)
<b>mA</b>	Millie-Ampere (unit to describe X-ray tube current)
<b>MDCT</b>	Multiple detector computed tomography
<b>MoH</b>	Ministry of Health
<b>MRI</b>	Magnetic Resonance Image
<b>NGOs</b>	Non-Governmental Organizations
<b>NIS</b>	New Israeli Shekel
<b>PACS</b>	Picture Archiving and Communication System
<b>PCBS</b>	Palestinian Central Bureau of Statistics
<b>PHC</b>	Primary Health Center
<b>PNA</b>	Palestinian National Authority
<b>SPSS</b>	Statistical Package of Social Science
<b>RT</b>	Radiologic Technologist
<b>TLD</b>	Thermoluminescent dosimeter
<b>UNRWA</b>	United Nations Relief and Works Agency for Palestine Refugees in the Near East
<b>U/S</b>	Ultrasound
<b>WHO</b>	World Health Organization
<b>WB</b>	West Bank

# Chapter 1

## Introduction

### 1.1 Background

Good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources (WHO, 2007). Therefore, facilities and tools used to support health services, including Diagnostic Imaging Services (DIS), are a necessary key to deliver good health services.

The primary role of DIS is to support and serve different departments in hospitals or health care centers in terms of providing diagnostic and therapeutic measures.

DIS has evolved rapidly over the past 120 years, beginning with Rontgen's discovery of X-rays in 1895 and continuing through further advances in more recent decades (Done and Bradley, 2014). This evolution fits with the rapidly increasing of types and complexity of diseases to help reach the accurate diagnosis with reasonable costs, lower risks, minimum side effects and higher quality services. There are many types of diagnostic imaging procedures, each of which uses different technologies and techniques, such as Conventional radiography, Computed Tomography (CT), Magnetic Resonance Image (MRI), and Ultrasound (U/S) (FDA, 2016).

The DISs are available in different health sectors in Gaza Governorates (GGs) as governmental sector representative by Ministry of Health (MoH), Non-Governmental Organizations (NGOs), United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) and private sectors. Over the years, huge efforts in GGs have been made in different health care providers to improve the DIS, but still limited, due to several factors such as Israeli siege, high price of imaging equipment, difficulty in importing spare parts and inadequate installation and operating of imaging machines, rendered the development of the DIS extremely difficult. In addition, there is a complete absence of certain types of DIS in the health care providers as radioscintigraphy.

The NGOs provide multi-medicinal services at low costs or free of fees for the in-social needed patients. It funded by internal and external association, which match with their attitudes, philosophies and common interests.

The NGOs play a significant role in complement the health services provided by the governmental health care sectors, reducing the overloaded on the governmental health facilities and increasing the patient options and alternatives in choosing health services.

In GGs, the DIS in some NGOs is advanced to some extent and provides significant services such as MRI in Red Crescent Society for Gaza Strip and multi-detector CT services, including vascular and cardiac CT, in the Public Aid Hospital. There are approximately 29 NGOs in GGs providing different types of imaging services depending on the priorities of the health needs and the financial ability of the organization but the most advanced imaging services are available in GG (unit of accreditation and licenses, 2017).

In this study, the researcher was evaluated the DIS in NGOs according to Donabedian model, which highlighting on structures or inputs and processes that may lead to improve outcomes in quality of health care (Lawson and Yazdany, 2012). Avedis Donabedian, a health services researcher, he developed Donabedian model in 1966 that provided a framework for assessing health services and evaluating quality of care (Donabedian, 2005).

## **1.2 Research problem**

Medical imaging is considered a crucial diagnostic tool for many diseases and has an important role in monitoring treatment and predicting outcomes. It includes different imaging modalities that distinct depending on the degree of complexity of their physical properties.

NGOs are distributed in all GGs and offer a wide range of health services including DISs such as MRI, CT, U/S and plain X-ray.

The role of NGOs is prominent in the Palestinian health care system, resulting from unsuitability and shortage of governmental health services due to Israeli siege to Gaza Strip and the frequent wars. These circumstances lead to deterioration of governmental health services. For that, the NGOs aimed to compensate this shortage and provided options and alternatives for patients to get health services which include imaging services.

In spite of the importance of NGOs to deliver imaging services, there is no credible and reliable data about the quality of imaging services.

This study tries to evaluate the imaging services in NGOs, specifically the accessibility to service, readiness of imaging department, safety measures of services and to clarifies their strength and weakness points to help the decision makers to conduct the proper policy for DIS.

### **1.3 Justification of the study**

In GGs, a health care is provided through uncoordinated services by various sectors. They are represented by MoH, UNRWA, Military medical services, private sectors and NGOs. Thus, lack of coordination in providing the health services has constituted an obstacle in evaluating their adequacy and proficiency of services provided. NGOs are one of the important health care providers and play a vital and prominent role in providing health services. One of these services is the DIS, which covers a large sector of GGs clients. The imaging services have developed rapidly in the NGOs in order to fill in the gap of shortage in governmental imaging services. On reviewing the literature of evaluating medical imaging services in the NGOs, this research topic is unprecedented. Absence of such studies in literature established a motivation to perform the research regarding the medical imaging services in GS, that has been exposed to three devastating wars since 2008.

### **1.4 Aim of the study**

The overall aim of this study is to evaluate diagnostic imaging services at Non-Governmental Organizations in Gaza Governorates.

### **1.5 Specific objectives**

1. To evaluate imaging services in NGOs by using Donabedian model.
2. To identify the strength and weakness points of diagnostic imaging services at NGOs.
3. To examine the relationship between the satisfaction of clients about the diagnostic imaging services and some socio-demographic factors (gender, age, level of education, economic status).
4. To set recommendations and suggestions that might promote DISs performance.

### **1.6 Research questions**

1. What is the quality level of diagnostic imaging service at NGOs?
2. Are there sufficient imaging service modalities in NGOs?
3. Are the clients satisfied with the medical imaging service?
4. What are the strength and weakness points of diagnostic imaging service in NGOs?
5. What are the main obstacles facing NGOs to deliver diagnostic imaging service?
6. To what extent the imaging services are available and accessible?

7. What are the imaging services that need promotion in the NGOs?
8. Are there differences pertaining to individual variables for clients related to opinion for the imaging services?
9. What are recommendations raised to improve medical imaging services at NGOs?

## **1.7 Context of the study**

### **1.7.1 Demographic context**

Palestine is a geographic region in Western Asia between the Mediterranean Sea and the Jordan River with an entire area about 27,000 square kilometers. It was occupied more than 60 years from the Zionist occupation. Since that, it suffered from recurrent conflicts and instability and it still does. In 1993, the peace process between Israeli occupation and Palestinian representatives by Palestine Liberation Organization (PLO) implemented to stop the fight between them and led to establishing the Palestinian National Authority (PNA) on 22% of the historical Palestine. The Gaza Strip (GS) and the West Bank (WB) are the main parts of the PNA. Since signing peace process, the PNA has suffered from repeated violations and recurrent wars from Israeli governments, which led to delay the development of Palestinian institutions.

The GS is a narrow band of land located on the south of Palestine, which constitutes the coastal zone of the Palestine territory along the Mediterranean Sea between Egypt and Israel. It is 45 kilometers long and 6-12 kilometers wide with an area of 362 square kilometers.

According to Palestinian Central Bureau of Statistic (PCBS, 2016), the estimated population of the Palestinians in the state of PNA at end 2016 was 4,884,336 inhabitants; 2,972,069 inhabitants in the WB and 1,912,267 inhabitants in GS. The GS is divided into five governorates: The North Gaza governorate, Gaza governorate, Mid-Zone governorate, Khan-Younis governorate, and Rafah governorate (Annex 1). Regarding to the distribution of inhabitants in each governorate; North Gaza 16.4%, Gaza City 37.8%, Mid-Zone 14%, Khan-Younis 19.4% and Rafah 12.5%. (PCBS, 2016).

## **1.7.2 Socioeconomic and political context**

The special situation of GS population, resulted from frequent of the Israeli attacks, made a lot of suffers and difficulties in development and sustainability of health services and increased the number of injuries, disabilities and diseases among GS population. Since 2008, three destructive wars against GS resulted thousands of dead and wounded people. According to MoH (2014) the war on GS 2014 caused about 11066 wounded and 2130 martyrs. These numbers exceed the capacity of the health care institutions. In addition, about ten health centers were partial damaged. Also, since 2007 the Gazian people has suffered from strict siege that restricted the passage of people, goods, and aids across the borders.

The economic situation in GS is characterized by poor and low income, the unemployment rate is 41.2% (PCBS, 2016), 21.1% of GS population suffered from deep poverty (PCBS, 2011). These circumstances lead to reduce the development opportunities of the Palestinian institutions, especially in the field of health.

As a result, the role of NGOs is prominent to assist and support the governmental services in different fields.

## **1.8 Health care system**

The Palestinian healthcare system is fragmented due to the large number of health care providers (WHO, 2011). MoH, Military Health Services, UNRWA, NGOs and the private health services are the main health care providers in GS.

MoH is considered the major provider of healthcare services in PNA which provides primary, secondary and tertiary health services and purchase unavailable medical services through referring patients to the domestic and abroad providers.

UNRWA provides free healthcare services for all refugees in PNA which is mainly primary health care and purchasing secondary and tertiary services for the registered and the hardship Palestinian refugees from other healthcare organizations as NGOs.

NGOs play essential roles in primary, secondary and tertiary health care services, which are funded from donors and governments that provide healthcare services with reasonable fees to maintain sustainability.

Finally, the private healthcare sectors provide health services for profit purpose, it provide primary, secondary and some tertiary healthcare services and have effective role in improving health status to whom can pay the financial burden.

## 1.9 Medical imaging services

Diagnostic imaging encompasses different imaging modalities such as X-ray, U/S, CT and MRI for diagnostic purpose and follow up the diseases. In GS, there are six main providers for imaging services. The main imaging provider is MoH which includes 16 X-ray machines, 7 fluoroscopy machines, 7 CT and 2 MRI machines distributed in six main hospitals in all GGs (Suleiman, 2017). In addition, there are 13 X-ray machines and one mammography in the governmental Primary Health Care centers (PHC) (Senior of imaging services in PHC, March 2017, personal contact). The second imaging provider is UNRWA which provides only plain X-ray services in 7 primary health care centers and purchase specific types of diagnostic imaging services, such as mammography, urography and U/S through different contractual agreements with hospitals and private imaging centers for Palestinian refugees in GS (UNRWA, 2015). The third imaging service provider is NGOs which provides imaging services with low costs or free of fees for the in-social needed patients, 29 Non-governmental medical centers distributed in all GGs provide different types of imaging services, most of these services are basic imaging services as plain X-ray and U/S, but there are three advanced NGOs provide advanced imaging services including MRI and CT. The fourth provider of imaging service is the private sector, 15 licensed private imaging centers in all GGs provide plain X-ray services and U/S, also there are 2 private CT, one in GG and the second one in Khan-younis governorate (Unit of accreditation and licensed, 2017). The fifth imaging service provider is the Palestine Red Crescent Society which provide imaging services in four medical centers for the Palestinian people in the occupied Palestinian territory, the largest one is al Quds hospital in GG which provides different imaging services including CT, MRI, U/S and plain X-ray. Also, in Khan-younis governorate, there is a branch of Palestine Red Crescent Society which provides different types of imaging services including CT (Palestine Red Crescent Society, 2017). The last imaging provider is the Military Health Services which provide plain X-ray and U/S services in three military health center in North Gaza, GG and in Khan-younis Governorate (Senior of paramedical services in Military Health Services, March 2017, personal contact).

## **1.10 Operational definition**

### **1.10.1 Evaluation**

Evaluation is a systematic acquisition and assessment of information to provide useful feedback about some object (Trochim, 2006).

### **1.10.2 Non-Governmental Organizations**

A Non-Governmental Organizations (NGOs) is a citizen-based association that operates independently away of government, usually to deliver resources or serve some social or political purpose (Whalts.com, 2015).

### **1.10.3 Standard**

A standard acts as a basis for comparison or reference point against which something be evaluated. It can contain either quantitative or qualitative or requirements (HAP, 2010).

### **1.10.4 Health services**

Health services include all services dealing with the diagnosis and treatment of disease, or the promotion, maintenance and restoration of health. They include personal and non-personal health services (WHO, 2016).

### **1.10.5 Clients satisfaction**

Client satisfaction is a measure of how well a product or service experience meets customer expectations (Sauro, 2016).

## **Chapter 2**

### **Literature Review**

#### **2.1 Conceptual framework**

A conceptual framework is defined as a network or a “plane” of linked concepts ( Jabareen, 2008). The researcher was used the Donabedian model as a conceptual model that provides a framework for examining health services and evaluating quality of care. Donabedian highlighting on structures and processes that may lead to improved outcomes (Lawson and Yazdany, 2012).

##### **2.1.1 Structure (Input)**

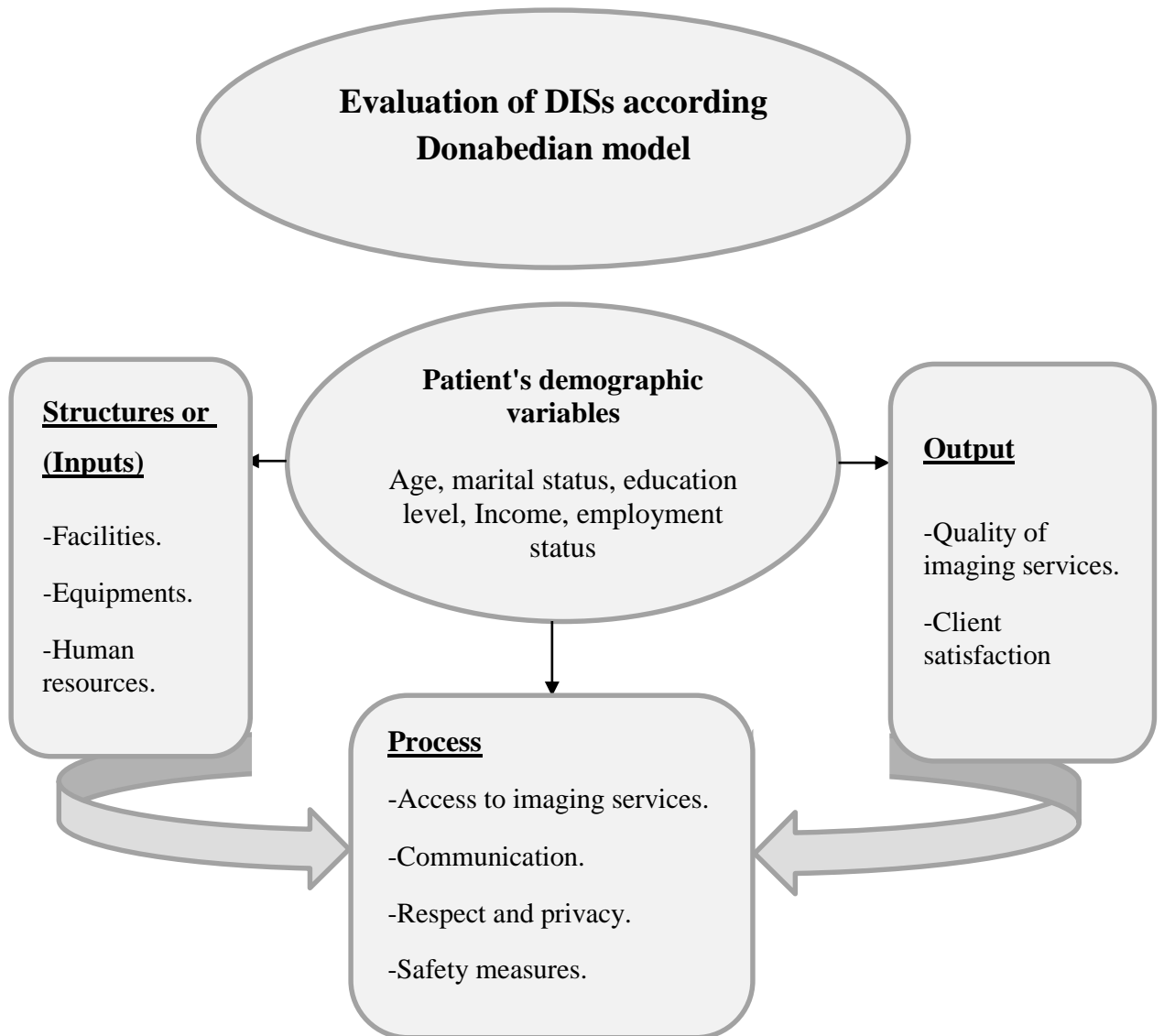
Examine the environment, in which services are provided; whether there is adequate capability to provide the services offered including facilities, equipment, human resources, qualification of care providers and administration structure.

##### **2.1.2 Process**

Examine what is done to patient and how care has provided in terms of appropriateness, acceptability, completeness and includes the interaction between patients and providers. The process can be assessed through accessibility, communication, respect, privacy and safety measures.

##### **2.1.3 Outcome**

Refers the results of care, what happen to the patients' health and the level of satisfaction of the healthcare. The outcome sometimes seen as the most important indicators of quality because improving patient health status is the primary goal of healthcare.



**2.1 Conceptual framework for the study-self developed**

## 2.2 Evaluation

It is impossible to give a single definition for the evaluation, because it depends on the sponsor, participant or another involved party (Sherman, 2013). According to literatures; the evaluation is “as either about proving something is working or needed, or improving practice or a project” (Smith, 2006). Another definition of evaluation is “a periodic process of gathering data and then analyzing or ordering it, in such way that the result information can be used to determine whether the organization or program is effectively to carry out planned activities, and the extent to which it is stated objectives and anticipated results” (Martinez, 2005). Also, CDC, (1999) defined the evaluation as “a systematic investigation of the merit, worth, or significance of an object”.

There are two main types of evaluation, the first one is a formative evaluation that conducted during the life of a program to identify its strengths or weaknesses and enhance its quality and effectiveness. The second type is a summative evaluation that conducted at the end of a program to help decision makers decide a programs future (Morford, 2003).

The evaluation can use quantitative or qualitative data, and often includes both. The qualitative approaches include methods such as interview, observation and focus group while the quantitative approaches include ranking, classifying and generalizing results. Rarely one method used for evaluation. Both methods provide important information for evaluation, and both can improve community engagement (Silberberg et al., 2011).

### **2.3 Evaluation of diagnostic imaging services**

Health care evaluation is the critical assessment, through rigorous processes, of an aspect of healthcare to assess whether it fulfils its objectives (Currie, 2009).

The main purpose of health service evaluation is to examine the access to care, health care costs and processes, and the outcomes of health services for individuals and populations (Steinwachs and Hughes, 2008).

According to literatures, the evaluation of DIS includes the following points; the human resources, staff training, accessibility to services, appropriateness of services, system for image quality, radiation protection, maintenance of imaging equipment, patient privacy and confidentiality, client satisfaction for imaging services.

### **2.4 Diagnostic imaging**

Diagnostic imaging encompasses different imaging modalities for diagnostic purpose and follow up the diseases such as X-ray, U/S, CT and MRI. Food and Drug Administration (FDA), (2016) defined medical imaging as a several different technologies that are used to view the human body in order to diagnose, monitor, or treat medical conditions.

The basic imaging services which includes X-ray and U/S, is fundamental for all health care providers at all major levels of healthcare, in primary, secondary and tertiary health services (WHO, 2006).

## **2.4.1 Types of diagnostic imaging**

According to (FDA, 2016) the diagnostic imaging classified into modalities that use and those that do not use ionizing radiation (IR) to form medical images.

### **2.4.1.1 Imaging devices using ionizing radiation**

Imaging modalities, which depend on IR, are the first form of medical imaging. They generate images, known as radiographs. It includes X-ray devices as Conventional radiography, mammography, panorama and CT. Also, there is another form of IR, which is gamma ray which named radioscintigraphy.

### **2.4.1.2 Imaging devices not using ionizing radiation**

Some types of medical imaging work without using IR, for example, MRI and U/S, and have specific uses in the diagnosis of disease and provides alternatives for IR.

Each type of imaging devices gives different information about the area of the body being studied or treated, related to possible disease, injury, or the effectiveness of medical treatment.

## **2.5 History of diagnostic imaging**

Medical Imaging began with radiography after the discovery of x-rays in 1895 by Wilhelm Rontgen, a German professor of physics. Since that time, the imaging services were limited in X-ray, which is basis for multi imaging services as conventional X-ray, fluoroscopy, mammography and panorama. In early 1970s, the first CT was introduced to the health service, which is based on X-ray but in new technique by taking cross-sectional slices through the body or organ.

According to Bradley (2008), In the 1950s radioscintigraphy entered to DIS. The source of the IR in radioscintigraphy is not imaging devices but radioactive compounds, which typically emit gamma ray as they decay when it is injected in human body and the ray is detected by special camera. Additionally, a new advance technology of radioscintigraphy is positron emission tomography which emits positrons when they decay instead of gamma ray.

In 1956, Donald introduced the first imaging devices by using non-ionizing radiation that depends on the sound wave to pass through the tissues and detecting the reflection, this image known as ultrasound. Another non-ionizing radiation technology was introduced in 1973 to imaging services which used a strong magnetic field and pulses of radio waves to make images of structures inside the body, known as Magnetic Resonance Image (Bradley, 2008).

## **2.6 Development in diagnostic imaging**

Diagnostic imaging is one of the fastest growing areas within medicine at present. The main goal for this growing is to reach high quality images with minimum risk especially for imaging based on the IR. The growing is evident in different imaging services, for example the mechanism of image processing in radiography which depend recently on computer technology that appear image with high resolution and contrast, and lack of chemical risks from conventional processing. Moreover, the computerized image processing reduced the repetition of radiography caused by under or over X-ray dose.

In CT, one of most important problem facing the imaging is motion artifact especially in chest and abdomen imaging which affects the quality of image, the advance imaging technology overcome this problem by introducing MDCT which provides very short scan time to avoid motion artifact, improved temporal and spatial resolution and made it possible to imaging the smallest and moving details in the body like coronary arteries and the cardiac chamber with high image quality and short imaging time.

According to Robbin et al. (2011) U/S is the most widely used imaging modality in the world because it is include relative low cost, lack of IR, no potential nephrotoxicity from contrast agents, and portability. Today's U/S technology offers high quality images and displays three and four dimensions of organs especially for obstetric U/S. Moreover, there is improvement and increase demand on Doppler U/S to estimate the blood flow through blood vessels. In addition, the Doppler U/S had widely used in cardiology services, which called echocardiograph to evaluate the heart chambers, valves and surrounding structures.

MRI plays significant role in diagnosis of diseases especially soft tissue organs and provides multi-dimensions of images enables radiologist to see the internal parts of human body. The improvement in MRI technology is obvious in the physical characteristics of MRI such as improve signal to noise ratio, use of permanent coils, increase the strength of a magnetic

field for more image quality and reduce scanning time, also the design of MRI is more comfortable to patient (Wlad, 2012).

## **2.7 Risk of diagnostic imaging**

According to FDA (2014) the IR is a form of radiation that has enough energy to potentially cause damage to DNA and may elevate a person's lifetime risk of developing cancer. Radiation damage to tissue depends on the dose of radiation received, or the absorbed dose, which is expressed in a unit called the gray (WHO, 2012). The IR has risks on patient and staff if the protection measurements not be used and from overuse the IR.

Imaging that avoiding IR exposure has no known harmful effects, but there is some risk related to patient. In MRI scanning, the magnet may affect pacemakers, artificial limbs, and other medical devices that contain iron. Also, the patient lies in a closed area inside the magnetic field, some patients can experience a claustrophobic sensation during the scanning (William and Shiel, 2015).

## **2.8 Personal monitoring devices in imaging department**

For the safety of radiology staff, there is a monitoring system to measure radiation dose received by radiology staff by using a small radiation monitoring device called dosimeter or sometimes called self-reading pocket dosimeter worn on anterior part of the body attached to the shirt collar area to record the radiation history and possible risks involved for imaging staff. The records help in improving radiation protection practices in clinical settings. The dosimeter must read monthly or quarterly (Statkiewicz, 2006).

## **2.9 Protective shielding for patients and staffs from radiation risk**

Most radiology departments protect the personnel and the attendant, paying little attention to the radiation protection of the patient; therefore, it is important to recall methods of patient protection during imaging. According to WHO (2004) there are many ways to protect patient from IR. The as low as reasonable achievable (ALARA) principles plays a significant role in reducing IR and it should be applied for every exposure made to patient. Also, Lead protective apparel such as lead aprons, thyroid and gonads shields to protect the sensitive organs especially in children and young adults should be used for patients exposed to IR. Moreover, there is a technical factors contribute in reducing radiation dose as restricted the

X-ray beam to the area of clinical interest, using high kVp/mAs technique is preferred to decrease radiation dose for patient. Appropriate selection of filtration to absorb low energy photons protects the patient from unnecessary IR and use alternative in selection of patient position during exposed to X-ray as posterior anterior (PA) preferred anterior posterior (AP), also the use of high-speed film screen combination is option to minimize patient dose. This is the major methods to reduce patient dose during imaging (Richard and Arlene, 2012).

For the imaging staff, the protective measures can be achieved by the following methods:

- Personnel should remain in the radiation environment only when necessary.
- The protective barrier between the operator and X-ray tube should have a minimum lead equivalence of 1.5 mm.
- Shielding apparel should be used as and when necessary which comprise of lead aprons, eye glasses, hand gloves and thyroid shields.
- Pregnant imaging professionals must be opt out from all radiation room during the first trimester and may continue to work at second and third trimester cautiously.

The radiation protection is very important subject at imaging procedures and there are many literatures in this field: Abu Zer (2014) evaluated the leakage of radiation in nine selected governmental hospitals at GS, Palestine, he found that there in not adequacy of radiation protection in some imaging services like CT and fluoroscopy and there is a risk of radiation at the control panel, which may lead to risk of chronic occupational exposure to the employees. In the same way, Al-Sultan (2010) conducted a study to evaluate the diagnostic radiologic technology services and education in the general governmental hospitals and health institutes in the Republic of Yemen, the study methods include the visits, the questionnaires, written examination and practical test, he found that the radiologist in Yemen didn't take care in conventional radiography and concentrate his work in advance modalities especially U/S, 25% dosimeters unavailable, and in 30% of the imaging room shielding unsuitable and absent of quality control tests. Also, Gesmallah (2013) evaluated the application of radiation protection program at cardiac catheterization laboratory, the design of department, the effectiveness of radiation protection devices, personal monitoring and usage of G-Arm X-ray machine, he found that there was no personal monitoring devices, the RTs were well-trained to dial with the G-arm x-ray machine and to apply the radiation protection program.

## **2.10 The basic of diagnostic imaging department design and construction**

According to the Dubai Health Authority (DHA) (2012), DIS performs imaging procedures from IR or non-ionizing radiation on patients in special equipped examination rooms. In general, the procedure rooms used for quick examinations such as chest, abdomen, and extremities should be located closest to the reception and patient waiting areas in order to decrease patient travel distance and improve patient streamlining, while rooms with long procedure times such as CT and MRI may be located away from the main waiting and reception areas. As well as a film processing and viewing areas are planned to be close to X-ray examination rooms. The office for radiologists must be provided (at least nine square meters), office shall include provisions for patient consultation and interpretation of medical images.

Storage area for films and equipment should be provided with proper ventilation and humidity. Additionally, medical recording systems must be available such as; Picture Archiving and Communication System (PACS), and/or paper-fold traditional archiving.

To protect the patients and caregivers from radiation risk the warning signs should be posted on the entrance door of imaging rooms to identify the radiation hazardous. Inside imaging rooms, the dressing room for patient changing with safe storage for valuables and clothing at least shall be 1.5 meters x 1.2 meters with immediate access to the imaging room should be available, in addition toilets (Minimum of two) one for males and the other for females, hand-washing stations within imaging room except MRI not be within the room shall be provided, also, mechanically ventilated and air conditioning should be provided to allow comfortable working conditions.

Medical requirements must be available for emergency conditions as oxygen, appropriate emergency equipment and medications to treat adverse reactions associated with administered contrast media.

In GGs, the unit of accreditation and licenses in MoH and Palestinian Energy and Natural Resources formed a basic legislation for design imaging room, but the legislation focused on the imaging room spaces and shielding without consideration to other requirements as waiting area, storage, emergency services....etc.

The researcher adopt the Palestinian legislation for accreditation & licenses of imaging department and DHA measurements with some modifications for the minimum X-ray room surfaces and shielding thicknesses, which summarized in annex (9).

## **2.11 Quality of imaging services**

Quality in health care is proper performance, in accordance with standards of interventions that are known to be safe, that are reasonable to society in questions, and that have the ability to produce an impact on morbidity, mortality and disability (WHO, 2006). "The standard of health care services based on optimum standards, professional accountability, and encourages healthcare organizations to pursue excellence" (Zaidi, 2010). According to literatures, the imaging services standards have focused on reduction of IR risk, patient and staff safety, staff training and self-development, improve performance, streamlining of patient flow and statutory compliance. According to Canada's diagnostic imaging services standards (2014), the following points should be considered for imaging services:

- Meeting the needs of clients and referring medical professionals.
- Having the right professionals.
- Providing a suitable environment.
- Selecting, operating and maintaining diagnostic imaging equipment.
- Providing safe and appropriate diagnostic imaging services.
- Keeping records accurate, up-to-date and secure.
- Monitoring the safety and quality of diagnostic imaging services.

## **2.12 Quality control (QC) in diagnostic imaging services**

According to PAHO/WHO (2010), QC refers to the specific tests required to management, safety, and proper performance of all imaging equipment. It includes specific tests and procedures of the imaging facilities to insure effectiveness of these facilities, reports any deterioration, and develop steps to overcome defect. The main goal of QC for diagnostic imaging services is ensure the accuracy of the diagnosis. Usually, all staff in the radiology department should be involved in quality control program.

## **2.13 Quality assurance (QA) in diagnostic imaging services**

According to PAHO/WHO (2010), QA is a systematic action to get high quality image with minimum dose to patients and workers. The main goal of QA is to improve patient care. QA actions include both quality control techniques and quality administration procedures. QC

was previously mentioned, quality administration procedures are managerial actions to follow and monitoring the quality processes.

## **2.14 Human resources and training programs in imaging department**

The human resources in imaging department comprise from multi-professional team with proper qualifications and experiences to perform diagnostic imaging procedures. They have specific skills relevant to their allocation and types of imaging equipment. The imaging team comprised from radiologists, Radiologic Technologist (RT), nurses and administrators. RT should be educated in anatomy, radiographic positions, examination techniques, equipment protocols, radiation safety, protection and basic patient care. Besides, the RT should be aware in the advanced imaging technology as CT and MRI. Radiologist specialized in the interpretation of medical images such as U/S, MRI, CT scan, and conventional radiography. The role of nursing is prominent in the preparation of patients during some procedures, especially if the contrast media is to be used, providing patient care and monitoring the recovery and discharge of patients after the invasive procedures (Oliveira et al., 2014).

In order to cope with development in imaging technology, and to improve skills and knowledge, the imaging staff should be periodically participate in training program specially in advanced medical imaging technology, radiation protection and infection prevention programs.

## **2.15 Availability and accessibility to health services**

Availability of health services refers to the presence of health infrastructure, qualified staffs and service utilization. Other factors play significant roles in determining the availability of health services including, but not limited to, referral process, wait time for appointment, wait time for service, travel time and travel access (WHO, 2014).

The access to health services is one of the basic factors for patient satisfaction and quality of the health care. There are three dimensions to assess access to health care; physical accessibility, financial affordability and acceptability. Physical accessibility refers to the availability of good health services with ability to use them when needed. Financial affordability measures the ability to pay for health services without financial hardship, and the acceptability means client's willingness to seek services (WHO, 2013).

## 2.16 Satisfaction

Including the patients satisfaction in evaluating the provided services has grown imperative, thus the patient's opinion must play a significant role in improving the health services. It is considered as one of the most important indicators for the quality of health care offered by any healthcare provider.

A lot of literatures discuss the patient satisfaction to explore the socio-demographic characteristics of patients that might influence the level of satisfaction, and then identify determinants of patient satisfaction for health care services.

Sa'adoon, Hussien, and Museher (2008) studied Patients satisfaction for health care services at Thi-qar province, Iraq by using special questionnaire consisting of socio-demographic, and health care service items for 452 clients. They found that 49.1% of participants were dissatisfied with the health care services offered by facilities. High dissatisfaction rate was associated with low education, unemployment, male gender, and being single. There was a high significant statistical association between the age of clients, education, marital status, and employment with satisfaction for the health care services.

In contrast, Al-Hindi (2002), studied the client's satisfaction in radiology services in Gaza city by using questionnaire to 410 clients at private center and radiology department in governmental hospital, she found that there is no statistical significant differences were recorded between males and females and between age groups. Regarding to availability and accessibility, she found the highest level of satisfaction was expressed toward privacy and security inside imaging rooms, while clients moderated satisfied with imaging availability and organizational culture, the lowest degree of satisfaction were reported toward communication and affordability of imaging services.

Another study conducted to evaluate the mammogram services in GGs by Jadallah (2016), which contained study the clients' satisfaction level, he found that a mammogram services were timely affordable for more than two thirds of cases, also, more than two thirds of cases were satisfied with the accessibility and affordability of mammogram services.

## **Chapter 3**

### **Methodology**

This chapter describes the research methodology, which includes research design, process of sample selection, pilot study, validity and reliability of the study, data analysis and ethical consideration.

#### **3.1 Study Design**

The design of this study is a descriptive analytical cross-sectional design. It is a triangulated method (Quantitative and Qualitative). The use of triangulation method is to strengthen the reality of data and validity of findings. The quantitative part includes interviewed questionnaire with clients for imaging services to study the client's perspective and their satisfaction for imaging services. In addition to, special checklist developed by researcher to assess the imaging machines, facilities and structure of imaging department. The qualitative *paradigms* include in-depth interviews with seven key informants to validate findings from one method with another (Donovan and Sanders, 2005).

#### **3.2 Study population**

The study includes two types of population who were represented the quantitative and qualitative parts.

##### **Quantitative part**

The study consists of all clients in the selected imaging departments at NGOs, the researcher find out the average total number of imaging services clients for three consecutive months was 2760 clients.

The total number of public aid hospital clients was 470; representing 17% of the study population. The total number of Red Crescent Society for Gaza Strip was 520; representing 19% of the study population. The total number of Al-Awda hospital was 570; representing 21% of the study population. The total number of Al-Sahabah Medical Complex was 320; representing 11% of the study population. The total number of Yaffa Medical Center was 560; representing 20% of the study population. The total number of Al-Kuwaiti Hospital was 320; representing 11% of the study population.

Then, all the selected imaging departments' facilities were evaluated through checklist.

### **Qualitative part**

Seven imaging service providers were selected for in-depth interview, the researcher took in his consideration the diversity of imaging service providers which include MRI technologist, X-ray technologist, CT technologist, senior of imaging department, radiation protection officer and radiologist.

### **3.3 Study setting**

The study was conducted at the medical imaging departments of six main Non-Governmental hospitals in GGs: Public aid hospital, Red Crescent Society for Gaza Strip, Al-Awda hospital, Al-Sahabah-Medical-Complex, Yaffa Medical Center and Al-Kuwaiti Hospital.

### **3.4 Study Period**

The study was started after having a letter from the university and obtaining approval from Non-Governmental Organizations to conduct the research. The study was performed in the year 2017; it started in February 2016 and ended in July 2017. Pilot study was conducted in February 2016, then data collection began in the mid of March 2016. Data entry and cleaning were conducted in parallel with data collection. Coding and analysis of data were conducted in January 2017. The study final report in July 2017.

### **3.5 Sample size and sampling process**

#### **For quantitative part:**

A census sample was selected regarding to Gaza Governorates and inclusion criteria. The sample was consisting of six main hospitals as the following: Al-Awda hospital, Public Aid Hospital, Al-Sahaba Medical Complex, Red Crescent Society for Gaza Strip, Yaffa Medical Center and Al-Kuwaiti Hospital.

To calculate the sample size of the six imaging department clients, a confidence interval of 95% and a margin error of 5% were accepted. By using Epi-info program, the sample size of clients was estimated to be 338 clients randomly selected from the six NGOs which distributed as the following:

**Table (3.1) Distribution of the clients sample regarding to the selected hospitals**

<b>NO.</b>	<b>Hospital/ center</b>	<b>Estimated total of clients/average for three months</b>	<b>Percent</b>	<b>Sample</b>
<b>1</b>	Al-Awda hospital	570	21.3 %	72
<b>2</b>	Public Aid Hospitals	470	17.2 %	58
<b>3</b>	Al-Sahabah Medical Complex	320	11%	37
<b>4</b>	Red Crescent Society for Gaza Strip	520	19.2%	65
<b>5</b>	Yaffa Medical Center	560	20.1%	68
<b>6</b>	Al-Kuwaiti Hospital	320	11.2%	38
<b>Total</b>		2760	100%	338

**For qualitative part:**

A purposive sample of seven key informants was selected from imaging service providers.

### **3.6 Eligibility criteria**

#### **3.6.1 Inclusion criteria for imaging department**

- The diagnostic imaging department which provides more than one type of imaging services.
- The diagnostic imaging department which provides imaging services for more than one shift per 24 hours.

#### **3.6.2 Inclusion criteria for imaging services clients**

- Well oriented clients who receive diagnostic imaging services from NGOs.

#### **3.6.3 Inclusion criteria for employees**

- Imaging service employees who are working in NGOs for one year or more.

#### **3.6.4 Exclusion criteria for employees**

- Imaging service employees who are working in NGOs for less than one year.

### **3.7 Study instruments**

In order to conduct a research study, one of the most important rules to achieve it, using a suitable instrument. Several features should be taken in consideration when choosing an instrument; mainly, the acceptability, applicability, procedural adequacy, reliability, and validity. In the current study, the researcher performed three instruments in order to answer the research questions.

### **3.7.1 Instrument for quantitative part**

**The first instrument** was interviewed structured questionnaire to clients which consists of three domains:

- The first domain included characteristic personal and demographic data of the participants.
- The second domain related to evaluation the accessibility to medical imaging and its equipping.
- The third domain related to the working mechanism in medical imaging departments.

Responses to the second and third domains are rated using a 5-points Likert-type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) (Annex 4).

The second instrument for quantitative part was a checklist for imaging departments, to investigate the design and structure of imaging rooms, availability and status of imaging machines, safety measures and administrative issues (Annex 5).

### **3.7.2 Instrument for qualitative part**

For the qualitative data the researcher used open ended (semi-structured) questions, see annex (6). Those questions were asked by the researcher within in-depth interviews.

## **3.8 Scientific rigor**

### **3.8.1 Quantitative part (Questionnaire and Checklist)**

#### **3.8.1.1 Validity**

The validity of the study questionnaire was examined by sending the constructed questionnaire with enclosed cover letter about the objective of the study to 10 experts from different backgrounds including radiologists, public health practitioners, radiology academics and researchers in order to give their views on the dimensions of the questionnaire statement. This would enhance the validity of the questionnaire after modifying it to be better understood. Annex (7) has named of experts who validated the questionnaire.

### 3.8.1.2 Reliability

The reliability refers to the consistency of a research study or measuring test (McLeod, 2007). The following steps were done to assure instruments reliability:

- Standardization of questionnaire and checklist filling.
- The data entry in the same day of data collection would allow possible interventions to check the data quality or to re-fill the checklist or/and the questionnaire when required.
- Re-entry of 5% of the data after finishing data entry to assure correct entry procedure and decrease entry errors.

### Cronbach alpha

The researcher used Cronbach alpha coefficient to find the reliability for each domain and the total score of the scale. The results are shown in the following table:

**Table (3.2) Reliability of questionnaire domains**

No	Domains and Sub-Domains	No. of items	Reliability (alpha coefficient)
<b>A</b>	<b><i>Accessibility to medical imaging and its equipping</i></b>	<b>41</b>	<b>0.827</b>
<b>1</b>	Accessibility to the medical imaging	7	0.830
<b>2</b>	Affordability of medical imaging services	6	0.835
<b>3</b>	Service place characteristics (amenities)	12	0.839
<b>4</b>	Characteristics of medical image staff	8	0.811
<b>5</b>	Reception	8	0.820
<b>B</b>	<b><i>Steps and working mechanism in medical imaging departments</i></b>	<b>20</b>	<b>0.8315</b>
<b>6</b>	Time factor	4	0.824
<b>7</b>	Communication factor	4	0.821
<b>8</b>	Respect and privacy factor	6	0.811
<b>9</b>	The safety factor of the risk of exposure to radiation	6	0.870
<b>Total</b>		<b>61</b>	<b>0.8293</b>

### 3.8.2 Qualitative part (In-depth interviews)

The following steps were done to assure the trustworthiness of the qualitative part in this study:

- A peer check was done through health experts to revise the in-depth interviews questions to assure that they cover all the required dimensions.

- A member check was done to assure accuracy and transparency of the transcripts during the in-depth interviews questions
- Prolonged engagement was done as the researcher tried to probe for answers and cover all the in-depth interviews questions.
- Recording the in-depth interviews would enhance tracking up facts and re-check the accuracy of the transcripts.

### **3.9 Ethical and administrative considerations**

- Academic approval was obtained from the School of Public Health at Al-Quds University.
- An administrative approval was solicited from the director of each imaging departments (Annex 9).
- To guarantee participants rights, attached letter indicating that the client's participation is voluntary and their confidentiality was assured for all of them after obtaining a consent. The researcher assure that client participation in the research was optional, and she/he can withdraw at any time and has the right to refuse to participate (Annex 3).

### **3.10 Pilot study**

A pilot study done for 20 clients from imaging services to explore the appropriateness of the study instruments and let the researcher train for data collection, the clarity of meanings and scales and the time taken to fill the questionnaire and for expecting response rate. As a result of this stage few rephrasing and explanation were added to some questions. The piloted cases were excluded from the study sample.

### **3.11 Data collection**

#### **Quantitative part**

After the pilot study, the researcher and three data collectors conducted the data collection, they started by performed interviews questionnaire for clients who are receiving the imaging services from NGOs. This lasted about four months; each month represent 25% of the sample size (338). We started from the health centers in the north and Gaza then to the middle and

south area. Prior the field work, the researcher conducted training to the three data collectors about the aim of the study, its objectives and tools that will be used and illustrated some questions that may be vague. Time allocation for each questionnaire ranged between 15-20 minutes. Privacy was maintained during gathering the completed questionnaires.

In parallel with data collection from clients, the researcher used arbitrated checklist to audit the imaging departments' requirements. Time allocation for each checklist ranged between 30-40 minutes.

### **Qualitative part**

The second component of the data collection was conducted after the analysis of the quantitative part in July 2016. The researcher conduct seven interviews with imaging service providers in NGOs from different imaging departments and at different types of imaging service. All of the interviewees were informed about the purpose and the main features of this study.

### **3.11 Response rate**

The response rate for this study was 94 %, where, the total number of the participants was 319 out of 338 clients.

### **3.12 Data entry and analysis**

#### **3.12.1 Quantitative part**

After checking and verifying data by over viewing of the 319 questionnaires, all data was managed and analyzed by using the Statistical Package of Social Science (SPSS) version 20.

The following SPSS tools were used:

Statistical analysis includes simple statistical procedures (frequency, means and standard deviation).

- Tabular and Graphical display.
- Independent Samples T-test to examine whether the means of two groups are statistically different from each other.
- One way ANOVA test to determine whether there are any significant differences between the means of more than two independent groups.

P-value equal or less than 0.05 was considered statistically significant, with confidence interval (CI) of 95%.

### **3.12.2 Qualitative part**

The following steps were used to analysis the in-depth interview:

- Debriefing report for each interview was done immediately after the end of each one.
- Objective consideration of non-prompted intimation, non-verbal cues were noted.
- Transcription was done to every interview then open coding thematic analysis method was used to analyze the transcripts of the in-depth interviews.
- The researcher obtained the main findings from the transcripts of the interviews.
- Categorization of related ideas. Comparison and integration between the quantitative and the qualitative findings was done to create rich items for discussion.

### **3.13 Limitations of the study**

- Lack of archiving system in the most imaging departments.
- Difficulties to access the NGOs.
- Lack of resources and materials that belong to the study.
- Recurrent electricity cut off.

## Chapter 4

### Results and discussion

#### 4.1 Introduction

This chapter presents the results of the statistical analysis of the data and the interpretation of these results. The results include descriptive data and inferential analysis of questionnaire, followed by the results of checklist data analysis.

#### 4.2 Demographic characteristics of the study participants

**Table (4.1) Demographic characteristics of the participants (n=319)**

<b>Variable</b>	<b>Frequency</b>	<b>Percent %</b>
<b>Age groups</b>		
< 20 Yrs.	40	12.5
20-40 Yrs.	165	51.7
41-60 Yrs.	89	27.9
>60 Yrs	25	7.8
<b>Sex</b>		
Female	165	51.7
Male	154	48.3
<b>Participants address</b>		
North	75	23.5
Gaza	144	45.1
Mid-Zone	53	16.6
Khan-younis	3	0.9
Rafah	44	13.8
<b>Marital status</b>		
Married	211	66.1
Single	81	25.4
Divorced	10	3.1
Widow	17	5.3
<b>Education</b>		
Secondary school and less	131	41.1
Diploma	47	14.7
Bachelor degree	124	38.9
More than bachelor	17	5.3
<b>Working</b>		
Yes	153	48.0
No	166	52.0
<b>Family income (NIS) categories</b>		
1000 NIS and less	101	31.7
1001-2000 NIS	113	35.4
2001-3000 NIS	76	23.8
3000 and more	29	9.1
<b>Health insurance</b>		
Yes	232	72.7
No	87	27.3
<b>Type of health insurance</b>		
UNRWA coverage	22	8.8
Governmental	201	80.4
Insurance companies	27	10.8

Table 4.1 shows that 319 participants who received medical imaging services from NGOs in GGs with response rate 94 %.

51.7% of the respondents were female, while male constitute 48.3%. The participants from GG are the larger group of the study, which comprise 45.1%, while 23.5% from the north Gaza, 16.6% from Mid-zone region and finally 17.5 % of the participants were from the South Gaza. This distribution is consistent with normal distribution of residents in GGs, where 37.8% of the population residing in GG, 16.4% in North Governorate, 14% in Middle-zone and 12.5% in Rafah Governorate. The Khan-yonis Governorate constitutes 19.4 % of GGs inhabitants, but during the study period there isn't NGOs provide imaging services compatible with the study criteria.

The mean age of the respondents was 36 years old. The age group between 20 and 40 years old which represented the largest percentage (51.7%) of the respondents, followed by age group between 40 and 60 years old which represented 27.9% of the respondents, and the age group higher than 60 years old formed the smallest percentage of the respondents (7.8%).

These results indicate that the lowest percentage for elderly clients (more than 60 years), and this can be justified since the most of elderly clients are suffering from different diseases and they need a regular follow up in the health services and that considered expensive, so they go to governmental health services.

On the education level, 58.9% of the respondents had bachelor degree or more, 41.1% had secondary school or less. Regarding to the marital status, 66.1 % of the respondents were married, 25.4% were single, 3.1% were divorced, and 5.3% were widow.

48% of the respondents are working, the average income of respondents is 1819 New Israeli Shekel (NIS). After categorizing the income into groups, the first group (less than 1000 NIS) constitutes 31.7 % of the working respondents. The second group (1001-2000 NIS) constitutes 35.4% of the participants. The percentage of the third group which represents the income group between 2001-3000 NIS is 23.8% of the participants. The last group (more than 3000 NIS) constitutes 9.1% of the participants.

Most of the respondents 72.7% had health insurance. 80.4% of the insured participants had governmental health insurance, where the other insured respondents 19.6% have different type of coverage (10.8% health insurance companies, 8.8% UNRWA referrals).

### 4.3 Reasons for seeking and choosing health care from NGOs

The aim of this part to determine the causes of seeking health care from NGOs.

**Table (4.2) Reasons for seeking health care from NGOs**

		Yes		No		Total
		Frequency	Percent %	Frequency	Percent %	
1	Closeness to your address	103	32.3	216	67.7	100
2	Service Excellence in this place	104	32.6	215	67.4	100
3	Low cost of the health service	59	18.5	260	81.5	100
4	The reputation of the service providers	131	<b>41.1</b>	188	58.9	100

Table 4.2 shows that 41.1% of participants looking for the reputability of the service providers, while the participants obtained health care due to low price of health care represents 18.5 %. The closeness of hospitals to respondents' residency and service excellence in the hospitals represents 32.3% and 32.6% respectively.

These findings revealed that the participants had a knowledge and awareness of health care providers in NGOs and they are looking for good and well known health services regardless to some extent the cost of the service.

### 4.4 Comparison between medical imaging services in NGOs and governmental health organizations from participants point of view

Table 4.3 shows that most of respondents received medical imaging services in governmental hospitals 79.3% and 20.7% were not.

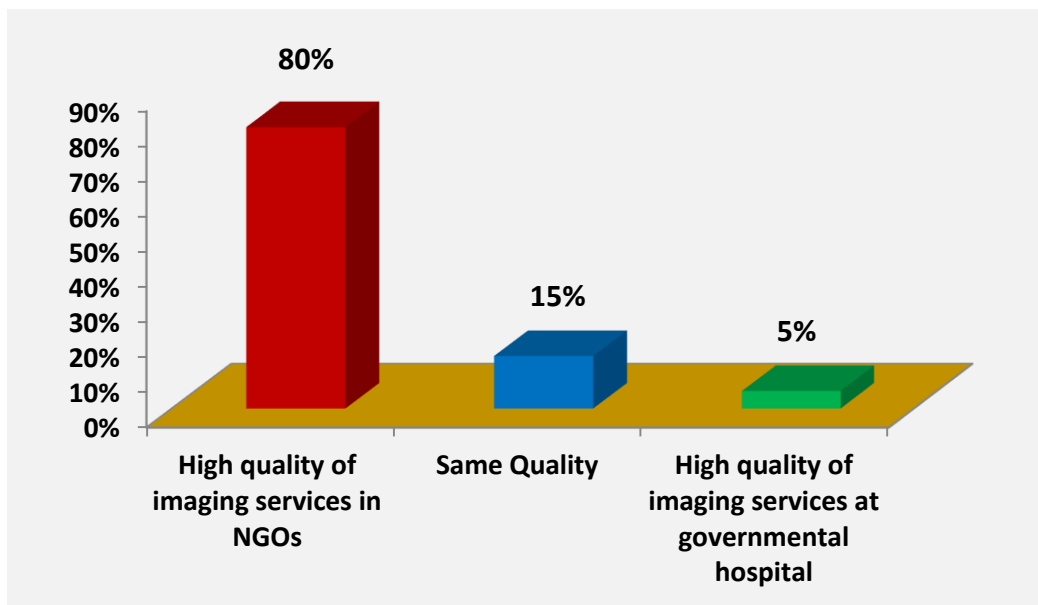
**Table (4.3) Number and percent of respondents who received medical imaging services in a governmental hospitals**

	Frequency	Percent %
Yes	253	79.3
No	66	20.7
Total	319	100

This high percentage of participants who received medical imaging service from governmental hospitals, but when they needed the service again, they went to NGOs. This

indicates that the participants were looking for another option to receive imaging services. Also, the researcher asked the respondents who received imaging service in NGOs and had experience in the imaging services in the governmental hospitals, about the quality of service. Most of the respondents (80%) said that the imaging services in NGOs have high quality, while 15% said that the services in both organizations have the same quality. The lowest percentage of respondents (5%) said that the governmental imaging services have high quality of imaging services (Figure 4.1).

**Figure (4.1) Comparison between Governmental and Non-governmental imaging services from participant point of view**



Then, we asked the respondent if they recommend or advise a friend or relative to receive imaging services from NGOs if necessary. Table 4.4 shows that 92.5% of participants stated that they would recommend the NGOs to other patients. This indicates the satisfaction of participants for the imaging service in NGOs and it meets their expectations.

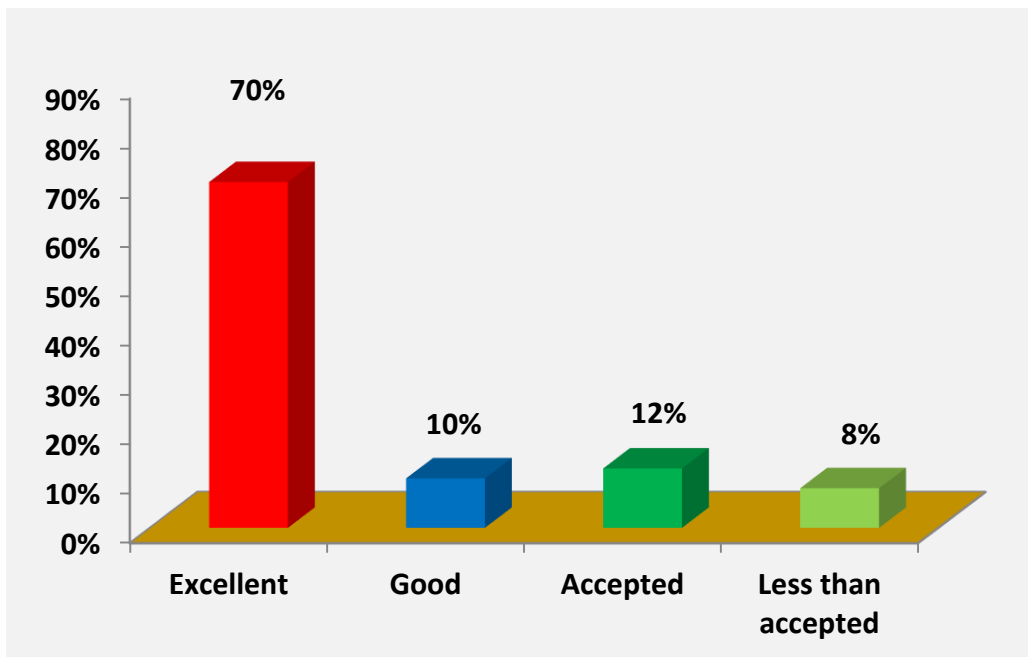
**Table (4.4) Number and percentage of respondents who recommend a relative or a friend to receive imaging services from NGOs**

	Frequency	Percent %
Yes	295	92.5
No	24	7.5
<b>Total</b>	319	100

## 4.5 Satisfaction

Patient satisfaction is an important and commonly used as indicator for measuring the quality of health care. To measure the satisfaction of participants, the researcher asked the participants about their satisfaction from imaging service, 70% of participants said the imaging services were excellent, while 10 % were good, 5 % were acceptable, and 8 % were less than acceptable (Figure 4.2).

**Figure (4.2) Percent of client's satisfaction who received imaging services in NGOs**



Regarding to these results, the NGOs were achieved clients satisfaction. This result was obtained due to the following factors: accessibility, patient privacy, communication, amenities in the services place, staff characteristics, and waiting time which represent the core need for health care. These factors will analyze in more details in this chapter.

## 4.6 Accessibility to the medical imaging services

Accessibility to health care services is considered an important factor that reflects the quality of health care. Access to health care means having "the timely use of personal health services to achieve the best health outcomes" (Millman, 1993).

The researcher selected two dimensions of accessibility: physical and financial accessibility to NGOs and imaging services within it. The following results illustrate the accessibility status of imaging services.

## 4.6.1 Physical accessibility

**Table (4.5): physical accessibility analysis**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
Location of health center is near to your residency	12 (3.8)	23 (7.2)	16 (5)	163 (51.1)	105 (32.9)	4.02	80.4	6
Well-known health center address	3 (0.9)	2 (0.6)	6 (1.9)	157 (49.2)	151 (47.3)	4.41	88.2	1
Transportation is available to health center	3 (0.9)	6 (1.9)	15 (4.7)	163 (51.1)	132 (41.4)	4.30	86.0	3
Proper placement of the imaging department	4 (1.3)	2 (0.6)	10 (3.1)	172 (53.9)	131 (41.1)	4.33	86.6	2
Registration office and payment fees are nearby to imaging department	1 (0.3)	4 (1.3)	14 (4.4)	186 (58.3)	114 (35.7)	4.28	85.6	4
Feasible contact with image department	5 (1.6)	24 (7.5)	35 (11)	157 (49.2)	98 (30.7)	4.00	80.0	7
Reachable information office	4 (1.3)	7 (2.2)	11 (3.4)	183 (57.4)	114 (35.7)	4.24	84.8	5
<b>Total</b>						<b>84.5</b>	<b>4.23</b>	

Table 4.5 shows that the majority of participants had a high level of physical accessibility indicated by the overall mean score above 4. The overall mean score was 4.23 and its overall percentage 84.5 % which reflect a high level of physical accessibility among participants. The mean scores for the physical accessibility domains ranged from 4.00 to 4.41 and the average percentages ranged from 80% to 88.2%.

The item “Well-known health center address” had the highest score among the physical accessibility with average percentage of 88.2%. This reflects the reputability and good place distribution of NGOs in GGs.

On the other side, the researcher noticed that the item “Feasible contact with image department” had the lowest score with average percentage of 80%. Despite this item had a lowest score, the most of clients are referred to imaging department from outpatient clinics of the same hospital. So, they don't need to use any communication tools such as telephone, mobile, or E-mail.

## 4.6.2 Affordability or economic accessibility

Affordability is a measure of people's ability to pay for services without financial hardship. It takes into account not only the price of the health services but also indirect costs (e.g. the costs of transportation to and from facilities and of taking time away from work). Affordability is influenced by the health financing system and by household income (Evans et al., 2013).

**Table (4.5.1) Affordability results analysis**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
Transport cost to the medical center is accepted	2 (0.6)	9 (2.8)	15 (4.7)	171 (53.6)	122 (38.2)	4.26	85.2	1
Affordable imaging services	2 (0.6)	23 (7.2)	34 (10.7)	176 (55.2)	84 (26.3)	3.84	76.7	3
Imaging cost matches the service level	31 (9.7)	35 (11)	93 (29.2)	104 (32.6)	56 (17.6)	3.99	79.9	2
Availability of exemption policy to social in-needed clients	9 (2.8)	27 (8.5)	40 (12.5)	174 (54.5)	69 (21.6)	3.37	67.5	5
The cost of imaging service does not constitute a financial load	22 (6.9)	35 (11)	39 (12.2)	149 (46.7)	74 (23.2)	3.68	73.7	4
<b>Total</b>						<b>3.83</b>	<b>76.6</b>	

Table 4.5.1 shows that the majority of participants had to some extent accepted level of economic accessibility indicated by the overall mean score above 3.70. The overall mean score was 3.83 and its overall percentage 76.6% which reflect the accepted level of economic accessibility among participants.

The mean scores for the economic accessibility domains ranged from 4.26 to 3.37 and the average percentages ranged from 85.2% to 67.5% respectively.

The item “Transport cost to the medical center is accepted” had the highest score among the economic accessibility items with average percentage of 85.2%. This reflects the availability of transportation with reasonable cost price and near hospitals for residential communities. The item of “Availability of exemption policy to hardship cases” had the lowest score among the economic accessibility items with average percentage of 67.5%. This indicates the unclear policy to deal with social in-needed cases in NGOs.

Through key informant interviews, they agreed and support our result; they said the NGOs provide imaging services with reasonable cost and high quality, but some imaging procedures are expensive as MRI and CT, resulting from high cost of machines, spare parts and contrast media. Also, they said the difficult economic situation in GS constitute financial burden for patients to obtain the medical services while the NGOs provided medical services with reasonable cost to maintain continuity of services.

The researcher noted there are no clear administrative regulations to deal with social in-needed cases, so clients ask to meet the administrative manager in order to obtain a reasonable discount. The discount they may obtain almost does not exceed 20% of the service cost.

#### **4.6.3 Service place characteristics (basic amenities)**

This domain focuses on the basic amenities inside imaging department that would affect on imaging services such as appropriateness of waiting halls, availability of potable water, clean toilets, permanent electric power supply, sufficient ventilation and air conditioners, noiseless place, availability box of suggestions and special design for handicap clients.

This domain is important simply because the clients don't understand clinical quality and may be making choices on the basis of amenities because they are easier to understand (Goldman et al. 2010).

**Table (4.5.2) Service place characteristics (basic amenities)**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
The space of imaging department matches the provided services	26 (8.2)	22 (6.9)	28 (8.8)	173 (54.2)	70 (21.9)	3.75	75.0	6
Available guiding signs	8 (2.5)	22 (6.9)	14 (4.4)	175 (54.9)	100 (31.3)	4.06	81.1	3
Clean waiting halls	31 (9.7)	28 (8.8)	10 (3.1)	156 (48.9)	94 (29.5)	3.80	75.9	5
Comfortable waiting seats	22 (6.9)	35 (11)	21 (6.6)	147 (46.1)	94 (29.5)	3.80	76.1	4
Entertainment means are available in waiting halls	45 (14.1)	53 (16.6)	48 (15)	96 (30.1)	76 (23.8)	3.33	66.6	10
Potable water is available	39 (12.2)	30 (9.4)	31 (9.7)	125 (39.2)	94 (29.5)	3.64	72.9	8
Clean WCs are available for males and females	34 (10.7)	25 (7.8)	40 (12.5)	139 (43.6)	81 (25.4)	3.65	73.0	7
Special designed place for handicapped /disabled clients	21 (6.6)	40 (12.5)	69 (21.6)	117 (36.7)	71 (22.3)	3.56	71.1	9
Available electric power at the time of visit	120 (37.6)	2 (0.6)	9 (2.8)	188 (58.9)	0 (0.0)	4.34	86.7	1
Air conditioners are available at the place of service	0 (0.0)	5 (1.6)	14 (4.4)	188 (58.9)	111 (34.8)	4.27	85.5	2
Noiseless place	1 (0.3)	4 (1.3)	15 (4.7)	186 (58.3)	113 (35.4)	4.27	85.5	2
Box for suggestion and complaints is available	42 (13.2)	31 (9.7)	75 (23.5)	122 (38.2)	49 (15.4)	3.33	66.6	10
<b>Total</b>						<b>76.3</b>	<b>3.82</b>	

Table 4.5.2 shows that the majority of participants had moderate acceptance level for basic amenities in imaging department indicated by the overall mean score above 3.8. The mean score was 3.82 and its overall percentage 76.3% which reflects some acceptance in what is available of basic amenities.

The mean scores for the basic amenities domain ranged from 4.34 to 3.33 and the average percentages ranged from 86.7% to 66.6%.

The items of “Available electric power”, “Air conditioners are available at the place of service” and “Noiseless place ” had the highest score among the basic amenities domain with average percentage of 86.7%, 85.5% and 85.5% respectively. This indicates the ability of NGOs to overcome the current electricity cutoff and keep silence and discipline.

The last three rank items for “Entertaining means are available in waiting halls”, “Special designed place for handicapped clients” and "availability box of suggestions” with average percentage of 66.6%, 71.2% and 66.6% respectively.

#### 4.6.4 Medical imaging staff characteristics

**Table (4.5.3) Medical imaging staff characteristics**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
Image service providers are professionals	0.0 (0.0)	5 (1.6)	8 (2.5)	160 (50.2)	146 (45.8)	4.40	88.0	2
Image service providers are decency	2 (0.6)	5 (1.6)	11 (3.4)	143 (44.8)	158 (49.5)	4.41	88.2	1
There are adequate staff to provide imaging services	3 (0.9)	2 (0.6)	14 (4.4)	154 (48.3)	146 (45.8)	4.37	87.5	3
Imaging service providers are committed at workplace	1 (0.3)	6 (1.9)	23 (7.2)	156 (48.9)	133 (41.7)	4.30	86.0	4
Staff wears uniform on duty	14 (4.4)	13 (4.1)	10 (3.1)	138 (43.3)	144 (45.1)	4.21	84.1	5
Each member of the staff has identification card	83 (26)	58 (18.2)	54 (16.9)	79 (24.8)	45 (14.1)	2.83	56.6	7
Directors respond to questions and complaints of clients	8 (2.5)	11 (3.4)	82 (25.7)	140 (43.9)	76 (23.8)	3.84	76.7	6
<b>Total</b>						<b>4.05</b>	<b>81.0</b>	

Table 4.5.3 shows that the majority of participants expressed satisfaction for medical imaging staff characteristics indicated by the overall mean score above 4. The overall mean score was 4.05 and its overall percentage 81%.

The mean scores for the medical imaging staff characteristics domain ranged from 4.41 to 2.83 and the average percentages ranged from 88.2% to 56.6%.

Most of respondents were satisfied with decency, professionalism, commitment of medical imaging staff in their working hours & their work place and commitment of staff to wears uniform on duty with average relative weight above 84%, these results indicate that the imaging providers are able to deal with clients efficiently. Qualitatively, a key informant was interviewed and commented “most of imaging staff working in NGOs which provide advance imaging services have high degree of commitment and loyalty to their work place despite the incentives shortage and this reflect positively on their performance, but the imaging staff who work in imaging department that contains old imaging machines or inappropriate workplace have low degree of loyalty.

Regarding responsiveness of director to respondents complaints which had the six ranked and its weighted percentage 76.8%, some respondents who said a negative answer not exposed to problems during imaging services and they had no clear idea about the directors responsiveness to solve problems, but the respondents who had exposure to problem said positive feedback with their reaction.

The lowest score was in the item "each member of the staff has identification card" with relative weight 56.6%, this result attributed to absence of self-identification culture, while this is considered a client right.

#### **4.6.5 Reception**

The reception is the first step to provide health care for clients, for that it is the important factor which may affect the client's impression toward the service. The receptionists are often the first person who patients see. They use customer service and admin skills to welcome and guidance clients to a health center department.

**Table (4.5.4) Reception results**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
Well organized reception offices	1 (0.3)	1 (0.3)	9 (2.8)	178 (55.8)	130 (40.8)	4.36	87.3	3
Reception staff have a high degree of tact and respect	2 (0.6)	2 (0.6)	15 (4.7)	153 (48)	147 (46.1)	4.38	87.6	2
Receptionist committed at his workplace during working hours	2 (0.6)	4 (1.3)	13 (4.1)	149 (46.7)	151 (47.3)	4.39	87.8	1
Receive clear and nice replies when you ask about the service	5 (1.6)	1 (0.3)	12 (3.8)	166 (52)	135 (42.3)	4.33	86.6	4
<b>Total</b>						<b>4.37</b>	<b>87.3</b>	

Table 4.5.4 shows that the majority of participants expressed satisfaction for medical reception indicated by the overall mean score above 4. The overall mean score was 4.37 and its overall percentage 87.3%.

The mean scores for the reception domain ranged from 4.39 to 4.33 and the average percentages ranged from 87.8 % to 86.6%.

The domain items focused on the regulation of reception offices, commitment of receptionist in their work place and if the receptionist deals with clients respectfully. The most answers had percentages more than 86%, that indicate a professionalism of receptionists to welcome the clients and dealing with them gently.

#### 4.6.6 Time factor

The time consumed is the time spent from reaching the imaging department until receiving the imaging service which including waiting list and waiting time, where the waiting list is an appointment date for imaging service and waiting time is the time consumed from the client entrance the department until finishing the procedure (HCS, 2017).

**Table (4.5.5) Time factor results**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
The date of receiving the service is appropriate	0 (0.0)	6 (1.9)	18 (5.6)	179 (56.1)	116 (36.4)	4.27	85.39	3
Waiting time to get medical imaging service is adequate	2 (0.6)	8 (2.5)	13 (4.1)	179 (56.1)	117 (36.7)	4.26	85.14	4
Getting the result of medical imaging service at an appropriate time	1 (0.3)	4 (1.3)	7 (2.2)	186 (58.3)	121 (37.9)	4.32	86.46	1
Hours of work in the health care centers is sufficient and appropriate	0.0 (0.0)	5 (1.6)	15 (4.7)	178 (55.8)	121 (37.9)	4.30	86.02	2
<b>Total</b>						<b>4.29</b>	<b>85.7</b>	

Table 4.5.5 shows that the majority of participants expressed satisfaction for medical reception indicated by the overall mean score above 4. The overall mean score was 4.29 and its overall percentage 85.7%.

The mean scores for the time factor domain ranged from 4.32 to 4.26 and the average percentage ranged from 86.4% to 85.14%.

This result is justified and attributed to many factors; in some NGOs, there is a limited health care providers in most specialties in the morning shift and that leads to decrease imaging orders, lack of variety imaging services in most imaging departments, commitment of imaging staff in their work place and working hours and finally, the NGOs policy more concerned and interested to meet the clients need as much as possible. The researcher noted

the urgent cases are rare in most NGOs which require long time to deal with it. This contributed to the regularity of work.

#### 4.6.7 Communication factor

Communication is essential for delivering quality patient care and building good health care provider-patient relationships based on compassion and shared respect. Clear, accurate, and timely communication is absolutely essential to maximizing performance, improving patient outcomes, and decreasing risk exposure (Douglas, 2015).

**Table (4.5.6) Communication factor results**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	mean	% mean	Rank
Service Providers listen to your questions carefully	1 (0.3)	2 (0.6)	15 (4.7)	180 (56.4)	121 (37.9)	4.31	86.2	3
Suitable responses were received when inquiring about the services	0.0 (0.0)	3 (0.9)	9 (2.8)	183 (57.4)	124 (38.9)	4.34	86.8	2
Medical imaging examinations are explained clearly by the service provider	5 (1.6)	24 (7.5)	23 (7.2)	155 (48.6)	112 (35.1)	4.08	81.6	4
Service Provider was not busy with else during your queries or during the imaging process	0.0 (0.0)	2 (0.6)	15 (4.7)	154 (48.3)	147 (46.1)	4.41	88.2	1
<b>Total</b>						<b>4.29</b>	<b>85.7</b>	

Table 4.5.6 shows that the majority of participants expressed satisfaction for communication with imaging staff indicated by the overall mean score above 4. The overall mean score was 4.29 and its overall percentage 85.7%.

The mean scores for the reception domain ranged from 4.41 to 4.08 and the average percentages ranged from 88.2% to 81.6%. Those results reflect the good communication with the imaging providers.

The lowest relative weight (81.6%) was “the imaging provider explained the imaging procedure clearly”. Through the key informant interview, he said that the communication is

high between staff and clients, due to the limited number of clients usually, which permit to communicate with them carefully.

Of the researcher experience in imaging services, the communication between imaging provider and patient is limited due to paper or software based services and full data related to the patient is illustrated on papers or by software. Only some guidance needed such as clarify radiation risks, replace clothing, take out the companions from radiation room and clarify imaging procedure.

#### 4.6.8 Respect and privacy factor

Respect and privacy are long established principles of medical practice and it is one of the most important issues for patients who come for care and treatment.

Operationally, in this study, the privacy is a state in which one is not observed or disturbed by other people during imaging procedure, while patient respect is a physical and mental health information is very personal and private.

**Table (4.5.7) Respect and privacy factor results**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
The respect was the core of service for client in the department	0.0 (0.0)	0.0 (0.0)	2 (0.6)	168 (52.7)	148 (46.4)	4.46	89.28	1
I did not feel any discrimination in treatment	1 (0.3)	1 (0.3)	9 (2.8)	164 (51.4)	143 (44.8)	4.41	88.21	2
Alternative clean clothes were available if required	6 (1.9)	22 (6.9)	70 (21.9)	126 (39.5)	93 (29.2)	3.88	77.54	5
Feeling safe while receiving service	1 (0.3)	5 (1.6)	12 (3.8)	175 (54.9)	126 (39.5)	4.32	86.33	4
Privacy is valued during imaging process	0.0 (0.0)	2 (0.6)	11 (3.4)	168 (52.7)	138 (43.3)	4.39	87.71	3
There is a female health provider for special procedure	37 (11.6)	11 (3.4)	40 (12.5)	123 (38.6)	107 (33.5)	3.79	75.85	6
<b>Total</b>						<b>4.21</b>	<b>84.15</b>	

Table 4.5.7 shows that the majority of participants expressed satisfaction for respect and privacy with imaging staff indicated by the overall mean score above 4. The overall mean score was 4.21 and its overall percentage 84.15%.

The mean scores for the respect and privacy domain ranged from 4.46 to 3.79 and the average percentages ranged from 89.2% to 75.8%. These results reflect the good communication with the imaging providers.

The lowest relative weights were “the availability of alternative clothes” and “availability of a female imaging providers in the imaging department” with average relative weight 77.54% and 75.85% respectively. These results reflect to some extent lack of attention to community norms and sensitivity of some imaging procedures.

#### 4.6.9 The safety factor from radiation risks

The ionizing radiation constitutes a harm for patients and staff if the safety measures not taken to prevent them from radiation exposure and associated health risks. The safety tools to protect patients from unnecessary radiation should be available in all imaging rooms and the imaging providers must be use these tools.

**Table (4.5.8) Results of safety factor from radiation risks**

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)	Mean	% Mean	Rank
Instructions and signals about the risks of radiation were clearly written , especially for pregnant women	12 (3.8)	12 (3.8)	31 (9.7)	151 (47.3)	113 (35.4)	4.07	81.4	1
Service Provider illustrates the danger of exposure to radiation before the imaging process.	50 (15.7)	29 (9.1)	46 (14.4)	137 (42.9)	57 (17.9)	3.38	67.6	4
Service Provider is keen to bring out the escorts of the X-ray room during the imaging process	37 (11.6)	32 (10)	33 (10.3)	132 (41.4)	85 (26.6)	3.61	72.3	3
the adequate tools of prevention from unnecessary radiation were used by medical imaging service provider	85 (26.6)	71 (22.3)	51 (16)	75 (23.5)	0.0 (0.0)	2.71	54.2	5
Did not seek medical imaging service provider for re-examination because of a defect that during the filming process	17 (5.3)	29 (9.1)	10 (3.1)	140 (43.9)	123 (38.6)	4.01	80.3	2
<b>Total</b>						<b>3.56</b>	<b>71.2</b>	

Table 4.5.8 shows that the overall mean score of commitment of imaging providers to apply radiation safety measures above 3.5 .The overall mean score was 3.56 and its overall percentage 71.2%.

The mean scores for the safety factor ranged from 4.07 to 2.71 and the average percentages ranged from 81.4% to 54.2%.

These results reflect the negative practices of imaging providers toward safety measures and protective tools shortage in the imaging rooms.

These results are consistent with the results of Abu Zer (2014) which was conducted in Radio-Diagnostic Centers in Governmental Hospitals of GGs, and revealed that there is approximately half of imaging providers have negative practices toward radiation protection. The same results were reported in the study of Pacheco, Santos and Tavares, (2007) which was conducted in radio-diagnosis services in two hospitals of the state public network in Rio Bronco, Brazil and revealed that the imaging provider neglected the protective measures to companions and sensitive organs for patients, both institutions did not had individual protection equipments.

#### 4.6.10 Ranking all questionnaire domains

Regarding to Table (4.5.9), the overall mean score was 4.06 and its overall percentage 81.2%. The mean scores for the all domains ranged from 4.29 to 3.82 and the average percentages ranged from 85.8% to 71.2%.

we can see the first rank was for reception and waiting time in imaging department and second rank for communication factor with same relative weight (85.6%), while the last rank for service place characteristics with relative weight 76.3% followed by affordability of imaging service with relative weight 74% and final rank for safety measures from radiation risks with relative weight 71.2%.

**Table (4.5.9) Distribution of all study domains by mean, percent, S.D and rank**

	Statement	Mean	Percent	SD	Rank
1	Accessibility to the medical imaging	4.23	84.53	0.53	3
2	Affordability of medical imaging services	3.83	76.6	0.67	6
3	Service place characteristics (amenities)	3.82	76.34	0.69	7
4	Medical imaging staff characteristics	4.05	81	0.56	5
5	Reception	4.37	87.3	0.54	1
6	Time factor	4.29	85.7	0.50	2
7	Communication factor	4.29	85.7	0.50	2
8	Respect and privacy factor	4.2	84.18	0.51	4
9	The safety factor for radiation risks	3.56	71.2	0.78	8
	<b>Total</b>	4.06	81.2	0.37	

These results show the strength and weakness points of imaging services from respondent's perspective which revealed that the safety measure from radiation risks, characteristics of imaging department and the cost of imaging services specifically for social in-needed clients are consider weakness points. While, the reception, appropriate waiting time which consumed to receive imaging services, accessibility to the medical imaging, respect the clients and the imaging staff characteristics revealed the strength points in imaging services.

## 4.7 Inferential analysis

To study the respondents satisfaction from imaging services, the following part compares between the selected socio-economic characteristics of study participants and accessibility to imaging services, characteristics of imaging service place and imaging staff, respect and privacy, communication and client safety from radiation risk.

### 4.7.1 Relationship between level of education and imaging services

Regarding to table 4.6 One-way ANOVA shows a statistical significant difference at (P-value<0.05) between education level and accessibility to imaging services. LSD post hoc test shows that there is a statistical significant difference between respondents who had more than bachelor degree (mean = 4.3697) and accessibility to imaging services which reflect the interest of high educational respondents to seeking health services and their ability to deal with the different access barriers to health services. Also, the statistical significant was shown between respondents who had less than secondary school (mean = 4.1352) and characteristics of imaging staff which attributed to low capability of criticism.

The differences of the scores of the remaining domains and education level did not reach any statistical significant.

**Table (4.6) Differences in domains by level of education**

No	Domains	level of education	N	Mean	SD	F	Sig.
1	<b>Accessibility to the medical imaging</b>	Secondary school and less	131	4.29	0.51	4.306	<b>0.005</b>
		Diploma	47	4.33	0.44		
		Bachelor	124	4.09	0.57		
		More than bachelor	17	4.36	0.39		
		Total	319	4.23	0.53		
2	<b>Affordability of medical imaging services</b>	Secondary school and less	131	3.76	0.59	1.845	0.139
		Diploma	47	3.82	0.77		
		Bachelor	124	3.61	0.69		
		More than bachelor	17	3.58	0.64		
		Total	319	3.70	0.67		
3	<b>Service place characteristics (amenities)</b>	Secondary school and less	131	3.86	0.68	1.615	0.186
		Diploma	47	3.91	0.65		
		Bachelor	124	3.77	0.68		
		More than bachelor	17	3.54	0.87		
		Total	319	3.82	0.69		

4	<b>Medical imaging staff characteristics</b>	Secondary school and less	131	4.14	0.49	2.678	<b>0.047</b>
		Diploma	47	4.11	0.64		
		Bachelor	124	3.96	0.58		
		More than bachelor	17	3.92	0.54		
		Total	319	4.05	0.56		
5	<b>Reception</b>	Secondary school and less	131	4.38	0.61	0.738	0.530
		Diploma	47	4.45	0.49		
		Bachelor	124	4.32	0.51		
		More than bachelor	17	4.31	0.65		
		Total	319	4.37	0.56		
6	<b>Time Factor</b>	Secondary school and less	131	4.33	0.51	1.732	0.160
		Diploma	47	4.25	0.62		
		Bachelor	124	4.23	0.54		
		More than bachelor	17	4.50	0.56		
		Total	319	4.29	0.54		
7	<b>Communication factor</b>	Secondary school and less	131	4.32	0.51	1.129	0.338
		Diploma	47	4.35	0.51		
		Bachelor	124	4.23	0.51		
		More than bachelor	17	4.21	0.59		
		Total	319	4.28	0.53		
8	<b>Respect and privacy factor</b>	Secondary school and less	131	4.26	0.48	1.460	0.225
		Diploma	47	4.25	0.45		
		Bachelor	124	4.15	0.52		
		More than bachelor	17	4.09	0.67		
		Total	319	4.21	0.50		
9	<b>The safety factor of the risk of exposure to radiation</b>	Secondary school and less	131	3.52	0.84	1.960	0.120
		Diploma	47	3.75	0.79		
		Bachelor	124	3.56	0.67		
		More than bachelor	17	3.25	0.94		
		Total	319	3.56	0.78		
	<b>Overall</b>	Secondary school and less	131	4.09	0.35	2.798	0.040
		Diploma	47	4.14	0.41		
		Bachelor	124	3.99	0.37		
		More than bachelor	17	3.97	0.43		
		Total	319	4.06	0.37		

\* P value < 0.05 is statistically significant

## 4.7.2 Relationship between age group and imaging services

Regarding to table 4.6.1 One-way ANOVA shows that there are no statistical significant differences ( $P\text{-value} < 0.05$ ) of all domains and there are no significant difference in the mean score between respondents age groups and all domains which could be attributed to the most respondents were adults (50.7% of respondents age 20-40 years) and mostly they considered not chronic patients and not frequently using the health care including imaging services.

**Table (4.6.1) Differences in domains by age group**

No	Domains	Age group	n	Mean	SD	F	Sig.
1	Accessibility to the medical imaging	Less than 20 Yrs	40	4.24	0.49	0.502	0.681
		20- 40 Yrs	165	4.23	0.48		
		40- 60 Yrs	89	4.20	0.65		
		More than 60 Yrs	25	4.34	0.47		
		Total	319	4.23	0.53		
2	Affordability of medical imaging services	Less than 20 Yrs	40	3.83	0.58	1.330	0.265
		20- 40 Yrs	165	3.64	0.66		
		40- 60 Yrs	89	3.77	0.71		
		More than 60 Yrs	25	3.67	0.69		
		Total	319	3.70	0.67		
3	Service place characteristics (amenities)	Less than 20 Yrs	40	3.70	0.63	1.098	0.350
		20- 40 Yrs	165	3.86	0.67		
		40- 60 Yrs	89	3.84	0.72		
		More than 60 Yrs	25	3.65	0.78		
		Total	319	3.2	0.69		
4	Medical imaging staff characteristics	Less than 20 Yrs	40	4.22	0.53	1.968	0.119
		20- 40 Yrs	165	3.99	0.58		
		40- 60 Yrs	89	4.08	0.51		
		More than 60 Yrs	25	4.04	0.58		
		Total	319	4.05	0.56		
5	Reception	Less than 20 Yrs	40	4.47	0.50	1.413	0.239
		20- 40 Yrs	165	4.31	0.58		
		40- 60 Yrs	89	4.41	0.52		
		More than 60 Yrs	25	4.42	0.57		
		Total	319	4.37	0.55		
6	Time Factor	Less than 20 Yrs	40	4.46	0.53	2.334	0.074
		20- 40 Yrs	165	4.22	0.53		
		40- 60 Yrs	89	4.33	0.56		
		More than 60 Yrs	25	4.26	0.56		
		Total	319	4.29	0.54		

<b>7</b>	<b>communication factor</b>	Less than 20 Yrs	40	4.38	0.61	1.051	0.370
		20- 40 Yrs	165	4.24	0.50		
		40- 60 Yrs	89	4.30	0.50		
		More than 60 Yrs	25	4.36	0.48		
		Total	319	4.28	0.51		
<b>8</b>	<b>Respect and privacy factor</b>	Less than 20 Yrs	40	4.25	0.47	0.826	0.480
		20- 40 Yrs	165	4.18	0.53		
		40- 60 Yrs	89	4.24	0.46		
		More than 60 Yrs	25	4.29	0.54		
		Total	319	4.21	0.50		
<b>9</b>	<b>The safety factor of the risk of exposure to radiation</b>	Less than 20 Yrs	40	3.38	0.79	1.876	0.133
		20- 40 Yrs	165	3.61	0.79		
		40- 60 Yrs	89	3.60	0.73		
		More than 60 Yrs	25	3.31	0.83		
		Total	319	3.56	0.78		
<b>Overall</b>	Less than 20 Yrs	40	4.10	0.33	0.704	0.550	
	20- 40 Yrs	165	4.03	0.38			
	40- 60 Yrs	89	4.09	0.36			
	More than 60 Yrs	25	4.04	0.39			
	Total	319	4.06	0.37			

\* P value < 0.05 is statistically significant

### 4.7.3 Relationship between income level and imaging services

Regarding to table 4.6.2 One-way ANOVA shows that there are no statistical significant differences ( $P\text{-value} < 0.05$ ) and there are no significant difference in the mean score between respondents income categories and all domains which attributed to the appropriateness of imaging services to different income level in Palestinian community, but if we compare the mean of the income level and the overall result, the income level of less than 1000 NIS is higher mean from other group, which attributed to the satisfaction of this group with their difficult reality and their ability to adaptation.

**Table (4.6.2) Differences in domains by income level**

No	Domains	Income level	n	Mean	SD	F	Sig.
1	<b>Accessibility to the medical imaging</b>	Less than 1000 NIS	101	4.25	0.49	0.131	0.942
		1000-2000 NIS	113	4.21	0.55		
		2001-3000 NIS	76	4.22	0.50		
		More than 3000	29	4.21	0.60		
		Total	319	4.23	0.54		
2	<b>Affordability of medical imaging services</b>	Less than 1000 NIS	101	3.64	0.65	1.461	0.225
		1000-2000 NIS	113	3.81	0.69		
		2001-3000 NIS	76	3.66	0.67		
		More than 3000	29	3.61	0.61		
		Total	319	3.70	0.67		
3	<b>Service place characteristics (amenities)</b>	Less than 1000 NIS	101	3.93	0.67	1.597	0.190
		1000-2000 NIS	113	3.74	0.71		
		2001-3000 NIS	76	3.82	0.64		
		More than 3000	29	3.72	0.72		
		Total	319	3.82	0.69		
4	<b>Medical imaging staff characteristics</b>	Less than 1000 NIS	101	4.15	0.55	1.970	0.118
		1000-2000 NIS	113	4.03	0.58		
		2001-3000 NIS	76	3.95	0.55		
		More than 3000	29	4.02	0.44		
		Total	319	4.05	0.56		
5	<b>Reception</b>	Less than 1000 NIS	101	4.44	0.51	1.209	0.307
		1000-2000 NIS	113	4.33	0.55		
		2001-3000 NIS	76	4.30	0.64		
		More than 3000	29	4.41	0.49		
		Total	319	4.37	0.56		

<b>6</b>	<b>Time Factor</b>	Less than 1000 NIS	101	4.30	0.53	0.516	0.671
		1000-2000 NIS	113	4.32	0.56		
		2001-3000 NIS	76	4.23	0.54		
		More than 3000	29	4.27	0.54		
		Total	319	4.29	0.54		
<b>7</b>	<b>communication factor</b>	Less than 1000 NIS	101	4.32	0.47	0.983	0.401
		1000-2000 NIS	113	4.31	0.54		
		2001-3000 NIS	76	4.20	0.52		
		More than 3000	29	4.31	0.53		
		Total	319	4.28	0.51		
<b>8</b>	<b>Respect and privacy factor</b>	Less than 1000 NIS	101	4.28	0.47	1.155	0.327
		1000-2000 NIS	113	4.19	0.53		
		2001-3000 NIS	76	4.16	0.53		
		More than 3000	29	4.14	0.47		
		Total	319	4.21	0.50		
<b>9</b>	<b>The safety factor of the risk of exposure to radiation</b>	Less than 1000 NIS	101	3.64	0.81	0.529	0.663
		1000-2000 NIS	113	3.51	0.82		
		2001-3000 NIS	76	3.53	0.70		
		More than 3000	29	3.54	0.69		
		Total	319	3.56	0.78		
<b>Overall</b>		Less than 1000 NIS	101	4.11	0.36	1.102	0.348
		1000-2000 NIS	113	4.05	0.39		
		2001-3000 NIS	76	4.01	0.38		
		More than 3000	29	4.02	0.34		
		Total	319	4.05	0.37		

\* P value < 0.05 is statistically significant

#### 4.7.4 Relationship between gender and imaging services

Regard to table 4.6.3 an independent t-test shows a statistical significant difference at (P-value<0.05) between gender and medical imaging staff characteristics. LSD post hoc test shows that there is statistical significant difference between male respondents (mean = 4.09) and accessibility to imaging services which attributed to the most imaging providers are male. So, the respondents and imaging providers are easy to contact and deal with each other. The differences of the scores of the remaining domains and gender did not reach any statistical significant. By comparing the mean of gender and overall result, we can noted the female get the high mean which attributed to women in Gaza is satisfied with what is available and their expectation is few.

**Table (4.6.3) Differences in domains by gender**

No	Domains	Gender	n	Mean	SD	t	Sig
1	Accessibility to the medical imaging	Male	154	4.21	0.50	0.612	0.074
		Female	165	4.24	0.56		
2	Affordability of medical imaging services	Male	154	3.80	0.66	2.245	0.928
		Female	165	3.62	0.67		
3	Service place characteristics (amenities)	Male	154	3.79	0.66	0.633	0.496
		Female	165	3.84	0.71		
4	Medical imaging staff characteristics	Male	154	4.09	0.50	1.158	<b>0.032</b>
		Female	165	4.02	0.61		
5	Reception	Male	154	4.35	0.58	0.499	0.964
		Female	165	4.38	0.53		
6	Time factor	Male	154	4.27	0.56	0.472	0.951
		Female	165	4.30	0.53		
7	communication factor	Male	154	4.278	0.49	0.312	0.119
		Female	165	4.29	0.53		
8	Respect and privacy factor	Male	154	4.21	0.47	0.041	0.230
		Female	165	4.21	0.53		
9	The safety factor of the risk of exposure to radiation	Male	154	3.56	0.76	0.048	0.499
		Female	165	3.56	0.79		
Overall		Male	154	4.06	0.35	0.183	0.340
		Female	165	4.05	0.39		

\* P value < 0.05 is statistically significant

### 4.7.5 Relationship between employment status and imaging services

Regard to table 4.6.4 an independent t-test was used to compare the means of the nine domains of imaging services in reference to employment status. Table 4.7.4 Shows that there are no statistical significant differences at (P-value<0.05) between employment status and all study domains and there are no significant difference in the mean score which attributed to needful of imaging services in spite of employment status. It is worth to mention the unemployment level in the study sample was 52%.

**Table (4.6.4) Differences in domains by employment condition**

No	Domains	Employment condition	n	Mean	SD	t	Sig
1	Accessibility to the medical imaging	Yes	153	4.16	0.56	2.117	0.588
		No	166	4.28	0.49		
2	Affordability of medical imaging services	Yes	153	3.68	0.64	0.31	0.206
		No	166	3.71	0.69		
3	Service place characteristics (amenities)	Yes	153	3.75	0.67	1.620	0.543
		No	166	3.87	0.69		
4	Medical imaging staff characteristics	Yes	153	3.98	0.554	2.132	0.754
		No	166	4.11	0.553		
5	Reception	Yes	153	4.30	0.60	1.945	0.378
		No	166	4.42	0.51		
6	Time factor	Yes	153	4.25	0.56	0.472	0.770
		No	166	4.32	0.53		
7	communication factor	Yes	153	4.26	0.52	1.083	0.943
		No	166	4.31	0.51		
8	Respect and privacy factor	Yes	153	4.18	0.53	0.994	0.241
		No	166	4.236	0.48		
9	The safety factor of the risk of exposure to radiation	Yes	153	3.51	0.79	1.090	0.667
		No	166	3.60	0.77		
	Overall	Yes	153	4.01	0.36	2.109	0.246
		No	166	4.10	0.38		

\* P value < 0.05 is statistically significant

## 4.8 Checklist data analysis

The second tool used in this study is checklist. Checklist data were collected and analyzed from all imaging departments in the selected NGOs.

### 4.8.1 RTs distribution among medical imaging departments at NGOs

**Table (4.7) RTs distribution among medical imaging departments at NGOs**

No	Hospital	No. of RTs	Gender of RTs		Qualification	Training program	Radiologist
			Male	Female			
1	Red Crescent Society for Gaza Strip	5	2	3	Bachelor degree	Yes	2-B*
2	Public aid Hospitals	4	3	1	Bachelor degree	No	3 (2B-M*)
3	Al-Sahaba Medical Complex	4	1	3	Bachelor degree	No	2 (2M)
4	Al-Awda Hospital	5	4	1	Bachelor degree	No	2 (B)
5	Yaffa Medical Center	3	2	1	Bachelor degree	No	1 (M)
6	Al-Kuwaiti Hospital	2	2	0	Bachelor degree	No	1 (B)
<b>Total</b>		23	14	9			11
<b>Percent</b>		100%	60%	40%			

*B: Board, M: Master*

Table 4.7 illustrated the imaging staff number and distribution who working in all imaging departments which accounts 23 RTs and 11 radiologists. All RTs have bachelor degree, 60% of them are males, while 40% are females. 7 radiologists have Palestinian board degree and the rest have master degree. Only RTs in Red Crescent Society for Gaza Strip participated in training program. The RTs in Red Crescent Society for Gaza Strip and Public aid Hospitals provides training program in different imaging modalities from outside the hospital.

Based on key informant: most of employees in NGOs working by contract of temporary employment except Red Crescent Society for Gaza Strip which depends on a temporary and permanent contracts employment. This leads to the instability of the medical staff and increases the turnover rate when there is a better alternative, therefore this situation adversely affects the quality of work.

Regard to the number of imaging services employees in most NGOs, key informant interviews reported that the number of RTs and radiologists in most NGOs is adequate and commensurate with the number of imaging exams, where the RT does not exceed 15 imaging exams per one shift and the radiologist write 10 reports and do 7 to 10 U/S exams per one shift. These numbers are considered low resulted from the poor economic situation in GS. Suleiman, (2016) studied the imaging services in governmental sector and he calculated the number of imaging exams per RTs and found that each RT carry out 21 to 34 X-ray per one shift, 4-5 fluoroscopy exams per one RT, 21 CT exams per one RT and 16 MRI exams per on RT. Therefore, the rate of RT work in the government sector is equivalent to twice that of the RT in the NGOs.

The researcher noted the work system for RTs in governmental sector is depend on the determine the RT on specific type of imaging services such as X-ray RT, CT RT and MRI RT but the NGOs depend on the rotation system whereas the RT work in different type of imaging services at the same shift.

## 4.8.2 Distribution and functionality of imaging machines at NGOs

Table (4.7.1) Distribution and functionality of imaging machines

Hospital		Medical Imaging type	Red Crescent Society for Gaza Strip	Public aid Hospitals	Al-Sahaba Medical Complex	Al-awda Hospital	Yaffa Medical Center	Al-Kuwaiti Hospital	Total	Percent %
1	Conventional radiology	Functioning	1A*	1A	1A	1A	1A	1A	6A	100
		Malfunctioning	0	0	0	0	0	0	0	0
2	Panorama	Functioning	1A	1A	1D*	1A	1A	1A	6	85
		Malfunctioning	0	1D	0	0	0	0	1D	15
3	Mammography	Functioning	1A	0	0	1A	0	0	2A	100
		Malfunctioning	0	0	0	0	0	0	0	0
4	Fluoroscopy	Functioning	1A	0	0	1D	0	0	1A,1D	100
		Malfunctioning	0	0	0	0	0	0	0	0
5	CT	Functioning	1	0	0	0	0	0	1	50
		Malfunctioning	0	1	0	0	0	0	1	50
6	MRI	Functioning	1	0	0	0	0	0	1	100
		Malfunctioning	0	0	0	0	0	0	0	0
7	U/S	Functioning	2DO*	3DO	1DO	1DO	1C*	1C	9	100
		Malfunctioning	0	0	0	0	0	0	0	0
Total		Functioning	8	7	3	6	3	3	27	92
		Malfunctioning	0	2	0	0	0	0	2	8
8	Processing machines	Digital	1	0	1	1	1	1	5	
		Conventional	1	1	0	1	1	1	5	

(A\*=Analogue, D\*=Digital, DO\*=Doppler, C\*= Conventional). Malfunctioning: failure to function properly

Table (4.7.1) shows that there are 29 imaging machines in all NGOs. Every imaging department have one plain X-ray machine. A mammography machine is available in Red Crescent Society for Gaza Strip and Al-Awda hospital. 85% of panoramic machines are functioning, and only one of them is digital machine. Two fluoroscopy machines are available; one is analogue in Red Crescent Society for Gaza Strip and the other one is a digital system in Al-Awda hospital. Only two CT machines are available, one of them is functioning with limited capabilities due to old model in Red Crescent Society for Gaza Strip, another advanced CT is available in Public Aid Hospital. But, it is out of service during time of data collection. Only one MRI is available in Red Crescent Society for Gaza Strip.

U/S is available in all imaging departments with high quality machines. Most of available U/S machines are Doppler U/S except those at Al-Kuwaiti hospital and Yaffa medical center which are conventional U/S.

Most of processing system is computed radiography (CR) which allow visualizing the X-ray images with high quality print out or computerized image.

Regarding to the previous descriptive data, the researcher concludes that the distribution of basic imaging services and U/S in GGs is good and appropriate in general, but the advanced imaging services such as MRI and CT are available in GG, this is due to the most health care services in NGOs offered limited and basic health services. Also, we noted the mammogram services are not available in Mid-Zone and south governorate.

Qualitatively, a key informant said *“the basic imaging machines are available in all GGs, but the advanced imaging machines specifically MRI are limited, due to a high price and high maintenance cost of these machines. So, the most NGOs unable to purchase or afford it”*. Also, he said *“the major obstacles facing imaging services is the faults in imaging machines especially advanced machines as CT and MRI and it takes long time to repair it due to a high cost of spare parts and political difficulties to import everything related to radiation. Regarding to the basic X-ray machines and U/S are rarely breaks down due to lack of pressure on these machines, but there is not any alternative plans if sudden out of services occurs”*.

The researcher collected all advanced imaging services in NGOs, governmental and private sector in GS and found that 4 MRI and 12 CT are available. The GS inhabitants are approximately 2000,000. So, 2 MRI and 6 CT machines are available per one million inhabitants. . In comparison, the availability of CT numbers by million inhabitants in some countries is; 18, 14 and 10 CT machines in Spain, Turkey and Israel, respectively. Regarding to MRI, there are 19, 10 and 5 MRI machines by million inhabitants are available in Spain, Turkey and Israel, respectively (OECD, 2016). This comparison gives indication about the great shortage of MRI and CT machines in GS.

### 4.8.3 Medical imaging room spaces at NGOs

Table (4.7.2) Medical imaging room spaces m<sup>2</sup>

Hospital		Palestinian standard space m <sup>2</sup>	Red Crescent Society for Gaza Strip	Public aid Hospitals	El – Sahaba Medical Complex	El – Aawda Hospital	Yaffa Medical Center	Al Kuwaiti Hospital
1	Conventional radiology	20 m <sup>2</sup>	30	25*	35*	18	30*	36*
2	Panorama	4 m <sup>2</sup>	16*	25*	35*	9	30*	36*
3	Mammography	4 m <sup>2</sup>	16*	NA	NA	8	NA	NA
4	Fluoroscopy	2 m <sup>2</sup>	30	NA	NA	30	NA	NA
5	CT	30 m <sup>2</sup>	28	30	NA	NA	NA	NA
6	MRI	30-75 m <sup>2</sup>	35	NA	NA	NA	NA	NA
7	U/S	9 m <sup>2</sup>	12	12	10	8	9	9
8	Processing machine	9 m <sup>2</sup>	10	4	7	7	5	5

NA: not available

(\*): Two imaging machines in one room

Regarding to table (4.7.2) the most imaging rooms space are conformity with Palestinian legislation for design imaging department (Annex 10), but there are four imaging rooms contains two imaging machines in the same room (mostly conventional radiography machine and panorama) and this is not complies with Palestinian legislation for design imaging department.

U/S, processing room and MRI standard spaces not mentioned in the Palestinian legislation for accreditation imaging department. According to DHA for accreditation imaging services and from the researcher experience, the appropriate spaces for both U/S and processing room are approximately 9 m<sup>2</sup>, and the MRI room is 35 m<sup>2</sup>. This standard matches the spaces in all imaging departments in NGOs.

The researcher followed the shielded of walls, doors and control panels of imaging rooms which depend on ionizing radiation and found that all imaging rooms are complies with Palestinian legislation for radiation safety, but there is no periodic follow up the radiation leakage, especially when there is a replace or add a new imaging machine or redesign imaging rooms (Palestinian Energy and Natural Resources, 2017).

#### 4.8.4 Availability of basic amenities

Table (4.7.3) clarifies that the basic amenities of imaging department, whereas the most imaging departments are well-structured and ready to provide services. But, the frequent neglected basic amenities are obvious in the most imaging departments which include the availability of potable water, special design for handicap clients, proper design of the waiting area, resting room for the imaging staff and the dressing room for clients.

**Table (4.7.3) Percent of basic amenities availability in imaging department**

NO		Red Crescent Society for Gaza Strip	Public aid Hospitals	Al.Sahaba Medical complex	Al-Awda Hospital	Yaffa Medical Center	Al-Kuwaiti Hospital	%
1	The imaging room's space are appropriate and designed according to the standards.	Y	√		√	√	√	83
		N		√				16
		TSE						0
2	There is X-ray viewer at a control room.	Y	√	√	√	√	√	100
		N						0
		TSE						0
3	There is a suitable office for radiologists to interpret the medical images and patient consultation.	Y	√		√			33
		N		√	√	√	√	66
		TSE						0
4	There is a rest room for medical staff.	Y	√					17
		N		√	√	√	√	83
		TSE						0
5	The waiting area is close to imaging rooms.	Y	√	√	√	√	√	100
		N						0
		TSE						0
6	The waiting area is comfortable to client.	Y	√					17
		N		√	√	√	√	66
		TSE				√		17
7	There is a guidance in the imaging rooms and waiting area.	Y	√	√		√	√	83
		N			√			17
		TSE						0
8	Suitable temperature in imaging rooms.	Y	√	√	√	√	√	100
		N						0
		TSE						0
9	Suitable ventilation in imaging and processing rooms.	Y	√		√	√	√	83
		N		√				17
		TSE						0
10	There are W/Cs for clients within departments for male and female.	Y	√		√	√		66
		N		√			√	34
		TSE						0
11	There is A dressing room for clients	Y	√					17
		N		√	√	√	√	83
		TSE						0

12	The imaging facilities are clean and in order	Y	√	√	√	√	√	√	100
		N							0
		TSE							0
13	There is an adequate supply of fresh water.	Y	√			√	√	√	66
		N		√	√				33
		TSE							0
14	Electricity is available all time.	Y	√	√	√	√	√	√	100
		N							0
		TSE							0
15	There are ways and facilities for handicapped clients	Y	√					√	33
		N			√	√	√		50
		TSE		√					17
	Total Yes		15	6	8	11	10	10	
	Percent Yes		<b>100</b>	40	53	<b>73</b>	66	66	

The Red Crescent Society for Gaza Strip is consider the best hospital in terms of available basic amenities, then Al-Awda Hospital follows. The rest imaging departments are accepted and in some points less accepted. The main weakness points were noted in the ways for handicapped clients, dressing room for clients, a rest room for medical staff and suitable office for radiologists to interpret the medical images.

The researcher compares the checklist and questionnaire results and shows that the respondents show their dissatisfaction from the following points: availability of entertaining means in the waiting halls, availability of potable water, clean WCs, special design for handicapped clients and availability of box for suggestions.

These dissatisfied points were consistent with the checklist results, where the potable water is available in 66% of imaging department, also 17% of waiting halls are convenient and fits with services provided and only 33% of imaging departments consider the handicapped clients.

Based on Key Informant Interview, the design and readiness of imaging services in most NGOs depend on the type of the imaging services provided and the number of clients, where the most of imaging services provide basic imaging services such as plain X-ray and U/S and these services take few minutes to be performed. So, the most imaging departments in NGOs characterized by small size and lack of furnishing.

## 4.8.5 Radiation safety tools in the imaging department

Regarding to table (4.7.4) the radiation safety tools are available to some extent in all imaging department. The Red Crescent Society for Gaza Strip is the best hospital in term of availability of radiation protection tools followed by Al-Awda Hospital. Other hospitals have only lead apron which attributed to the limited imaging services provided and the lack of attention to radiation risks. It is worth to mention, when the researcher asked the respondents, if the imaging provider used the radiation protection tools during imaging procedures, 50.2% said "yes".

The dosimeter which used to measure the exposure received by imaging staff is not available in all hospitals.

**Table (4.7.4) Number, functionality and adequacy of radiation protection tools**

Radiation protection tools		Hospital						
		Red Crescent Society for Gaza Strip	Public aid Hospitals	El - Sahaba Medical Complex	El -Awda Hospital	Yaffa Medical Center	Al Kuwaiti Hospital	
1	Lead apron	<i>Number</i>	9	1	1	5	3	1
		<i>Functionality</i>	5	0	1	2	2	1
		<i>Adequately</i>	100	0	100	100	100	100
		<i>Not adequate</i>	0	100	0	0	0	0
2	Thyroid collar	<i>Number</i>	3	0	1	3	0	0
		<i>Functionality</i>	3	0	1	3	0	0
		<i>Adequately</i>	100	0	100	100	0	0
		<i>Not adequate</i>	0	100	0	0	100	100
3	Eye glasses	<i>Number</i>	3	0	0	0	0	0
		<i>Functionality</i>	3	0	0	0	0	0
		<i>Adequately</i>	100	0	0	0	0	0
		<i>Not adequate</i>	0	100	100	100	100	100
4	Lead gloves	<i>Number</i>	1	0	0	0	0	0
		<i>Functionality</i>	1	0	0	0	0	0
		<i>Adequately</i>	100	0	0	0	0	0
		<i>Not adequate</i>	0	100	100	100	100	100
<b>% of functioning radiation protection tools</b>		75	0	50	62	50	100	
<b>% of adequacy radiation protection tools</b>		100	0	50	50	25	25	
5	A dosimeter availability	0	0	0	0	0	0	

#### 4.8.6 Essential emergency supplies in imaging department

Table (4.7.5) clarifies the percentage of availability of emergency supplies in imaging department. The Red Crescent Society for Gaza Strip was the highest percentage, followed by Al-Awda Hospital. Both Yaffa center and Al-kuwaiti hospital have the same percentage 40% only. The public aid hospital hasn't any type of emergency supplies.

**Table (4.7.5) Percent of essential emergency supplies in imaging departments**

Hospitals		Red Crescent Society for Gaza Strip	Public aid Hospitals	El – Sahaba Medical Complex	El –Awda Hospital	Yaffa Medical Center	Al Kuwaiti Hospital
Emergency supplies							
1	There is central oxygen or oxygen cylinder at imaging rooms	Y	N	Y	Y	Y	Y
2	There is a suction machine at imaging rooms	Y	N	N	Y	N	N
3	There is emergency trolley at imaging rooms	Y	N	Y	Y	Y	Y
4	There is a monitor machine at imaging rooms	Y	N	N	N	N	N
5	There is a fire extinguisher at imaging department	Y	Y	Y	Y	N	N
<b>Percent %</b>		100	20	60	80	40	40

## 4.8.7 Registration procedures

Table (4.7.6) clarifies the basic registration requirements, where the Red Crescent Society for Gaza Strip and El-Awda Hospital have organized administration procedures. While other imaging departments have limited registration procedures which attributed to limited imaging services provided, so the imaging staff performs the registration procedures then they provides imaging services.

In most imaging departments observed there is no system to archiving or documenting the imaging services and there is no a written protocol for providing imaging services.

**Table (4.7.6) Percent of registration procedure requirements in imaging departments**

Hospitals		Red Crescent Society for Gaza Strip	Public aid Hospitals	El – Sahaba Medical Complex	Al-Awda Hospital	Yaffa Medical Center	Al Kuwaiti Hospital
Registration procedure Requirements							
1	The administrative procedures are regular and appropriate	Y	Y	Y	Y	Y	Y
2	Receptionist is available	Y	Y	Y	Y	Y	Y
3	There is a reception counter inside department	Y	Y	Y	Y	Y	Y
4	There is a system for archiving medical image and reports.	Y	N	N	N	N	N
5	There is a written protocol for providing imaging services	Y	N	N	Y	N	N
<b>Percent %</b>		100	60	60	80	60	60

#### 4.8.8 Summarize the checklist items

Table (4.7.7) illustrate that approximately all imaging machines are working well. The administration procedure, imaging room size and structure of imaging departments are accepted to some extent and were got 70%, 62% and 64.3% respectively. Other checklist items which included radiation protection tools, essential emergency supplies were got the lowest percentage approximately 53.3% and lower.

**Table (4.7.7) Summarize checklist data**

Hospitals Checklist items		Red Crescent Society for Gaza Strip	Public aid Hospitals	El – Sahaba Medical Complex	Al-Awda Hospital	Yaffa Medical Center	Al Kuwaiti Hospital	Total percent
1	Functionality of imaging machine	100	71.4	100	100	100	100	95.2
2	Medical imaging room size	71.4	50	50	100	50	50	62
3	Structure of medical imaging departments	100	40	53	73	60	60	64.3
4	Adequate radiation protection tools	100	0	50	50	25	25	41.6
5	Essential emergency supplies	100	20	60	80	40	40	57
6	Administrative procedure	100	60	60	80	60	60	70
<b>Percent %</b>		<b>95.2</b>	40	62	<b>80.5</b>	55.8	55.8	

If we compare the best imaging services in GGs, the Red Crescent Society for Gaza Strip and Al-Awda hospital are the best imaging departments which provides verity imaging services with safety measures, while others hospitals provides limited imaging services. The qualifications of imaging services providers are excellent in all hospitals, but the training programs is very limited.

This summary is consistent with the result of our qualitative study in which key informant said the NGOs are adequately equipped and provides imaging services which meet the client needs with accepted services place and machines. Another one said the NGOs provide mostly basic imaging services while the advanced imaging services are limited resulted from limited support of donors to NGOs

## Chapter 5

### Conclusion and recommendations

#### 5.1 Conclusion

This study is carried out for evaluation of diagnostic imaging services in NGOs at GGs by using Donabedian model, where the inputs of imaging services include the facilities, equipment and human resources. The process includes accessibility to imaging services, service place & imaging staff characteristics, communication, waiting time, respect, and safety measures. Finally the output of imaging services includes delivery of appropriate imaging services and client satisfaction.

The study sample included six Non-Governmental Organizations distributed in all GGs. This study may provide a guidance to the decision makers in order to improve the medical imaging services. The study utilized a descriptive, analytical cross-sectional design with a triangulated approach. Both interviewed questionnaire and checklist were used as data collection tools for the quantitative part. In addition, semi-structure interview was done with seven key informants as qualitative part to enhance and strengthen quantitative results. The response rate was (94%) which is considered high interesting study and high validity of findings.

The questionnaire was used for clients to find out the quality of care from their perspectives and measure their satisfaction from the imaging services. The main results indicate that the accessibility to NGOs and its imaging departments was appropriate in all hospitals. We have obtained these results due to good distribution of NGOs in GGs. In spite of the clients economic status, they were able to purchase the imaging services, but there is not clear policy to deal with social in-needed cases.

From participant's perspective and key informant interviews, the imaging staff were characterized with a professionalism and decency during imaging procedure. The number of imaging staff is limited, due to limited imaging procedures. 23 RTs and 11 radiologists are working in all imaging departments. Most of the RTs have bachelor degree in the imaging medical science and 63% of the radiologists have board degree in the radiology and the rest has master degree.

The reception is organized only in two hospitals, while the other hospitals have not a receptionist or area to receive the patients in the imaging department. Due to the current situation, the imaging staff performs the registration procedures then they provides imaging services.

Most of clients were satisfied with their communication with the imaging providers, also they were satisfied with time spent during imaging procedure.

The results of respect and privacy of clients during imaging procedures showed that the most of clients felt with respect during imaging, and their privacy were assured. The female imaging providers were not available in some imaging departments, especially when there is a sensitive imaging procedure for female clients.

Regarding to safety measures from radiation risks, about 50% of the clients exposed to radiation without using radiation protective tools, and approximately 30% of companions stayed in imaging room during radiation exposure. The results revealed that there are shortage of radiation protection tools. Also, the dosimeter, which is used to measure the radiation dose received by imaging staff is not available in all hospitals.

Concerning to imaging machines, 29 machines are available in the NGOs and most of them are ready to use; six plain X-ray machines, and six panorama machines are functioned and are distributed in different imaging department at NGOs and meet the health needs of imaging services.

Only two mammography machines are available, one of them is in the GG and the other one in the North Governorate (Red Crescent Society for Gaza Strip & Public Aid Hospital). Two functioned fluoroscopic machines are available, one in GG (Red Crescent Society for Gaza Strip) and other one in the north governorate (AL-Awda hospital).

U/S is available in all NGOs, but the Doppler U/S is not available in the South and Mid-zone Governorates. Two CT machines are available (Red Crescent Society for Gaza Strip & Public Aid Hospital), one of them is out of service during time of data collection (Public Aid Hospital). Only one MRI machine is available in GG (Red Crescent Society for Gaza Strip). These results indicate that there is shortage of advanced imaging machines as CT and MRI, especially in the South and Mid-zone governorates.

The researcher audited the space of imaging room and compared it with accreditation and licenses unit standards in MoH and found that the most imaging room space is appropriate

and complied with the standards, but there are four imaging rooms contain more than one imaging machine which is considered incompatible with the standards. The shielding of walls, doors and control panel is complied with Palestinian legislation for radiation safety.

Regarding the basic requirements in the imaging department, the most imaging departments are to some extent well-structured and ready to provide imaging services, but there are basic deficiencies in four departments in waiting area, dressing room, drinking water, WCs and special design for handicapped clients. Approximately 50% of emergency supplies as oxygen, emergency trolley, and suction machines are not available in more than half of departments.

Inferential analysis shows that there was a statistical significant difference at ( $P$ -value  $< 0.05$ ) between respondents who had more than bachelor degree and other education levels regarding accessibility to imaging services. Also, there was a statistical significant between respondents who had less than secondary school and other education levels regarding to imaging staff characteristics. Finally, a statistical significant difference between males and females respondents regarding to imaging staff characteristics, in favor to males, was observed.

## **5.2 Recommendation**

Based on the study analysis, findings and conclusions, the researcher proposes the following recommendations:

- Increase the number of advanced imaging machines to cover all Gaza Governorates.
- Re-audit the safety measures used in the radiation rooms.
- Health care providers in imaging centers at NGOs should commit with Palestinian accreditation and licenses rules and regulations.
- Establishing rules and regimes for social in-needed clients to be able them from obtain NGOs services.
- Rules enforcement to assure safety of imaging staff and clients from radiation risks.
- Regularly, monitoring clients perspectives about the imaging services through routine data collection and reporting.

### **5.3 Recommendations for further studies**

- Conduct similar study at private sectors.
- Conduct comparative study between imaging services in governmental and non-governmental organizations.
- Conduct action research in similar study to improve medical imaging services.
- Conduct study to evaluate the medical image quality, such as CT image quality, MRI image quality.
- Conduct study to evaluate the imaging reports.

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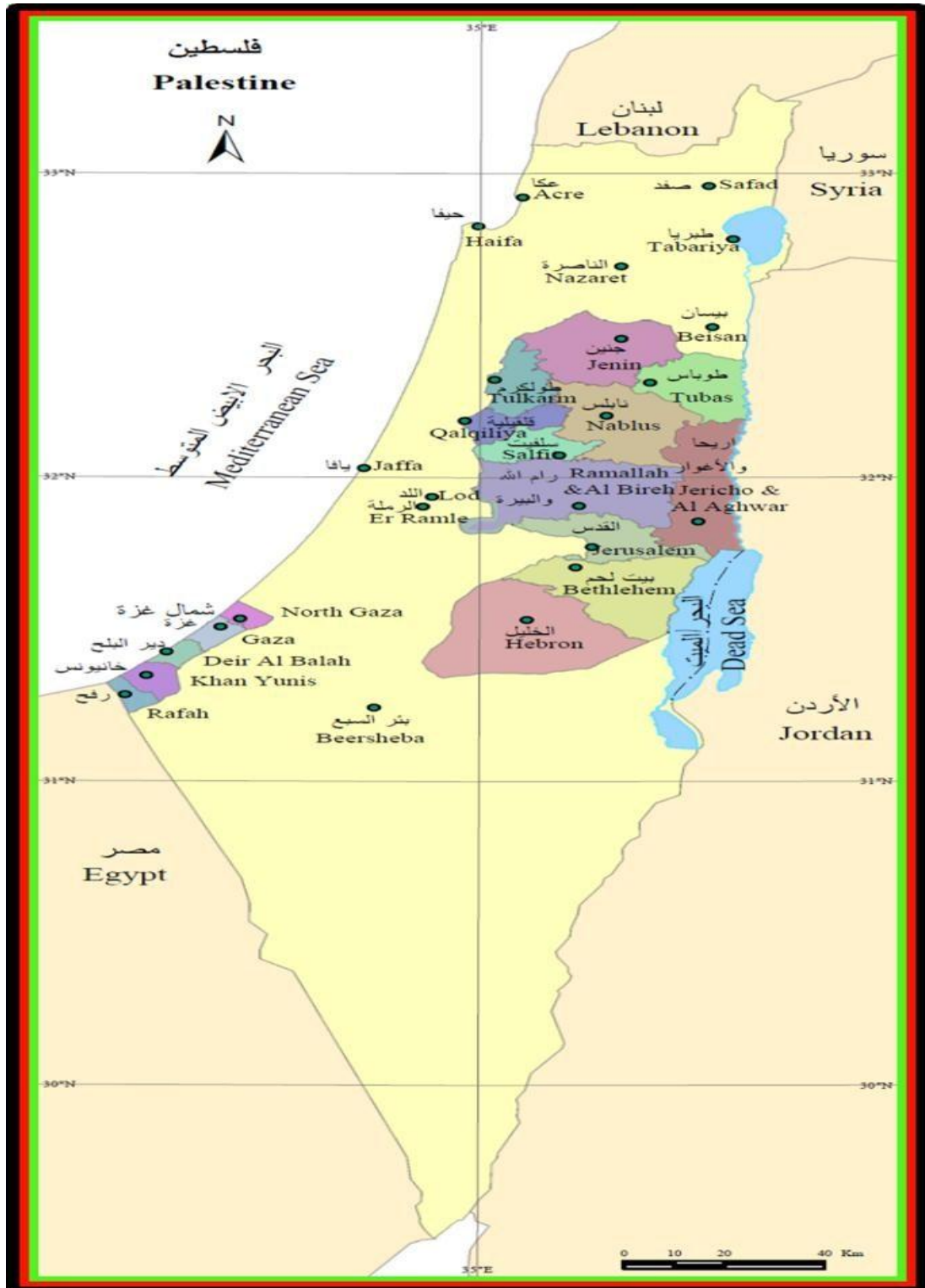
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## Annexes

Annex (1): Gaza Strip Map



From (PCBS, 2015)

## Annex (2) sample size calculation

[Expand All](#) | [Collapse](#)

- Home
- Info and Help
- Language/Options/Settings
- Calculator
- Counts
  - Std.Mort.Ratio
  - Proportion
  - Two by Two Table
  - Dose-Response
  - R by C Table
  - Matched Case Control
  - Screening
- Person Time
  - 1 Rate
  - Compare 2 Rates
- Continuous Variables
  - Mean CI
  - Median/%ile CI
  - t test
  - ANOVA
- Sample Size
- Power
- Random numbers
- Searches
  - Google--Internet
  - PubMed--MEDLARS
- Internet Links
- Download OpenEpi

Start	Enter	Results	Examples	Help
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### Sample Size for Frequency in a Population

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Population size(for finite population correction factor or fpc)(*N*): 2760  
 Hypothesized % frequency of outcome factor in the population (*p*): 50%+/-5  
 Confidence limits as % of 100(absolute +/- %)(*d*): 5%  
 Design effect (for cluster surveys-*DEFF*): 1

---

#### Sample Size(*n*) for Various Confidence Levels

---

ConfidenceLevel(%)	Sample Size
95%	338
80%	156
90%	247
97%	403
99%	536
99.9%	778
99.99%	978

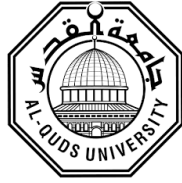
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**Equation**

Sample size  $n = [DEFF * N * p(1-p)] / [(d^2 / Z^2)_{1-\alpha/2} * (N-1) + p(1-p)]$

Results from OpenEpi, Version 3, open source calculator--SSPropor  
 Print from the browser with ctrl-P  
 or select text to copy and paste to other programs.

## **Annex (3)**



### **Participation Consent**

You have been randomly selected to participate in this research study conducted by myself as a part of the requirements for the Master Degree in Public Health at Al-Quds University. The study is entitled "Evaluation of Diagnostic Imaging Services at Non-Governmental Organizations in Gaza Governorates". The overall aim of this study is to evaluate Diagnostic Imaging Services, which provided at Non-Governmental Organizations.

- Your participation in this study is optional, you have the right to accept or refuse sharing your opinions.
- You will be interviewed and asked some questions. This may take up to 15 minutes to complete the questionnaire.
- There are no right and/or wrong answers; just give your perspective.
- Your answers will be confidential; the provided responses refer to your opinions and personal experience with imaging services.
- The responses you will provide will not affect the services you receive from the imaging services.

Thank you for your patience and cooperation.

The researcher  
Mohamed Adnan Balousha  
School of Public Health

## Annex (4)

### Questionnaire of clients from medical imaging services in Non-Governmental Organizations (NGOs)

The questionnaire is structured to evaluate the medical imaging services in the Non - Governmental health centers in Gaza Governorates from client perspective

Data collection information						
(1) Serial No. .....	(2) Date: / /		(3) Day:.....		(4) Name of the data collector:.....	
(5) Health Center Name	Red Crescent Society for Gaza Strip ( )	Public aid Hospitals ( )	El – Sahaba Medical Complex ( )	El – AlawdaHospital ( )	Yaffa Medical Center ( )	Al- Kuwaiti Hospital ( )
(6) Governorate	( ) North	( ) Gaza	( ) Middle	( ) Khan- younis	( ) Rafah	

#### Part I: Personal Data

No.	Item	Answer
1	Age	..... Years
2	Gender	( ) Male ( ) Female
3	Social Status	( ) Married ( ) Single ( ) Widow ( ) Divorced
4	Level of education	( ) Illiterate ( ) General secondary ( ) Diploma ( ) Bachelor ( ) Bachelor ate
5	Are you employed?	( ) Yes ( ) No
6	If the answer is yes – specify	.....
7	Average monthly income	..... shekels
8	Address	( ) North ( ) Gaza ( ) Middle Governorate ( ) Khan Younis ( ) Rafah
9	Do you have health insurance?	( ) Yes ( ) No
10	If the answer is yes-specify its type	( ) Governmental ( ) Private ( ) Others, specify .....
11	What is the reason for seeking health service in the NGOs?	( ) closeness to where you live. ( ) Service Excellence in this place. ( ) Lower the cost price of the service is in place.

		<input type="checkbox"/> Reputable provider of the service. <input type="checkbox"/> Other reasons, (Specify).....
12	Did you receive imaging service from governmental or private health centers?	<input type="checkbox"/> Yes <input type="checkbox"/> No If the answer (yes) please answer the next question
13	How do you compare between what service you received in the governmental and Non-governmental or private health centers?	<input type="checkbox"/> Governmental medical services are high quality <input type="checkbox"/> Non-Governmental medical services are high quality <input type="checkbox"/> private medical services are high quality <input type="checkbox"/> Same quality <input type="checkbox"/> Less quality
14	Did you recommend or advise a friend or a relative to go to this health center if necessary?	<input type="checkbox"/> Yes <input type="checkbox"/> No If the answer No, please mention the causes.....
15	In general, how was your satisfaction with the service provided in this medical center?	<input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Acceptable <input type="checkbox"/> Less than expected

**Part II: Evaluation of accessibility to medical imaging and its equipping, so, please tick ( ✓ ) against agreeable item.**

<b>a) Physical accessibility to the medical imaging</b>						
<b>No.</b>	<b>Item</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
16	Location of health center is near to my residency					
17	Well known health center address					
18	Transportation is available to health center					
19	Proper placement of the imaging department at the health center					
20	The registration place and payment the fees nearby and appropriate					
21	Feasible contact with image department					
22	Reachable information office					
<b>b) Affordability or economic accessibility of medical imaging services</b>						
23	Transport cost to the medical center is accepted					
24	Affordable imaging services					
25	Imaging cost matches the service level					
26	Availability of exemption policy to social in-needed clients					
27	The cost of imaging service does not constitute a financial load					
<b>c) Service Place characteristics (amenities)</b>						
28	The accommodate of imaging department fits with the provided services					
29	Available guiding signs					
30	Clean waiting halls					
31	Comfortable waiting seats					
32	Entertainment means are available in waiting halls					
33	Potable water is available					
34	Clean WCs are available for males and females					
35	Special designed place for handicapped /disabled clients					
36	Available electric power at the time of visit.					
37	Air conditioners are available at the place of service					
38	Noiseless place					
39	Box for suggestions is available					
<b>d) Medical imaging staff characteristics</b>						
40	Image service providers are professionals					
41	Image service providers are decency					
42	There are adequate staff to provide imaging services					

43	Imaging service providers are committed at workplace during work hours					
44	Staff wears uniform on duty					
45	Each member of the staff has identification card					
46	Directors respond to questions and complaints of clients					
<b>e) Reception</b>						
47	Well organized reception offices					
48	Reception staff have a high degree of tact and respect					
49	Receptionist committed at his workplace during working hours					
50	Receive clear and nice replies when you ask about the service					

**Part III: Assessment of steps and working mechanism in medical imaging departments, so, please tick (✓) against agreeable item.**

No.	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
<b>a) Time Factor</b>						
51	The date of receiving the service is appropriate					
52	Waiting time to get medical imaging service is adequate					
53	Getting the result of medical imaging service at an appropriate time					
54	Hours of work in the health care center is sufficient and appropriate					
<b>b) Communication Factor</b>						
55	Service Provider listens to my questions carefully					
56	Suitable responses were received when inquiring about the services					
57	Medical imaging examinations are explained clearly by the service provider					
58	Service Provider was not busy with something during my queries or during the imaging process					
<b>c) Respect and Privacy Factor</b>						
59	The respect is the core during the receipt of service					
60	I did not feel any discrimination in imaging procedure					
61	Alternative clean clothes were available if required					
62	Feeling safe while receiving service					
63	Privacy is valued during imaging process					
64	There is a female health provider for special procedure.					
<b>d) The safety factor of the risk of exposure to radiation</b>						
65	Instructions and signals about the risks of radiation were clearly written, especially for pregnant women					
66	Service Provider illustrates the danger of exposure to radiation before the imaging process.					

67	Service Provider is keen to bring out the companions of the X-ray room during the imaging process					
68	The adequate tools of prevention from unnecessary radiation were used by service provider					
69	Did not seek medical imaging service provider for re-examination because of a defect that during the filming process					

**Annex (5)**

**Checklist for imaging department in Non-Governmental hospitals**

**Date:** \_\_\_\_\_

The following selected items to be checked at Diagnostic Imaging Services						
<b>Imaging staff</b>	<b>1</b>		<b>Male</b>	<b>Female</b>	<b>qualification</b>	<b>Training program</b>
		<b>No. of RTs</b>				
		<b>No. of radiologists</b>				
<b>Imaging machine and room specifications</b>	<b>2</b>	<b>Imaging type</b>	<b>No. of machine</b>	<b>Status</b>	<b>Dimensions of imaging room/m</b>	<b>Wall shielding thickness and height</b>
						<b>Thickness of Doors shielding</b>
						<b>Thickness of control panel shielding</b>
		<i>X-ray</i>				
		<i>Panorama</i>				
		<i>Mammography</i>				
		<i>CT</i>				
		<i>U/S</i>				XXXXXXXXXXXXXXXXXXXX
		<i>MRI</i>				XXXXXXXXXXXXXXXXXXXX
<i>Processing machine</i>	<i>Digital</i>				XXXXXXXXXXXXXXXXXXXX	
	<i>Conventional</i>					

<b>Structure and design</b>	<b>3</b>	The imaging room's space are appropriate and designed according to the standards.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>4</b>	There is X-ray viewer at a control room.	Y <input type="checkbox"/>	N <input type="checkbox"/>		
	<b>5</b>	There is a suitable office for radiologists to interpret the medical images and patient consultation.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>6</b>	There is a rest room for medical staff.	Y <input type="checkbox"/>	N <input type="checkbox"/>		
	<b>7</b>	The waiting area is close to imaging rooms.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>8</b>	The waiting area is comfortable and convenient to patients.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>9</b>	There is a guidance in the imaging rooms and waiting area.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>10</b>	Suitable temperature in imaging and processing rooms.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>11</b>	Suitable ventilation in imaging and processing rooms.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>12</b>	There are toilets for clients within departments for male and female.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>13</b>	There is dressing area for clients with safe storage for valuables and clothing.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>14</b>	The imaging facilities are clean and in order	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>15</b>	There is an adequate supply of fresh water.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>16</b>	Current electricity is available all time.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>17</b>	There is a ways and facilities within the department for special needs clients (wheel chair, trolley.....etc.).	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>	
	<b>Safety measures</b>	<b>18</b>				
			<b>Protective devices to safeguard clients and staffs from x-ray hazards.</b>			<b>Adequacy</b>
<i>Lead apron</i>			Y <input type="checkbox"/>	N <input type="checkbox"/>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Thyroid shield</i>			Y <input type="checkbox"/>	N <input type="checkbox"/>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Special protective eye glasses</i>			Y <input type="checkbox"/>	N <input type="checkbox"/>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Lead gloves</i>			Y <input type="checkbox"/>	N <input type="checkbox"/>	Y <input type="checkbox"/>	N <input type="checkbox"/>
<i>Gonadial shield</i>		Y <input type="checkbox"/>	N <input type="checkbox"/>	Y <input type="checkbox"/>	N <input type="checkbox"/>	
<b>19</b>	There is a dosimeter to measure occupational radiation exposure.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>		

	20	The staff is committed to wear dosimeter during work.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>
	21	The warning signs are available on the entrance of imaging rooms to identify radiation hazards.	Y <input type="checkbox"/>	N <input type="checkbox"/>	
	22	Protective measures to prevent cross infection taken in consideration.	Y <input type="checkbox"/>	N <input type="checkbox"/>	
<b>Emergency supplies</b>	23	There is central oxygen or oxygen cylinder at imaging rooms	Y <input type="checkbox"/>	N <input type="checkbox"/>	
	24	There is suction machine at imaging rooms	Y <input type="checkbox"/>	N <input type="checkbox"/>	
	25	There is emergency trolley at imaging rooms	Y <input type="checkbox"/>	N <input type="checkbox"/>	
	26	There is a monitor machine at imaging rooms	Y <input type="checkbox"/>	N <input type="checkbox"/>	
	27	There is a fire extinguisher at imaging department	Y <input type="checkbox"/>	N <input type="checkbox"/>	
<b>Registration procedure</b>	28	The administrative procedures are organized and appropriate (Registration, fees payment, appointment.....etc.)	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>
	29	Secretarial services are available	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>
	30	Receptionist is available	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>
	31	There is a system for archiving medical image and reports.	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>
	32	There is a written guidelines for providing imaging services	Y <input type="checkbox"/>	N <input type="checkbox"/>	TSE <input type="checkbox"/>

## **Annex (6)**

### **In depth interview questions:**

1-From your perspective, what are the most important difficulties that could hinder the provision of the service?

2- What are the difficulties you face to maintain imaging equipment work properly?

3- From your perspective, do you think that your medical imaging department designed to fit with the nature of work and provide comfort for the clients?

4- Tell us about the services and equipment available in imaging department at NGOs?

5- From your perspective, what are the most important difficulties that could hinder the provision of the service?

6-Quantitative findings indicate that communication results between imaging staff and clients were high, why do you think?

7- Quantitative findings indicate that economic accessibility of imaging services were moderate, why do you think?

## Annex (7)

### List of experts who review the study tools

No	Name	Position
1	Dr. Yasser Alajerami	Head of applied medical science college- Al-Azhar university
2	Dr. Amjad Al Shantie	Lecture in Palestine university
3	Dr. Motassem Salah	Lecture in Islamic university
4	Dr. Ashraf Al Jeede	Lecture in Islamic university
5	Dr. Yousef Al Jeesh	Associate Professor in Public Health Medicine-Islamic university
6	Dr. Bassam Abu Hammad	Associate Professor in Public Health Medicine- Al-Quds university
7	Dr. Mohammad Matter	Consultant radiology
8	Mr. Abed Al Razeq Beram	Lectures in Al-Azhar university- master degree in public health
9	Mr. Awni Obeed	Head of specialized radiology department-Al-Shifa hospital
10	Dr. Moala Abu Taleb	Head of nurse –Al-Shifa hospital

## Annex (8)

### Characteristics of the key informants

No	Name	Location	Position	Experiences
1	Yasser Abu Shawesh	Palestinian Energy and Natural Resources	Head of radiation safety department	More than 10 years
2	Mr. Mousa Abu-zour	Public Aid Hospital	Senior of computed tomography	More than 15years
3	Mr. Abed Al-razeq beram	Red Crescent Society for Gaza Strip	Former head of radiology department	More than 20 years
4	Mr. Tareq Helail	Red Crescent Society for Gaza Strip	Radiologic technologist	More than 5 years
5	Mr. Ashraf Al-halaq	Public Aid Hospital	Radiologic Technologist	More than 5 years
6	Mr. Ahmed Mansoor	Yaffa Medical Center	Radiologic Technologist	More than 5 years
7	Mr. Samira Abu Al shiekh	Ministry of Health	Radiologic Technologist	More than 10 years

**Annex (9)**

**Dubai Health Authority and Palestinian unit for accreditation and licenses of imaging department**

<b>Main X-ray Applications</b>	<b>Minimum Required Surface (DHA)</b>	<b>Minimum Required Surface (Palestinian unit for accreditation and licenses-MOH)</b>	<b>Recommended Structural Shielding Walls and Doors (DHA)</b>	<b>Minimum Shielding Thickness and Height (DHA)</b>
<b>Conventional radiography</b>	15 m <sup>2</sup>	20 m <sup>2</sup>	Walls: Lead Doors: Lead	Walls: 1.5 mm Doors: 1.5 mm Height: 1.80 m
<b>Fluoroscopy</b>	20 m <sup>2</sup>	20 m <sup>2</sup>	Walls: Lead Doors: Lead	Walls: 1.5 mm Doors: 1.5 mm Height: 1.80 m
<b>CT</b>	24 m <sup>2</sup> (6m x 4m)	30 m <sup>2</sup>	Walls: Lead Doors: Lead	Walls: 1.5 mm Doors: 1.5 mm Height: from floor to Ceiling
<b>MRI</b>	30.20 m <sup>2</sup> to 57.60 m <sup>2</sup>	Not mentioned	Walls, ceiling, and flooring covered with Cooper, which galvanized with aluminum to block out specific radio waves that may distort images created by the MRI	-----
<b>Mammography</b>	9 m <sup>2</sup> (3m x 3m)	4 m <sup>2</sup>	Walls: Stone Wall Board Doors: hard wood or steel	Walls: normal stone wall (2.5 cm min) Doors: 1 mm Steel or 2.5 cm of hard wood
<b>Panoramic</b>	6 m <sup>2</sup> 2m x 3m	4 m <sup>2</sup>	Walls: Stone Wall Board	Walls: normal stonewall (2.5 cm min)

Source: Dubai health authority (2012)

Annex (10)

Al-Quds University  
Jerusalem  
School of Public Health



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التاريخ 2017/1/30

حضرة الدكتور خليل مطر المحترم  
مدير مستشفى يافا الطبي  
تحية طيبة وبعد،،،

الموضوع: مساعدة الطالب محمد بعلوشة

تحديكم أطيب التمنيات ونتمنى لكم دوام التقدم والأزدهار، ونود إعلامكم بأن الطالب المذكور أعلاه يقوم بعمل بحث كمتطلب للحصول على درجة الماجستير في الصحة العامة-مسار إدارة صحية بعنوان:

**Evaluation of Diagnostic Imaging Services at Non-Governmental Organizations in Gaza Governorates**

وعليه نرجو من سيادتكم التكرم بالموافقة على تسهيل مهمة الطالب في إنجاز هذا البحث حيث تشمل عينة الدراسة المستفيدين من خدمة التصوير الطبي والمراجعين ومقدمي الخدمات بقسم الأشعة في مستشفى يافا التابع لإدارتكم الموقرة.

شاكرين لكم حسن تعاونكم ودعمكم للمسيرة التعليمية،،،  
و اقبلوا فائق التحية و الاحترام،،،

  
د. بسام أبو حمود  
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التاريخ 2017/1/14

المحترم  
حضرة الدكتور/ عبدالرحمن الداودي  
المدير الطبي - المستشفى الكويتي  
تحية طيبة وبعد،،،

الموضوع: مساعدة الطالب محمد بعلوشة

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التاريخ 2017/1/14

حضرة الدكتور/ تيسير السلطان المحترم  
رئيس مجلس إدارة اتحاد لجان العمل الصحي  
تحية طيبة وبعد،،،

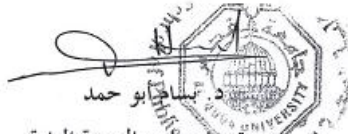
الموضوع: مساعدة الطالب محمد بعلوشة

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التاريخ 2017/1/14

حضرة الدكتور/عبدالعزیز أبو القرايا المحترم  
مدير جمعية الهلال الأحمر الفلسطيني  
تحية طيبة وبعد،،،

الموضوع: مساعدة الطالب محمد بعلوشة

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التاريخ 2017/1/14

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تحية طيبة وبعد،،،

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مفتش عام برامج الصحة العامة  
جامعة القدس - فرع غزة



نسخة:  
الملك



حضرة الأخ / كامل الغفري المحترم  
رئيس مجلس إدارة جمعية مجمع الصحابة الطبي  
تحية طيبة وبعد،،،

الموضوع: مساعدة الطالب محمد بعلوشة

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### Evaluation of Diagnostic Imaging Services at Non-Governmental Organizations in Gaza Governorates

وعليه نرجو من سيادتكم التكرم بالموافقة على تسهيل مهمة الطالب في إنجاز هذا البحث حيث تشمل عينة الدراسة المستفيدين من خدمة التصوير الطبي والمراجعين ومقدمي الخدمات في قسم الأشعة بمجمع الصحابة الطبي التابع لإدارتكم الموقرة.

شاكرين لكم حسن تعاونكم ودعمكم للمسيرة التعليمية،،،  
و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد  
معتسق عام برامج الصحة العامة  
جامعة القدس- فرع غزة



Annex (11) Accreditation and licenses of imaging department-MoH

ملاحظات	المساحة المطلوبة	نوع الجهاز
<p>يتم تشكيل لجنة للتوافق على التالي:</p> <ul style="list-style-type: none"> <li>- المساحة المتوفرة</li> <li>- سماكة الترخيص</li> <li>- ضمان حرية الحركة للمرضى المحمولين</li> </ul>	<p>على الأقل 20 m<sup>2</sup> لا تقل عن 18 m<sup>2</sup></p>	Basic x-ray
<ul style="list-style-type: none"> <li>- يتم مراعاة حرية الحركة للمرضى والأخصائي في المساحة المتوفرة.</li> <li>- المساحة غير شاملة الحاجز الرصاصي والأجهزة الملحقة.</li> </ul>	على الأقل 4 m <sup>2</sup>	Panorama
<ul style="list-style-type: none"> <li>- غير شاملة لغرفة تبديل ملابس المريض</li> </ul>	على الأقل 4 m <sup>2</sup>	Mammogram
<p>يتم تشكيل لجنة للتوافق على التالي:</p> <ul style="list-style-type: none"> <li>- المساحة المتوفرة</li> <li>- سماكة الترخيص</li> <li>- ضمان حرية الحركة للمرضى المحمولين</li> </ul>	<p>على الأقل 24 m<sup>2</sup> لا تقل عن 20 m<sup>2</sup></p>	Fluoroscopy
<ul style="list-style-type: none"> <li>- غير شاملة لغرفة تبديل ملابس المريض</li> </ul>	على الأقل 30 m <sup>2</sup>	C.T.

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سلطنة الوطنيه الفلسطينيه

وزارة الصحة  
نابلس

ص.ب. ١٤  
تلفون - ٣٨٤٧٧٦ ، ٣٨٤٧٧٥  
فاكس - ٣٨٤٧٧٧

Ref. : *مدير عام الصحة  
مدير عام الصحة  
مدير عام الصحة*

Date : *مدير عام الصحة  
مدير عام الصحة  
مدير عام الصحة*

نظام ترخيص ومراقبة الاشعة

مادة (١) - يسمى هذا النظام (نظام ترخيص ومراقبة الاشعة لعام ١٩٩٦).

مادة (٢) - يكون للالفاظ والعبارات التالية المعاني المخصصة لها الا اذا دلت القرينة على خلاف ذلك:

الوزارة : وزارة الصحة

الوزير : وزير الصحة

الوكيل : وكيل وزارة الصحة

الاشعة : الاشعة الكهرومغناطيسية او الجسيمية التي تسبب تأينا في الاجسام التي تعترضها.

جهاز الاشعة : كل جهاز ينتج اشعة كهرومغناطيسية او جسيمية تسبب تأينا في الاجسام التي تعترضها ويستخدم لغايات الفحص والمعالجات الطبية .

أخصائي الاشعة : الطبيب المتخصص في علم الاشعة والحاصل على اعتراف بالتخصص وعلى ترخيص بمزاولة المهنة من الجهات المختصة .

فني الاشعة : الشخص الحاصل على دبلوم في علم الاشعة لمدة سنتين بعد الثانوية العامة والحاصل على ترخيص بمزاولة المهنة .

مركز الاشعة : المكان المخصص لإستخدام أجهزة الاشعة .

فاحص الاشعة : الشخص المرخص له من الوزارة بممارسة فحص مصادر الاشعاع .

سجل الاشعة : السجل المعتمد في الوزارة الخاص بحفظ المعلومات عن أجهزة الاشعة في الدولة .

الرخصة : الوثيقة التي تصدرها الوزارة للسماح للشخص الطبيعي او المعنوي بامتلاك و أو استخدام الاشعة .

اللجنة : لجنة الترخيص والرقابة التي يعينها الوزير بموجب هذا النظام .

مادة (٣) - لا يجوز امتلاك جهاز اشعة و/ أو إنشاء مركز اشعة الا بعد الحصول على موافقة مبدئية من الوزير أو الوكيل .

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السلطة الوطنية الفلسطينية

وزارة الصحة

نابلس

ص.ب. ١٤

ت. ٠٩- ٣٨٤٧٧٦ ، ٣٨٤٧٧٥

فاكس - ٠٩- ٣٨٤٧٧٧

Ref. : .....

Date : .....

مادة (٤) على كل من يرغب بامتلاك جهاز أشعة و/ أو إنشاء مركز أشعة أن يتقدم بطلب لذلك يتضمن ما يلي :-

١٠٤ - نوع ومواصفات الجهاز / الأجهزة .

٢٠٤ - مخطط موقع يبين أرض مركز الأشعة والشوارع المحيطة به ومدخله ومخارجه والابنية المحيطة به واستعمالاتها .

٣٠٤ - مخططات البناء التي صدرت بموجبها رخصة بناء المركز من الجهة المختصة .

٤٠٤ - اعداد وتخصصات ومؤهلات الجهاز الفني والاداري المقترح لتشغيل المركز .

مادة (٥) لا يجوز منح الترخيص بفتح مركز أشعة للأشخاص الآتي ذكرهم :-

١٠٥ - من صدر ضده حكم ترتب عليه غلق مركز أشعة أو أي مرفق صحي آخر ولم يرضي على تنفيذ هذا الحكم خمس سنوات .

٢٠٥ - من سبق الحكم عليه بعقوبة في جنابة أو إحدى الجناح المعتبرة من الجرائم المخلة بالشرف أو الأمانة ما لم يكن قد رد له اعتباره .

مادة (٦) يقوم من ووفق له على امتلاك جهاز أشعة بتسجيل الجهاز في الوزارة خلال ثلاثين يوماً من تاريخ استلامه .

مادة (٧) يراعى في بناء مركز الأشعة ما يلي :-

١٠٦ - تأمين المساحات المناسبة :

• غرفة لكل جهاز أشعة تتراوح مساحتها من ١٦-٢٣م<sup>٢</sup> وفقاً لنوع ومواصفات الجهاز وذات جدران من الخرسانة بسماكة ٢٠سم أو مرصعة ( محمية بالرصاص ) بسماكة ١,٥ ملم من الأرضية وحتى ارتفاع ٢,٢٠ سم .

• غرفة متللمة ( Dark room ) لتحميض الأفلام لا تقل مساحتها عن ٢م<sup>٢</sup> أو استعمال جهاز تحميض خاص ( Daylight ) شريطة توفير نظام آمن للتعامل مع الأبخرة .

• غرفة لحفظ أصول أفلام الأشعة بعيداً عن التلف ومخاطر الحريق لا تقل مساحتها عن ٢م<sup>٢</sup> .

• غرفة لقراءة الأفلام لا تقل مساحتها عن ٢م<sup>٢</sup> .

• أماكن انتظار ملائمة للمراجعين ومرافقيهم .

• أماكن عمل ملائمة للعاملين في المركز .

٢٠٦ - أن تكون غرفة جهاز الأشعة ذات مدخل خاص غير مشترك مع أية غرفة أخرى .

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بوتانية الفلسطينية

وزارة الصحة  
نابلس

ص. ب. ١٤  
٠٩-٣٨٤٧٧٦, ٣٨٤٧٧٥  
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٣٠٦ أن يكون المبنى مجهزاً بإتارة وتهوية كافيتين وبتمديدات صحية وبتمديدات طرح الفضلات السائلة

مادة (٨) تشكل لجنة الترخيص والرقابة من ثلاثة أشخاص على الأقل بقرار من الوزير أو الوكيل وذلك على النحو التالي :-

- \* مدير مديرية الصحة العامة الذي يقع المركز في منطقته رئيساً
- \* مهندساً
- \* فاحص ومراقب أشعة

مادة (٩) تناط باللجنة المهام التالية :-

- أ - دراسة طلبات الترخيص والتحقق من توفر شروط منح الترخيص ورفع تنسيباتها الى الوزير أو الوكيل .
- ب - الكشف الدوري على مراكز الأشعة ومراقبة استمرار تقيدها بشروط الترخيص وبالتشريعات النافذة .

ج - التحقق في الشكاوي التي يجيئها اليها الوزير أو الوكيل .

مادة (١٠) يشترط لتسيب ترخيص مركز الأشعة ما يلي :-

- أ - أن تكون أجهزة الأشعة مسجلة لدى الوزارة .
- ب - أن يتوفر في المركز مواصفات البناء التي يشترطها هذا النظام .
- ج - أن تراعى الاحتياطات اللازمة للوقاية الإشعاعية التي تضمن الأمن والسلامة للعاملين والمرضى على حد سواء .
- د - أن يكون الجهاز الفني العامل في المركز متناسباً مع نوع وحجم العمل وبحد أدنى قدره :-

١ . أخصائي أشعة بدوام كامل .

٢ . فني أشعة بدوام كامل .

هـ - التأكد من تنظيم سجلات خاصة بالعمل الإشعاعي والعاملين بما في ذلك السجلات التالية :-

- ١ - السجل الخاص بالكشف والمعالجة الطبية للمراجعين .
- ٢ - السجل الخاص بالكشف الطبي المهني على العاملين في المؤسسة .

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الوطنية الفلسطينية

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ص. ب. ١٤  
ن - ٣٨٤٧٧٦ ، ٣٨٤٧٧٥  
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- ٢ - السجل الخاص بالتعرض الاشعاعي للعاملين بالاشعة .
- ٤ - السجل الخاص بالحوادث سواء كانت متعلقة بأشخاص أو بأجهزة أو معدات .
- و- أن تراعى القوانين والانظمة والتعليمات المعمول بها في الدولة فيما يتعلق بالعاملين في مجال الاشعة .
- ١١) أ- إذا اقتنع الوزير أو الوكيل بأن كافة شروط الترخيص متوفرة في مركز الاشعة يصدر ترخيصاً مؤقتاً لمدة عام واحد .
- ب- قبل انتهاء مدة الترخيص المؤقت تعيد اللجنة الكشف على المركز وترفع تنسيباتها للوزير أو الوكيل الذي إذا تحقق بأن المركز يتقيد بالشروط المطلوبة أصدر ترخيصاً دائماً للمركز مدة سريانه سنة واحدة تجدد سنوياً .
- ج- يستوفى رسم ترخيص عند اصدار الترخيص المؤقت أو الترخيص الدائم مقداره خمسون ديناراً عن كل جهاز في السنة .
- مادة (١٢) لا يجوز اضافة أو استبدال جهاز أشعة الا بقرار من الوزير أو الوكيل وبتنسيب من اللجنة .
- مادة (١٣) أ- للوزير والوكيل واللجنة أو أي من أعضائها حق الكشف على مركز الأشعة في أي وقت للتأكد من التقيد بما ورد في هذا النظام .
- ب- إذا تبين بعد الكشف على مركز الأشعة أنه لا يراعي ما ورد في هذا النظام للوزير أو الوكيل الحق في إتخاذ الاجراءات المناسبة بما في ذلك إلغاء ترخيصه .
- مادة (١٤) يلغى ترخيص مركز الأشعة بقرار من الوزير أو الوكيل لأي من الاسباب التالية :-
- أ- إذا تبين أن المرخص له قد قدم بيانات غير صحيحة أو لجأ الى طرق غير مشروعة ترتب عليها صدور الترخيص .
- ب- إذا خالف المرخص له أي شرط من الشروط المنصوص عليها في هذا النظام والتعديلات الصادرة بموجبها .
- ج- إذا صدر بحق المرخص له حكم بعقوبة في جنائية أو احدي الجنح المعتبرة من الجرائم المخلة بالشرف او الامانة ما لم يكن قد رد له اعباره .
- د- إذا تبين وجود خطر على البيئة أو على المرخص له أو العاملين لديه نتيجة التعرض للأشعة .
- مادة (١٥) يجوز للوزير أو الوكيل وقف العمل فوراً بالترخيص للمدة التي يحددها ، كما يجوز له إعطاء مهلة للمرخص له لتنفيذ الشروط والواجبات المقررة والمحددة له .

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يو طنية الفلسطينية

وزارة الصحة

نابلس

ص. ب. ١٤

تلفون - ٣٨٤٧٧٦ ، ٣٨٤٧٧٥ - ٩

فاكس - ٣٨٤٧٧٧ - ٩

Ref. : .....

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مادة (١٦) لا يمنح من الترخيص ترخيصاً جديداً الا اذا أثبت وتعهداً بعدم مخالفة احكام هذا النظام وأية تعليمات تصدر عن الوزارة .

مادة (١٧) على جميع مراكز الاشعة المرخصة قبل صدور هذا النظام :-

١ - تسجيل أجهزة الأشعة الموجودة بحوزتهم في الوزارة خلال مدة أقصاها ثمانية يوماً.

٢ - الالتزام بما ورد فيه عند تغيير جهاز الأشعة أو في مدة أقصاها عشر سنوات من تاريخ استخدامه أو خمس عشرة سنة من تاريخ انتاجه .

مادة (١٨) يصدر الوزير التعليمات اللازمة لتنفيذ هذا النظام .

مادة (١٩) يصدر هذا النظام بقرار من وزير الصحة ويكون للتعدلات ما لمواد هذا النظام من الالزام.

مادة (٢٠) ١. يلغى هذا النظام أي نظام أو تعليمات سابقة تتعارض مع احكامه .

٢. يسري مفعول هذا النظام من تاريخ .....

د. وياض الزعنون

وزير الصحة

## Annex (12)

### Summary in Arabic

#### تقييم خدمات التصوير الطبي لدى المستشفيات الغير الحكومية في محافظات غزة

إعداد: محمد عدنان بعلوشة

إشراف: د. يوسف محمود عوض

خدمات التصوير الطبي تشمل العديد من الأنواع المتعددة من أنواع التصوير الطبي مثل أشعه اكس والأشعة المقطعية والرنين المغناطيسي والتصوير بالموجات فوق صوتيه.....الخ. وتهدف هذه الأنواع الى تقديم خدمات تشخيصيه ومتابعة الوضع الصحي للمرضى. تعتبر هذه الخدمة الأكثر تطوراً في المجال الطبي خصوصاً تلك التي تعتمد في طبيعة عملها على استخدام الاشعة المؤينة. هدفت هذه الدراسة بشكل عام الى تقييم خدمات التصوير الطبي في المؤسسات الغير الحكومية في محافظات غزة.

تم اجراء دراسة مقطعيه وصفيه تحليلية (كمية ونوعية)، شمل الجزء الكمي على استبانة محكمة تم تجهيزها من الباحث. تم توزيع الاستبانة على عينة عشوائية من متلقي خدمات التصوير الطبي في ستة مستشفيات غير حكومية موزعة على محافظات قطاع غزة. كانت طريقة تعبئة الاستبانة عن طريق المقابلة الشخصية مع أفراد العينة وكان عددهم 319 مراجع. وصلت نسبة الاستجابة الى 94%. شمل الجزء الكمي على قائمة تدقيق محكمة تم تجهيزها من الباحث للتدقيق في متطلبات وتجهيزات أقسام الاشعة. بينما شمل الجزء النوعي على اجراء مقابلات رسمية مع ذوي الاختصاص في مجال التصوير الطبي وكان عددهم سبعة.

من أهم النتائج: استقبال المرضى والوقت المستغرق للحصول على الخدمة والتواصل مع مقدمي الخدمة والوصول الى الخدمة واحترام خصوصية المراجع ومواصفات مقدمي الخدمة على اوزان نسبية: 85.8%، 85.8%، 85.6%، 84.5%، 84.18%، 81% بالترتيب بينما حصلت القدرة الشرائية للخدمة ومواصفات القسم من حيث التجهيزات ووسائل الوقاية من مخاطر الأشعة على اوزان نسبية : 67.6%، 76.34%، 71.2% بالترتيب.

كذلك أظهرت النتائج وجود فروقات ذات دلالة إحصائية بين أفراد العينة الحاصلين على درجة علمية أعلى من البكالوريوس وسهولة الوصول للخدمة. أيضاً لوحظ وجود دلالة إحصائية بين أفراد العينة الحاصلين على درجة علمية أقل من الثانوية العامة وصفات مقدمي الخدمة حيث أبدوا أعجابهم بالطاقم

أكثر من غيرهم مقارنة بالمستوى العلمي. وأخيراً وجد دلالة إحصائية بين أفراد العينة الذكور وصفات مقدمي الخدمة حيث أبدى أفراد العينة الذكور رضاهم عن مقدمي الخدمة أكثر من الإناث.

باستخدام قائمة التدقيق وجد ان 92% من أجهزة التصوير الطبي تعمل بصورة جيدة. ولوحظ وجود نقص في أجهزة الأشعة الأكثر تطوراً مثل أجهزة الرنين المغناطيسي وأجهزة الأشعة المقطعية خصوصاً في المحافظات الوسطى والجنوبية. كما ان معظم أقسام الأشعة لا توفر البديل عند حدوث أي عطل مفاجئ في الأجهزة.

مساحات الغرف والترصيص وتصميم قسم الأشعة مقبول الى حد ما ولكن لوحظ عيوب في تصميم غرف انتظار المرضى. أيضاً بعض غرف التصوير تحتوي على أكثر من جهاز أشعة، الأغلب كانت وجود جهاز أشعة عادية وجهاز تصوير الفكين والأسنان في نفس الغرفة.

بالنسبة للوقاية من الأشعة، جهاز قياس جرعات الأشعة غير موجود بالمطلق في جميع المستشفيات. أيضاً لوحظ وجود نقص حاد في الوسائل المستخدمة لوقاية المرضى والمرافقين من خطر التعرض للأشعة.

