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# **Assessment of Quality of Services Provided in Radiology and Medical Imaging Departments in the West Bank Hospitals**

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# **Assessment of Quality of Services Provided in Radiology and Medical Imaging Departments in the West Bank Hospitals**

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**1432 / 2011**

## Dedication

To my parents, wishing them wellness and good health

To my dear wife, Reem

To my precious lovely daughters Kinda & Tyna

To my brothers

To Dr. Asma Imam for her efforts and advices

I dedicate the fruit of this effort

إلى والداي الأعزاء, متعهم الله بتمام الصحة و العافية

إلى زوجتي الغالية, ريم

إلى إبنتي الحبيبات, كنده و تيمه

إلى إخواني الكرام

إلى حضرة الدكتورة أسمى الإمام على جهودها الكريمة

أهدي ثمرة هذا الجهد

**Mysara Rumman**

## **Declaration**

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

Signed

Mysara Ali Ahmad Rumman

2011

A handwritten signature in blue ink, appearing to read 'M. rumman A.', written in a cursive style.

## **Acknowledgment**

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Mysara Rumman,

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## **Abstract**

The radiology and medical imaging technologies have been dramatically developed through the past period. Moreover, increased attention is being paid to the importance of patient safety during medical examinations and especially for radiation safety, in addition to quality of practice.

The aim of this study was to assess the quality of services provided in the radiology and medical imaging departments in all hospitals that provide these services including governmental, private, NGOs, and UNRWA in the West Bank.

A qualitative descriptive design was used to determine and describe the relationships between selected variables. A site observation and interviews were held with the leaders of radiology departments in thirty hospitals using a check list (questionnaire) which was developed using the Joint Commission International Standards for quality of services in radiology and medical imaging departments and modified to fit the Palestinian hospitals.

Findings showed that 93.7% of the radiology technologists who are working in radiology departments were males, 67% have bachelor degree, and 63.7% of them have less than ten years of experience. Furthermore, only 6.7% of the departments have all the basic radiologic modalities. Findings of the study also showed that the adherence to the JCI standards in radiology and medical imaging departments in West Bank hospitals was generally low 57.4%. Specifically, the compliance with the standards of structural and managerial description of the hospital was 58.2%, duties and responsibilities of the radiology technicians 70%, safety precautions 65.4%, as well as very low compliance with the rejected film analysis 36%.

The study showed that the radiology departments in the West Bank hospitals have low adherence to the JCI standards for diagnostic radiology. Therefore, the quality of providing the radiology and medical imaging services is also low. Policy makers and stakeholders should pay their attention to improve the quality of services in radiology and medical imaging departments in order to increase the effectiveness and the efficiency of these departments and to ensure patient safety. Moreover, further research studies should be conducted in the field of patient safety during radiological procedures.



## تقييم خدمات الأشعة و التصوير الطبي في جميع أقسام الأشعة في مستشفيات الضفة الغربية

### الملخص

نظرا للتطور المتسارع في النظام الصحي عامة و في تقنيات التصوير بالأشعة خاصة, فقد أصبح من الضروري تطبيق أنظمة الجودة العالمية في هذه المجالات لكي يتم ضمان جودة و فعالية الخدمات الطبية و التشخيصية للمرضى في المؤسسات الصحية من جهة, و تقليل نسب تعرض المرضى للأشعة المؤينة سيما و قد تم إثبات ضرر هذه الإشعاعات على الصحة.

إن الهدف من هذه الدراسة هو تقييم خدمات التصوير الطبي في أقسام الأشعة في مستشفيات الضفة الغربية بالمقارنة مع متطلبات أنظمة الجودة العالمية الخاصة لهذا المجال.

اعتمدت عملية التقييم على زيارة الباحث لأقسام الأشعة و إجراء مقابلات مع رؤساء هذه الأقسام بناء على إستبانة تحتوي على أسس و معايير الجودة في أقسام الأشعة والتصوير الطبي. حيث تم تعديل عناصر الإستبانة لتتوافق مع مستشفيات الضفة الغربية.

أظهرت النتائج أن 93.7% من العاملين في أقسام الأشعة هم من الذكور, وأيضا 67% من العاملين يحملون شهادة البكالوريوس في هذا المجال, بالإضافة إلى أن 63% من العاملين لديهم أقل من عشر سنوات من الخبرة في هذه المهنة. من جهة أخرى, أظهرت النتائج أن 6.7% فقط من أقسام الأشعة في مستشفيات الضفة الغربية تحتوي على جميع الأجهزة الأساسية للتصوير الطبي. كما أظهرت النتائج أن تطبيق أنظمة الجودة العالمية في أقسام الأشعة كان منخفض بالمجمل 59.7%, حيث أن نسبة الامتثال لمعايير الوصف الإداري و الهيكلي للمؤسسة كانت 2.85%, الوصف الوظيفي لفنيي الأشعة 70%, السلامة العامة 65.4%, بالإضافة إلى النسبة المنخفضة جدا 36% للالتزام بتحليل الأفلام المعادة.

أظهرت نتائج الدراسة أن نسبة تطبيق أنظمة الجودة العالمية ( JCI standards ) في أقسام الأشعة و التصوير الطبي في مستشفيات الضفة الغربية كانت منخفضة. لذا فإنه من أولويات واضعي السياسات و صانعي القرار أن تتم مراقبة جودة الخدمات في أقسام الأشعة، و أيضا لابد من تواصل الدراسات لتقييم و تحديد إستخدام الأشعة على المرضى و مدى موافقتها للنسب المسموحة دوليا وذلك لتحسين فعالية و جودة الخدمات.

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## List of Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
ACSQHS	Australian Council for Safety and Quality in Health Care
AHA	Australian Healthcare Associate
AOP	Assessment of Patient
BSc	Bachelor of Science
CBR	Cardio-Pulmonary Resuscitation
CQI	Continuous Quality Improvement
CR	Computerized Radiography
CT	Computed Tomography
DC shock	Direct Current shock
DNA	Deoxyribonucleic Acid
ED	Emergency Department
FOV	Field of View
GS	Gaza Strip
IAEA	International Atomic Energy Association
ID	Identification Card
ISO	International Organization for Standards
IR	Interventional Radiology
JCIs	Joint Commission International standards
MOH	Ministry of Health
MRI	Magnetic Resonance Imaging
M Sc	Master of Science
NGOs	Non Governmental Organization
NM	Nuclear Medicine
PACS	Patient Archiving and Communication System
PMIA	Palestinian Medical Imaging Association
QA	Quality Assurance
RANZAR	Royal Australian and New Zealand
RIS	Radiology Information System

SCARD	Society of Chairmen of Academic Radiology Department
SD	Standard deviation
SPSS	Statistical Package for Social sciences
TQM	Total Quality Management
U.S	United States
U/S	Ultrasound
WB	West Bank

# **Chapter One**

## **Introduction**

Quality in general refers to the degree or grade of excellence or worth. It is a measure tool for all products and goods by which the outcomes of production could be assessed according to the pre-established objectives, or according to the standards of this production. Quality is defined as: “the totality of features and characteristics of a product or services that bears its ability to satisfy stated or implied needs” (ISO 8402: 1986, 3.1). In healthcare, the need of quality is crucial, since these services are provided to human patients. So, these services must be at a high level of accuracy and effectiveness because any error can lead to loose someone or make him/ her disabled. Therefore, to achieve these levels of accuracy, strict standards should be applied during the provision of healthcare services. These standards should be applied in all healthcare centers in the same way, and must be similar in each unit which has the same scope.

The quality of technical care consists in the application of medical science and technology in a way that maximizes its benefits to health without correspondingly increasing its risks. The degree of quality is, therefore, the extent to which the care provided is expected to achieve the most favorable balance of risks and benefits (Donabedian 1980). Radiology and medical imaging departments are providing the essential diagnostic services for all healthcare centers and hospitals customers. Many types of advanced technologies are used in these departments which give detailed images and information about the entire organs of the human body that are used for treatment procedures. Consequently, due to recent advances in radiology science, innovations in imaging technologies, and subspecialties of employees, there is a need for quality control, management, improvement, and assurance.

Quality in diagnostic imaging and interventional radiology can be defined in many ways and from different perspectives. One of these captures the desirable outcomes of the National Health Performance Framework (Lau 2006): “A timely access to and delivery of integrated and appropriate diagnostic imaging studies and interventional radiology services in a safe and responsive facility and a prompt delivery of accurately interpreted reports by capable personnel in an efficient, effective and sustainable manner.”

The basic components of a comprehensive quality management system in radiology department include patient safety, process improvement, customer service, professional staff assessment, and education, each of which requires strategies for implementing continuous programs to monitor performance, analyzing and depicting data, implementing change, and meeting regulatory requirements. For smaller departments or practices, the gradual introduction of one or more of these components is useful in ensuring the safety and quality of their services.

There are 4 key stakeholders in diagnostic imaging: Consumers, Referrers, Providers, and Payers (Lau 2006). The best outcome will be achieved if all stakeholders have a good understanding of their roles and responsibilities and are committed to delivering these within the finite resources by doing the right test for the right patient at the right time for the right reason and at the right cost. For the providers of diagnostic imaging services, their role is to ensure that quality services are readily accessible and available and meet their communities’ needs and expectations.

### **1.1 Problem statement**

Each year, many patients utilize the services of radiology departments all around the West Bank. But there is no evidence shows that these radiology departments are providing their imaging service in the most effective and efficient way, or according to international standards. The use of x-rays may cause adverse health effects for patients and healthcare professionals if it is used without regulations.

The radiology departments in the West Bank have no accreditation, and there are no international standards implemented in these departments to regulate the workflow and protect patient safety. Therefore, there is a great need to assess the current situation in radiology departments in the West Bank hospitals to determine the variations from international standards and the level of quality of services provided besides patient and staff safety.

## **1.2 Justification of the study**

The Ionizing Radiation – mainly X-ray- is the basic component needed to produce most of the diagnostic images in various modalities founded in almost all radiology departments. Diagnostic imaging using X-rays goes back to the time of Roentgen’s discovery in 1896. The use of ionizing radiation for medical purposes should be justified, minimized, and controlled in order to reduce the radiation dose to patients and staff. To achieve this goal, the practice in radiology departments must follow the international standards.

Quality improvement is essential in radiology department. It aims to improve patient care with the intention of maximizing the effect of clinical care and minimizing its harm to the individual and to society as a whole. A definition as given by the European Council directive is: “a systematic examination or review of medical radiological procedures which seeks to improve the quality and the outcome of patient care, through structured review whereby radiological practices, procedures, and results are examined against agreed standards for good medical radiological procedures, with modifications of the practices where indicated and the application of new standards if necessary” (Off 1997. p 22-27).

Since there is no accreditation for any radiology department in the West Bank, this study is conducted to evaluate the level of quality in radiology departments in the West Bank hospitals against the variation from international standards. Furthermore, in the West Bank, there is no previous information or official statistics about the number of repeated films. Besides, being an indicator for low efficiency due to excessive use of resources.

In Addition, there are no previous studies in the West Bank that have discussed the low quality radiological procedures. Specifically, almost all x-ray images are given to patients without interpreting them by radiologists, or had been supervised by expert technicians. Thus, the following up treatment of patients will be at low level of quality in comparison with the interpreted imaging results.

### **1.3 Purpose of the study**

The purpose of the study is to assess the level of quality of services provided in the radiology and medical imaging departments in the West Bank hospitals, and determine their variations from international standards (JCI).

### **1.4 Objectives of the study**

The followings are the objectives for the study,

- 1- To assess the current level of services provided in the radiology departments in the West Bank hospitals.
- 2- To determine the variation in the quality of services provided in radiology and medical imaging departments in West-Bank in comparison with the JCI standards.

### **1.5 Research questions**

1. Who are the service providers for medical imaging in the West Bank?
2. What are the services provided in radiology departments in the West Bank hospitals?
3. What is the education level, years of experience, and the gender for the radiology technicians who are working in the West Bank hospitals?
4. What is the adherence level for the organizations managerial and administrative structure against the JCI standards?
5. What is the compliance level for the radiology staff to their duties and responsibilities in reference to the code of safe practice for the radiology technicians?
6. What is the practice level of the radiology departments in performing the rejected films analysis as quality indicator for efficiency?
7. What is the adherence level of the radiology departments to safety precautions?

## **1.6 Assumptions**

1. The participants are cooperative and informative.
2. The instruments used in the study are valid and reliable.

## **Summary**

In this chapter, the problem statement, justification of the study, purpose, objectives, and assumptions were discussed. In recent years, there was high level of improvement in healthcare industries, and specifically in medical imaging. The quality of services should be assured to improve patient treatment as well as their safety. The aim of the study was to address the points of weakness in the provision of radiology services in West Bank hospitals, in reference to the international standards.



## **Chapter Two**

### **Literature Review**

#### **Introduction**

This chapter includes the theoretical background and the previous studies that discussed the assessment of practice in diagnostic radiology department.

#### **2.1 Theoretical Background**

In the literature, there are several approaches that are concern in the total quality management regarding to radiology departments. The main two approaches were the ISO (International Organization for Standards) and the JCI Standards (Joint Commission International). In this study, the JCI standards were used as a reference, in order to determine the level of the adherence of the radiology departments in the West Bank hospitals to these standards.

In its 3<sup>rd</sup> edition, (2007), JCI (Joint Commission International Accreditation Standards for Hospitals) defines Accreditation as “Process in which an entity, separate and distinct from the health care organization, usually nongovernmental, assesses the health care organization to determine if it meets a set of requirements (standards) designed to improve the safety and quality of care”. Accreditation is usually voluntary. Accreditation standards are usually regarded as optimal and achievable. Accreditation provides a visible commitment by an organization to improve the safety and quality of patient care, ensure a safe care environment, and continually work to reduce risks to patients and staff. Accreditation has gained worldwide attention as an effective quality evaluation and management tool.

The accreditation process is designed to create a culture of safety and quality within an organization that strives to continually improve patient care processes and results. In doing so, organizations improve public trust that the organization is concerned for patient safety

and the quality of care, provide a safe and efficient work environment that contributes to worker satisfaction, negotiate with sources of payment for care with data on the quality of care, listen to patients and their families, respect their rights, and involve them in the care process as partners, create a culture that is open to learning from the timely reporting of adverse events and safety concerns, and establish collaborative leadership that sets priorities for and continuous leadership for quality and patient safety at all levels (JCI 2007).

The 10-step process for quality assurance was developed by the Joint Commission on Accreditation of Health Care Organizations (JCI 2007) includes:

1. Planning for quality assurance
2. Developing guidelines and setting standards
3. Communicating standards and specifications
4. Monitoring quality
5. Identifying problems and selecting opportunities for improvement
6. Defining the problem operationally
7. Choosing a team
8. Analyzing and studying the problem to identify its root causes
9. Developing solutions and actions for improvement
10. Implementing and evaluating quality improvement efforts

The ISO is a nongovernmental organization who produces standards for goods production and industries, and including healthcare facilities. The standards offer sufficient flexibility to apply them in health-care organizations. Furthermore, a radiology department also has some characteristics in common with a production company. A quality system according to the ISO standards has three main characteristics (Demming 1986): 1. The main focus is on the process of delivering the service and not primarily on the outcome, 2. There is a system approach. This implies that working processes and authorized and accountable staff are identified, performance measured on a regular basis through indicators, and finally a feedback loop—defined as transparency, and, 3. The quality system has to be verifiable by means of a number of documents such as the quality handbook of the organization,

procedures describing the most important working processes, protocols, and the measurement results of the indicators.

On the other side, healthcare services have many disciplines, specialties, and many sophisticated services. Furthermore, quality in healthcare has several elements, including:

- **Quality control:** is a process employed to ensure a certain level of quality in a product or service. The basic goal of quality control is to ensure that the products, services, or processes provided meet specific requirements and are dependable, satisfactory, and fiscally sound. (Kruskal 2009)
- **Total quality management:** is a comprehensive and structured approach to organizational management that seeks to improve the quality of products and services through ongoing refinements in response to continuous feedback. (Kruskal 2009) Also, it focuses on the needs and expectations of customers and the continuous improvement of the products.
- **Quality improvement** according to Fleming (2008), aims at insuring that the services are: *Safe*: avoiding injuries to patients from care that is intended to help them, *Effective*: providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those unlikely to benefit (avoiding underuse and overuse), *Patient-centered*: providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide clinical decisions, *Timely*: reducing waits and sometimes harmful delays for both those who receive and give care, *Efficient*: avoiding waste, such as waste of equipment, supplies, ideas, and energy, and *Equitable*: providing care that does not differ in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.
- **Quality assurance:** refers to all the activities necessary to ensure that a module, component or system conforms to established technical requirements. It encompasses all planned and systematic actions and programs that are designed to provide confidence that a product or service will meet customer expectations.

Kruskal et al (2009) argued that it is essential that all imaging departments establish and maintain managed, comprehensive, and effective performance improvement programs in order to improve the safety and quality of the care that radiologists provide, and to allow radiologists and radiology personnel to remain competitive in an increasingly complex environment.

Regarding to the International Atomic energy Agency (IAEA), in order to minimize the radiation doses to the patients, there should be a justification of the practice, and optimization of the protection standards. The basic principles of protection for medical exposures can be summarized as follows: 1- Justification of medical exposures: “Medical exposures should be justified by weighing the diagnostic or therapeutic benefits they produce against the radiation detriment they might cause, taking into account the benefits and risks of available alternative techniques that do not involve medical exposure”. 2- Optimization of protection for medical exposures: “The doses from medical exposures should be the minimum necessary to achieve the required diagnostic objective or the minimum to the normal tissue for the required therapeutic objective”. (IAEA, 2002)

## **2.2 Research Studies**

### **2.2.1 Practice in Diagnostic Radiology**

On the basis of the findings of Australian medical defense organizations and malpractice insurers, the common risks in radiology are of different forms; missed diagnosis, misinterpretation of results, complication from intervention procedures, failure to manage adverse events, failure to communicate result to referrer, incomplete or absence of informed consent, wrong procedure on wrong patient, incompliance with patient safety, failure to communicate with patient, and performing procedure without adequate training. The incidents of these risks are likely similar in other countries. Such risks can be eliminated or their impact minimized by applying appropriate quality improvement measures (Lau, 2006).

Ondategui-Parra et al (2004), have conducted a cross-sectional study in which a validated national survey was sent to members of the Society of Chairmen of Academic Radiology

Departments (SCARD) to determine the management performance indicators most frequently utilized in academic radiology departments in the United States.

The survey was designed to examine the following six categories of 28 performance indicators: (a) general organization, (b) volume and productivity, (c) radiology reporting, (d) access to examinations, (e) customer satisfaction, and (f) finance. They found that Assessing departmental performance with a wide range of management indicators is not yet an established and standardized practice in academic radiology departments in the United States. Among all indicators, productivity indicators are the most frequently used.

## **2.2.2 Safety Standards**

### **2.2.2.1 General Safety and Infection Control**

Donnelly et al 2009 have conducted a study to evaluate the effects of the pre established program to improving the safety performance of the health care delivery system on safety performance and culture in a pediatric radiology department. A comprehensive safety program implemented in a department of radiology included error prevention training for all employees, a safety coach program, safety awards, Crucial Conversations training, and operational rounds with radiology leaders. The number of serious safety events (events with deviation from best practice, patient harm, and causation) that in part involved radiology was compared for 2 years after implementation of the program and the previous 2 years (baseline). They found that before introduction of the safety program, radiology contributed to a serious safety event an average of once every 200 days as opposed to once in 780 days after implementation of the program, and they conclude that the program is having a positive effect on safety performance.

Goldenhirsch-Azriel (2010), has conducted a study to describe the process of transferring patients from the Department of Emergency Medicine (ED) to the radiology department in Mount Scopes Hospital, Jerusalem. She used prospective observational study. 160 patients scheduled for transfer to the Radiology Department were observed over a six month period. Observations were performed by three trained observers (including the author). Observers noted all activities, verbal exchanges, use of equipment and the period of time at which they

occurred. Each observation began when the physician ordered an x-ray and ended on the patient's return to the ED. All observations were performed during day and evening shifts (8 AM to 11 PM). She found that only 3 transfers were conducted according to the procedure protocol. No incidents of patient harm were recorded. 62% of patients left the ED not according to the protocol. In 16% of transfers there was an extreme problem in the process of leaving the ED and 13% had extreme problems on the stage of arriving to the radiology department. 43% of patients returned to the ED without an escort. ED nurses were aware of the returning of 22% of patients who left the ED. The average delay time outside the ED was 33 minutes. 20% of patients were out of the ED over 45 minutes. 50% of patients with trauma returned to the ED unescorted. She concluded that there is a lack of a safety atmosphere in the ED Mt, Scopus. In addition, there is a great need for an intervention program that would increase the safety awareness and cooperation between the various human factors, in order to prevent the next event before it occurs.

#### **2.2.2.2 Standards of Radiation Safety in Diagnostic Radiology**

Yoshinaga et al (2004), have conducted a study to determine the cancer risk among radiologists and radiologic technicians because they were among the earliest occupational groups exposed to ionizing radiation and represent a large segment of the working population exposed to radiation from human-made sources. The authors reviewed epidemiologic data on cancer risks from eight cohorts of over 270 000 radiologists and technicians in various countries. The most consistent findings were: Firstly, high radiation exposure among early medical radiation workers resulted in excess risks of leukemia and cancers of the skin and, in women, breast. Secondly, no excess cancer risk is evident among more recent workers. Finally, marked improvements in radiation protection practices in recent times have led to reduction in occupational exposures and cancer risks. The authors recommend that continued follow-up is necessary because recent workers are still young and have experienced different types of exposures from use of new radiologic procedures.

Johnston et al (2002), have conducted a study to evaluate current attitudes and radiation protection practices among radiologic technicians following recent reports of the dramatic

increase in radiation dose in the United States because despite early recognition of the potential hazards of ionizing radiation and research documenting these hazards over the past 115 years, problems persist regarding the safety of medical procedures that use ionizing radiation for imaging. The researchers have sent a survey to a random sample of 2000 radiologic technicians in the U.S and found that radiologic technicians are aware of exposure increases and may be contributing to the increase in patient dose, largely because there is a lack of in-service education.

Arslanoğlu et al (2007), have conducted a study to investigate the level of doctors' and intern doctors' knowledge about patients' radiation exposure doses during common radiological procedures. The researchers have asked 177 doctors to find the equivalent doses of radiation for common radiological examinations when a normal chest X-ray is accepted as one unit using a questionnaire listing the radiation doses of routine radiological diagnostic procedures. They found that most of the doctors and intern doctors underestimated real radiation doses (93.1%, n = 156), 4% (n= 7) did not know that ultrasound does not utilize ionizing radiation, and 27.4% (n = 47) did not know that magnetic resonance imaging does not entail ionizing radiation.

### **2.2.3 Efficiency**

#### **2.2.3.1 Rejected Films Analysis**

Reject analysis is described by the Quality Assurance Working Group of the Diagnostic Methods Committee of the British Institute of Radiology as 'the critical evaluation of radiographs which are used as part of the imaging service but do not play a useful part in the diagnostic process (Prieto et al 1998).

Özsunar, et al (2006), had conducted a study using a sampling analysis to determine the quality of radiographs, to discuss the causes of wasted resources, and to present possible solutions. They have reviewed 120 radiological examinations from 40 different institutions in 4 reference centers and found that coverage area 32.5% (39/120), FOV (Field Of View) 16% (14/ 86), X-ray dosage 16% (15/94), film processing 31% (37/120), sequence or window

65% (53/81), window level 44% (36/81); contrast material 51% (25/49), timing of contrast material 61% (30/49). Only 22% of the examinations were classified as excellent, whereas 47% required complete or partial repetition.

Peer et al (2009), had conducted a study for a comparative analysis of rejected radiographs in conventional and digital radiology under the aspects number of rejected images and reasons for rejection. During 2 months waste films of conventional radiography were collected; in digital radiography each image-delete command at the post processing workstation was documented. Rejected images were analyzed and assigned to four categories.

The overall reject rate was 27.6% in the conventional and 2.3% in the digital department. Whereas in the conventional department the main reason for rejection was exposure and others (problems related to film handling), the main reason in the digital environment was positioning. The high exposure tolerance of digital systems markedly reduces the amount of faulty images.

Deitch et al (1994), had conduct a study with two main objectives, first, to study the nature and extent of radiologists' Involvement In and their attitudes toward quality assessment (QA) and continuous quality improvement (CQI) total quality management (TQM) in hospitals and in offices; and second, to ascertain whether differences in size, type, and location among hospitals and nonhospital radiology offices affect the QA and CQI-TQM activities of radiologists. They found that 86% of the radiology departments have programs to monitor and evaluate physician performance. 51% collect incorrect diagnoses by specific radiologist. 28% collect some of their QA data through computerized information systems. There were some statistically significant differences by hospital size and location, with larger hospitals and urban hospitals being more likely to engage in some QA activities. QA and CQI programs were less common in offices than in hospitals. Respondents representing 58% of hospital radiology departments thought that QA and CQI contributed to improvement in patient care.



Only 19% of radiology practices answered that CQI has been of cost benefit to their organization. The questionnaire used by Deitch (1994) gives a good overview of the relevant items that can be of help in evaluating one's own department. Seltzer et al (1994) describe the use of quality-management techniques to improve the turnaround time of radiology reports, which are: 1) Providing home computer terminals, (2) implementing a buddy system for proxy signing, (3) eliminating the requirement for a signature from a fellow or resident, (4) teaming groups of radiologists with specific transcriptionists, and (5) streamlining transcription service. Crabbe et al (1994) performed the same task by using work-flow analysis techniques. They also discuss the use of indicators, based on data from the Radiology Information System (RIS) in their department. Deitch et al (1994) also found that 58% of radiologists believe that the introduction of QA and/or CQI/TQM programs contributed to the improvement of patient care. On the other hand, only 19% believed that efforts concerning quality result in a positive cost-benefit effect to their organization.

### **2.3 Local Studies**

Hamarsha (2009), has conducted a study to assess physicians' knowledge about the possible risks that are associated with the use of radiological examinations among the Palestinian patients in general hospitals. He used a self-reported questionnaire which was distributed to 167 physicians working at the biggest referral hospitals: Al-Makassed Hospital in East Jerusalem and Ramallah Governmental Hospital in the West Bank. A total of 163 questionnaires were returned, and the response rate was 97.6%. Findings revealed lack of knowledge regarding the radiation hazards associated with the use of radiological examinations among the Palestinian physicians. It's found that only one-third of the physicians have received a radiation protection course during their undergraduate study or at the workplace. The researches indicated that it is needed to increase physicians' knowledge and awareness about the potential hazards associated with the use of radiological examinations. This in turn may help to reduce the exposure of the Palestinian patients to the potentially harmful effects of ionizing radiation produced by unnecessary radiological examinations.

Kharouf (2010), has conducted a study to determine the factors that affect retention of the radiographers in the Palestinian health care system and to compare the different sectors of the Palestinian healthcare system according to the level of retention in each sector and the different motivational factors provided by each sector. He used a cross sectional survey design of all employed radiographers of the Palestinian health Care system, who have graduated before the year (2007) was implemented in this study. The study results revealed a high turnover frequency among the Palestinian radiographers with a frequency rate of around 70%. It was found that the public sector has the highest retention frequency, while the private has the least. It was found that not only the financial incentives are important for retention of the radiographers but also radiation protection, friendly relationships with peers, job security and administration efficiency are important for retention .The study results showed that the current shortage of the radiographers tend to be a surplus in the few coming years. The researcher recommended that decision makers to improve the retention of the radiographers by addressing the problems related to payment, working conditions, Supervision quality, administration efficiency and job security in each sector and to control academic health education according to the need of the health system.

The literature review showed that policy and decision makers in addition to researchers have been paid their attention on the quality of services in diagnostic radiology. They are all aim to increase the effectiveness and efficiency, in versus of decrease faults. Most of the researchers indicate the rejected films analysis as quality indicator for efficiency in diagnostic radiology departments. The overall objective of this study was to assess the level of quality of services provided in all radiology departments in the West Bank, which was the first study in this field. In addition, it is different from the other studies conducted previously, which were concerned in specific topics. On the other side, the study has used the rejected films analysis as quality indicator to assess the efficiency, which was the main indicator for quality in other international studies. In general, the study empathize the main aspects used in the international studies regarding to quality improvement in radiology departments in order to provide a platform for quality assessment.

## **Summary**

This chapter presented the theoretical background, international researches, and the local studies that have discussed the quality of practice in radiology departments.

## Chapter Three

### Conceptual Framework

#### Introduction

The purpose of the study was to assess the quality service provided in radiology and medical imaging departments in West Bank hospitals. This chapter includes the conceptual framework and both conceptual and operational definitions of the variables that might have an impact on the quality services in radiology and medical imaging departments.

#### 3.1 Conceptual Definitions

**Quality:** “the totality of features and characteristics of a product or services that bears its ability to satisfy stated or implied needs” (ISO 8402, 1986, 3.1).

**Quality in Diagnostic Radiology:** “a timely access to and delivery of integrated and appropriate radiological studies and interventions in a safe and responsive facility and a prompt delivery of accurately interpreted reports by capable personnel in an efficient, effective, and sustainable manner”(Lau, 2006).

**Standards:** agreed qualities and processes, designed to ensure a product, service or method will perform consistently at a designated level (The Australian Council for Safety and Quality in Health Care (ACSQHC, 2005).

**Organization:** addresses the management, administration, infrastructure, and policies for the hospitals that have radiology departments in West Bank in addition to their site, type of provider, and equipment.

**Diagnostic Radiology:** Branch of medicine that deals with the scanning of radiographic images of the body to diagnose illness and disease and evaluate the effects of treatment.

**Radiology Department:** medical facility in which diagnostic images are produces for patients by using several imaging modalities in accordance to referral physician requests.

**Staffing:** Main factors of the radiology personnel in the department, including their qualifications, education, years of experience and their duties and responsibilities.

**Radiologists:** medical specialists trained in the use of medical imaging techniques to study human anatomy, pathology and physiology and to define disease processes Australian Healthcare Associate (AHA, 2006).

**Radiologic Technician:** practitioner and/or prescriber, performs the radiographic examination that creates the images needed for diagnosis.

**Efficiency:** effective operation as measured by a comparison of production with cost such time, and money (Miflin 2002).

**Patient Safety:** generally known as a state of patients to be free of risks and injuries. Furthermore, safety activities also include infection control policies (Kohn 2000). It is defined as actions undertaken by individuals and organizations to protect healthcare recipients from being harmed by the effects of healthcare services (Spath 2000).

**Occupational Safety:** in radiology departments, the occupational safety is the policies, activities, and supplies used to ensure personnel safety. Moreover, ILO and WHO have shared the same definition, which was "Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job"(WHO & ILO 1995).

## **3.2 Operational Definitions**

For this study, there were six main elements that the review of the literature revealed as contributors for the quality of services in diagnostic radiology departments. These were:

### **3.2.1 Organization**

#### **3.2.1.1 Structure and administrative of the hospital**

Work place factors including hospital site, type of provider, and sum of units in radiology departments. Questions 1.01-1.03

#### **3.2.1.2 Policies and Management description of the hospital**

Policies and leadership management of the hospitals in addition to infrastructure, provision of services, and practice of radiology departments. Questions A.01-A.33

### **3.2.2 Staffing**

Personal data of the radiology technicians, including the gender, level of education, years of experience. Questions 1.04-1.07

In addition to duties and responsibilities the radiology technicians have to follow and apply in their practice. Questions B.01-B.22

### **3.2.3 Efficiency**

Process conducted by head of technicians to review the repeated films or examination in order to determine to causes of faults and also to calculate the used resources.

Questions C.01-C.15

### **3.2.4 Safety**

#### **3.2.4.1 Occupational Safety**

IAEA Standard requirements and precautions applied to ensure patients and operators safety during the use of ionizing radiation.

Questions D.01-D.23.

#### **3.2.4.2 Patient Safety**

JCI and IAEA recommended guidelines to be applied to ensure patient safety during the radiologic examinations. Questions D.24-D.35

#### **3.2.4.3 Infection Control**

Standards for prevention of the infections transmission during the examinations in the radiology departments, these standards is recommended by “Hospital Infections in Radiology Clinics (Üstünsöz, 2005)”. Questions D.36-D.56

### 3.3 The Study's Conceptual Framework

Figure (3.1) shows the study of conceptual framework. The framework developed was based on the literature reviewed, and it include factors related to demographic data, organizational factors, standards of quality of care, and standards of performance of diagnostic radiology.

**Figure 3.1: Linking the selected demographic data and organizational factors with the application of quality standards and the standards of diagnostic radiology practice**





### **3.4 Factors affecting the quality of service in radiology department**

Quality of service in radiology department generally has several determinants including organizational managerial structure, staffing, efficiency, and safety. The importance of improving the quality of services provided in diagnostic radiology emerges from the role of these services in prevention of diseases through early detection such as mammography, diagnosis of pathologies such as CT, and treatment in some cases through interventional radiology including biopsies and drainage.

#### **3.4.1 Organizational managerial structure**

It is highly recommended that all organization get accreditation from any of the international bodies. Therefore, organizations must set their objectives, plans, and develop policies to establish a comprehensive quality improvement programs to increase the effectiveness and the efficiency of the practice in radiology departments which will result in a great impact on patient diagnosis and quality of care. Furthermore, the administration of the organization should support their institutions in the quality improvement process; this support could be financial or administrative. (Kruskal 2009)

Otherwise, radiology departments in each organization considered as revenue departments because the services are provided to outside customers beside the inside patients. So, organization should pay their attention to increase the quality of services to increase the revenues and benefits. In addition, radiology services should be provided to meet patients and customer needs and demand including advanced modalities, accessibility, and within the local and national standards and regulations. (JCI 2008)

The infrastructure and design of radiology department also has an impact on the quality of service through a wide examination room for each modality which would be in line with respecting patient dignity and privacy, in addition to patient satisfaction. Furthermore, hospitals should place appropriate emphasis on patient safety such as patient rights.

### **3.4.2 Staffing**

Human resources section is the second important determinant in increasing the quality of service. Basically, the accreditation prerequisites for radiology departments indicate that both radiologists and radiologic technicians must be at high level of education and experience to be able to provide radiology services.(JCI 2008) Furthermore, the continuous learning and training increases the quality of services because of the continuous rapid innovations in the field of medical imaging which require advance training courses for radiology personnel, decrease the number of failed procedure, and also increase the effectiveness. On the other side, radiology personnel should also be qualified in the emergency condition as a medical team to participate in and urgent cases in radiology department.

### **3.4.3. Efficiency**

The leaders of organizations and radiology departments should pay their attention to a major quality indicator, which is the efficiency. Efficiency parameters can give clear information about the practice in diagnostic radiology and good feedback in quality control processes. As much the efficiency increased the utilization of scanners and scanning room turn around. It is also increased besides that the repetition of procedures, the number of personnel per scanner, and maintenance downtime for equipment would be decreased.

### **3.4.4 Safety**

Safety measures include occupational safety for personnel, patient radiation and general safety, and infection control. There is a great focus on patient safety though the literature and in accreditation requirements. A radiation safety program should be in place, followed, and documented in all radiology departments. That include:

1. Leadership: all organization should take into account the errors identifications.
2. Management of information: all patient information must be documented especially in giving medication to prevent risk to patients and reduce unnecessary radiation dose. (Borgstede and Znninger 2004)

Although the quality of image generally increases in increasing radiation exposure, technicians should be compromised in using the radiation in order to reduce patient doses while keep good quality of images ALARA principle (As Low As Reasonable Achievable).

## **Summary**

The conceptual framework addresses the basic components of quality assurance in diagnostic radiology. Furthermore, the chapter presented the conceptual and operational definitions of the study variables.

## Chapter Four

### Methodology

#### Introduction

A detailed description of the study methodology is presented in this chapter, including study design, target population, data collection instrument, and data statistical analysis.

#### 4.1 Study design

A qualitative (observational) descriptive study was used, since qualitative research design is broadly defined as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss and Corbin, 1990, p. 17).

#### 4.2 Target Population

The target population of this study was all the radiology and medical imaging departments in the West Bank hospitals. Thirty hospitals out of fifty hospitals have radiology department.

**Table (4.1): Distribution of radiology departments in the West Bank hospitals**

#	District	Hospitals
1.	Jenein	3
2.	Nablus	6
3.	Tul karem	2
4.	Qalqeilia	2
5.	Salfeat	1
6.	Ramallah	4
7.	Jericho	1
8.	Jerusalem	4
9.	Bethlehem	3
10.	Hebron	4
<b>Total</b>		<b>30</b>

Source: Palestinian Medical Imaging Association, [www.pmia.org](http://www.pmia.org). 2009

### 4.3 Study Instrument

The researcher formulated the check list from the following resources.

1. Code of Safe Practice for the use of X-Ray in Chiropractic Diagnosis (2010).
2. Guidelines for Quality Assurance in Radiation Protection for Diagnostic X-Ray Facilities: Large X-Ray Facilities (Poletti, 1995)
3. applying Radiation Safety Standards in Diagnostic Radiology and Interventional Procedures, (IAEA, 2002).
4. The Royal Australian and New Zealand College of Radiologists. Standards of Practice for Diagnostic and Interventional Radiology, (RANZCR, 2009).
5. Hospital Infections in Radiology Clinics, (Üstünsöz, 2005).

The items of the final check list were modified and translated into Arabic (Appendix C) in order to be suitable for situation in West Bank hospitals, and then, the items were back-translated into English (Appendix D). Furthermore, the items were constructed using 5 points Likert Scale to indicate the degree to which the departments comply with the standards according to the researcher observational assessment and the response of the head of departments. In this study, a Likert Scale was weighted as Always = 5, Mostly = 4, Sometimes = 3, Rare = 2, and Never = 1.

#### 4.3.1 Study Variables

The study consists of independent and dependent Variables, which are:

1. **Independent Variables:** the characteristics of the technicians including gender, level of education, years of experience, site of the hospital, type of provider, and sum of units in each department.
2. **Dependent Variables:**
  - a. **Standards of Quality**
    - Organizational Structural Description (Q A.01-A.13)
    - Organizational Managerial Description (Q A.14-A.33)
    - Radiology technician duties and responsibilities (Q B.01-B.22)

#### **b. Quality Standards for Diagnostic Radiology**

- Rejected Film Analysis (Q C.01-C.15)
- Safety Precautions (Q D.01-D.56)

#### **4.3.2 Validity of the instrument**

Validity refers to the degree to which the instrument measures what is supposed to measure (Polit 2006). The questionnaire was reviewed by 5 specialists in diagnostic radiology, radiation protection, and research experts (Appendix E) to determine whether the items of the questionnaire were relevant to study purpose. Items were slightly modified according to experts' recommendations. Main modifications were on formatting and rearrangements of the items, adding or removing items, and language editing. No Substantial modifications were recommended.

#### **4.3.3 Reliability of the instrument**

Cronbach Alpha was used to determine the reliability of the instrument. The reliability Coefficient for all items is 0.94. Table (4.3) showed that the reliability coefficient values were high for all sub-items.

**Table (4.2): Reliability coefficient for standards of quality service in diagnostic radiology**

<b>Standard</b>	<b>Number of Items</b>	<b>Reliability Coefficient</b>
Organizational Structural and Managerial Description	33	0.711
Radiologic Technicians duties and responsibilities	22	0.829
Rejected Film Analysis	15	0.959
Safety Precautions	56	0.906
<b>Overall scorers</b>	<b>126</b>	<b>0.944</b>

#### **4.4 Ethical Considerations**

Al-Quds University has sent an official letter to all hospitals that provide imaging services in the West Bank (Appendix A) asking for permission to collect data from radiology departments, and the MOH confirmed by official letter to Al Quds University in addition to the hospitals of MOH (Appendix B). Also, respondents were assured that the data will be used for research purposes only, and they were have the right to refuse to participate or

withdraw from the study at any time through informed consent attached to the questionnaire. Furthermore, hidden assessment was performed in units while technicians are working to determine their performance usually.

#### **4.5 Study Setting**

The study was conducted in Radiology and Medical Imaging Departments in all Hospitals in West Bank.

#### **4.6 Study Period**

The study was conducted in the period between August 2010, and January 2011.

#### **4.7 Data Collection**

The assessment process was performed by the researcher in all the radiology departments during the period between September 2010 and November 2010. Observation and data collecting were carried out. The researcher noted all activities in all units and held in depth interviews with head of radiology departments using the check list of the assessment. All the heads of departments agreed to participate in this study. Data regarding to structure and infrastructure of the hospital, equipment modalities and performance of radiology technicians practices were determined through site assessment. Otherwise, data regarding to organizational management and policies, qualifications of radiology staff, and issues related to staff management were obtained via interviews with the head of department in each hospital.

#### **4.8 Data entry and statistical analysis**

The data was analyzed using the Statistical Package for Social Sciences (SPSS), version 17. Frequencies and descriptive statistics were used to measure the means, SDs, and percentages.

#### **4.9 limitations of the study**

The main limitations for this study were:

- 1- Methodological:** the challenges were observational bias, mainly due to the lack of experience of the researcher.

**Cooperation:** in few hospitals, the heads of radiology departments were reluctant to give information regarding to their departments.

## **Summary**

The variables used in the study were discussed in this chapter, in addition to the methods used to conduct this study. The assessment was done in all departments after testing the validity and reliability of the items in the questionnaire. Finally, results analyzed using SPSS 17.



## **Chapter Five**

### **Findings of the Study**

#### **Introduction**

This chapter presents the results of the study including descriptive statistics of the respondents, in addition to testing the hypothesis. For the purpose of this study, we consider the assessment criteria for the practice in radiology departments according to the percentage as high 85.0%-100%, moderate 70%-84.9%, and low under 70%.

#### **5.1 Demographic and departmental statistics**

The study was performed in all radiology and medical imaging departments in all West Bank hospitals. Thirty hospitals are distributed over three regions, 14 in the north, 9 in the Center, and 7 in the South respectively. The provision of the imaging services among the radiology departments in the West Bank hospitals varies according to the type of service provider.

#### **5.2 Finding related to the answers of the research questions 1-3**

**Q1.** The main providers of radiology and medical imaging services were: 11 MOH hospitals (36.6%), 8 Private hospitals (33.4%), 10 hospitals NGOs (26.6%), and 1 UNRWA hospital. Although the MOH was the largest provider for imaging services, the availability of advanced imaging modalities was greater in other sectors such as NGOs and Private. See table (5.1). Specifically, the distribution of the basic units of radiology departments shows that all departments in the West Bank hospitals provide routine x-ray services (n=30), but only 63.4% have radiologist (n=19), 56.7% provide Fluoroscopy (n=17), 56.7% provide U/S (n=17), 50% provide CT (n=15), 16.7% provide Mammography (n=5), 13.4% provide Interventional Radiology (n=4), and only 6.7% provide MRI (n=2). See table (5.1).

- Q2.** Regarding to the radiology technicians, results showed that 93.7% of the radiology technicians who are working in radiology and medical imaging departments were males (n=165), and only 6.3% were Females (n=11). In relation to their academic level, 28.9% of the radiology technicians have diploma certificate (n=51), 67% have bachelor certificate (n=118), 2.27 % have master certificate (n=4), 1.7 % have other certificates (n=3), and none of the technicians hold doctorate certificate. See table (5.1).
- Q3.** The distribution of radiology technicians in radiology departments according to their experience showed that 25.6% of the radiologic technicians who are working in radiology and medical imaging departments have up to 2 years experience (n=45), 22.1% have years of experience 2-5 years (n=39), 16.5% have years of experience 6-10 years (n=29), 9.65% have years of experience 11-15 years (n=27), and 20.5% have years of experience above 16 years (n=36). See table (5.1).

**Table (5.1) Distribution of the demographic and departmental statistics for radiology departments and radiology personnel in the West Bank hospitals according to the type of provider**

	<b>MOH</b>		<b>NGOs</b>		<b>Private</b>		<b>UNRWA</b>		<b>Total</b>	
<b>Distribution of radiology departments according to the site</b>										
<b>Site</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>
<b>North</b>	6	20.0%	3	10.0%	4	13.3%	1	3.34%	<b>14</b>	<b>46.6%</b>
<b>Center</b>	2	6.6%	6	20.0%	1	3.3%	0	0.0%	<b>9</b>	<b>30.0%</b>
<b>South</b>	3	10.0%	1	3.34%	3	10.0%	0	0.0%	<b>7</b>	<b>23.4%</b>
<b>Total Scores</b>	<b>11</b>	<b>36.6%</b>	<b>10</b>	<b>33.4%</b>	<b>8</b>	<b>26.6%</b>	<b>1</b>	<b>3.34%</b>	<b>30</b>	<b>100%</b>
<b>Distribution of imaging services provided in the radiology departments</b>										
<b>Modalities</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>
<b>Radiologist</b>	5	16.6%	6	20.0%	8	26.6%	0	0.0%	<b>19</b>	<b>63.3%</b>
<b>Conventional</b>	11	36.6%	10	33.3%	8	26.6%	1	3.3%	<b>30</b>	<b>100%</b>
<b>Fluoroscopy</b>	5	16.6%	6	20.0%	6	20.0%	0	0.0%	<b>17</b>	<b>56.6%</b>
<b>U/S</b>	5	16.6%	4	13.3%	8	26.6%	0	0.0%	<b>17</b>	<b>56.6%</b>
<b>CT</b>	5	16.6%	4	13.3%	6	20.0%	0	0.0%	<b>15</b>	<b>50.0%</b>
<b>MRI</b>	0	0.0%	1	3.34%	1	3.3%	0	0.0%	<b>2</b>	<b>6.67%</b>
<b>Mammography</b>	1	3.3%	3	10.0%	1	3.3%	0	0.0%	<b>5</b>	<b>16.6%</b>
<b>IR</b>	0	0.0%	3	10.0%	1	3.3%	0	0.0%	<b>4</b>	<b>13.3%</b>
<b>Distribution of radiology technicians according to gender</b>										
<b>Gender</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>
<b>Males</b>	92	52.2%	41	23.3%	30	17.0%	2	1.1%	<b>165</b>	<b>93.7%</b>
<b>Females</b>	2	1.1%	6	3.4%	3	1.7%	0	0.0%	<b>11</b>	<b>6.3%</b>
<b>Total Scores</b>	<b>94</b>	<b>53.4%</b>	<b>47</b>	<b>26.7%</b>	<b>33</b>	<b>18.7%</b>	<b>2</b>	<b>1.1%</b>	<b>176</b>	<b>100%</b>
<b>Distribution of radiology technicians according to educational level</b>										
<b>Education</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>
<b>Diploma</b>	32	18.1%	14	7.9%	5	2.8%	0	0.0%	<b>51</b>	<b>28.9%</b>
<b>Bachelor</b>	61	34.5%	29	16.4%	26	14.7%	2	1.1%	<b>118</b>	<b>67.0%</b>
<b>Master</b>	0	0.0%	4	2.2%	0	0.0%	0	0.0%	<b>4</b>	<b>2.2%</b>
<b>Doctorate</b>	0	0.0%	0	0.0%	0	0.0%	0	0.0%	<b>0</b>	<b>0.0%</b>
<b>Other</b>	1	0.5%	0	0.0%	2	1.1%	0	0.0%	<b>3</b>	<b>1.7%</b>
<b>Total Scores</b>	<b>94</b>	<b>53.4%</b>	<b>47</b>	<b>26.7%</b>	<b>33</b>	<b>18.7%</b>	<b>2</b>	<b>1.1%</b>	<b>176</b>	<b>100%</b>
<b>Distribution of Radiology technicians according to years of experience</b>										
<b>Experience</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>	<b>Freq.</b>	<b>Percent.</b>
<b>&lt; 2 years</b>	21	11.9%	14	7.9%	9	5.1%	1	0.5%	<b>45</b>	<b>25.5%</b>
<b>2 – 5 years</b>	19	10.7%	8	4.5%	12	6.8%	0	0.0%	<b>39</b>	<b>22.1%</b>
<b>6 – 10 years</b>	16	9.0%	7	3.9%	5	2.8%	1	0.5%	<b>29</b>	<b>16.4%</b>
<b>11 – 15 years</b>	21	11.9%	4	2.2%	2	1.1%	0	0.0%	<b>27</b>	<b>15.3%</b>
<b>&gt; 16 years</b>	17	9.6%	14	7.9%	5	2.8%	0	0.0%	<b>36</b>	<b>20.4%</b>
<b>Total Scores</b>	<b>94</b>	<b>53.4%</b>	<b>47</b>	<b>26.7%</b>	<b>33</b>	<b>18.7%</b>	<b>2</b>	<b>1.1%</b>	<b>176</b>	<b>100%</b>

### 5.3 Organization / hospitals management and administration

In this section, questions were asked about the managerial and administrative description of the hospital. Two types of questions were used; first part (Q 01-13) was a true/ false type, and the second part (Q 14-33) Likert Scale questions.

Results showed that 58.2% percent (first part was 51.8% percent, and 64.6% for the second group) of the hospital administrations in the West Bank adhere to the JCI standards. In addition, it was clear that there were low attention by the hospital management systems to develop policies regarding to apply the standards in radiology and medical imaging departments. Specifically, results of part one showed that any of radiology departments does not apply JCI Standards for diagnostic radiology departments. Besides, although all radiology departments provide diagnostic imaging services 24 hours/day and 7 days/week, only 6.7% of departments provide all radiology and medical imaging Services. 86.7% of equipments in radiology departments have been licensed by Ministry of Health. 93.4% of the radiology technicians have updated licenses from Ministry of Health. Seventy percent of organizations give their radiology personnel a radiation exposure allowance, but only 10% give additional radiation leave.

Moreover, results of part tow mainly showed that 50.7% of the departments conduct periodic maintenance, 51.3% provide reports for each procedure, 32.7% utilize the digital systems, 46% have reception office, and only 30% have procedure manuals in all units. See tables (5. 2), (5.3) for more details.

**Table (5.2): The frequency and percentage, of the answers for the structural and managerial description of the hospitals (part 1)**

#	Question	No	Percent.	Yes	Percent.	Assessment
<b>A.01</b>	The organization applies the JCI standards for quality in radiology department	30	100%	0	0.00%	<b>Low</b>
<b>A.02</b>	The organization holds the accreditation certificate for radiology department from the JCI	30	100%	0	0.00%	<b>Low</b>
<b>A.03</b>	The organization provides the radiology services 7 days a week	1	3.3%	29	96.7%	<b>High</b>
<b>A.04</b>	The organization provides the radiology services 24	2	6.7%	28	93.3%	<b>High</b>

	hours a day					
<b>A.05</b>	Radiology department has all types of medical imaging equipment	28	93.3%	2	6.7%	<b>Low</b>
<b>A.06</b>	All types of imaging examinations including those with contrast medium and interventional radiology are performed	28	93.3%	2	6.7%	<b>Low</b>
<b>A.07</b>	All the equipment in radiology department are licensed by Ministry of Health	4	13.3%	26	86.7%	<b>High</b>
<b>A.08</b>	All the technicians and radiologists hold degrees from educational institutes recognized by both; Ministries of Health and High Education	2	6.7%	28	93.3%	<b>High</b>
<b>A.09</b>	All the technicians and radiologists hold a valid license of practice from the Ministry of Health	8	26.7%	22	73.3%	<b>Moderate</b>
<b>A.10</b>	All the technicians and radiologists are members of professional unions	4	13.3%	26	86.7%	<b>High</b>
<b>A.11</b>	Number of technicians is appropriate for equipment operating	15	50%	15	50.0%	<b>Low</b>
<b>A.12</b>	Radiation workers receive additional salary allowance	9	30%	21	70.0%	<b>Moderate</b>
<b>A.13</b>	Radiation workers receive additional leave days	27	90%	3	10.0%	<b>Low</b>
<b>Total Score</b>			<b>48.2%</b>		<b>51.8%</b>	<b>Low</b>

**Table (5.3): The mean scores, standard deviation, and percentage, of the Structural and Managerial Description of the Hospitals (part 2)**

#	Question	Mean	SD	Percentage	Assessment
<b>A.14</b>	Periodic preventive maintenance is performed	2.53	1.50	50.7%	<b>Low</b>
<b>A.15</b>	The down time of the equipment is short	4.03	1.3	80.7%	<b>Moderate</b>
<b>A.16</b>	Procedure manuals are founded in each imaging unit	1.50	1.23	30.0%	<b>Low</b>
<b>A.17</b>	Newly hired RTs are trained on all imaging modalities by experienced existed ones	4.43	1.16	88.7%	<b>High</b>
<b>A.18</b>	Following their training period, newly hired RTs are evaluated by the chief RT	3.33	1.77	66.7%	<b>Low</b>
<b>A.19</b>	All RTs in the department can efficiently operate all types of the imaging equipment	4.27	1.08	85.3%	<b>High</b>
<b>A.20</b>	The department provide continuous education programs	1.43	1.00	28.7%	<b>Low</b>
<b>A.21</b>	The space of the imaging rooms is appropriate	3.47	1.50	69.3%	<b>Low</b>
<b>A.22</b>	The imaging rooms have changing cubicles	3.37	1.63	73.3%	<b>Moderate</b>
<b>A.23</b>	Direction signs are available on walls	3.77	1.45	75.3%	<b>Moderate</b>
<b>A.24</b>	The senior RT checks the imaging results before dispatching	3.57	1.45	71.3%	<b>Moderate</b>
<b>A.25</b>	All imaging examinations are interpreted by qualified radiologists before dispatching	2.57	1.50	51.3%	<b>Low</b>
<b>A.26</b>	Patient's information is presented on the hard and soft copies of all imaging results	3.47	1.39	69.3%	<b>Low</b>
<b>A.27</b>	All procedures and disposables are documented	4.20	1.16	84.0%	<b>Moderate</b>
<b>A.28</b>	Chief technician is involved in the inventory process	3.43	1.74	78.7%	<b>Moderate</b>
<b>A.29</b>	The radiology department utilize digital documentation	1.63	1.33	32.7%	<b>Low</b>
<b>A.30</b>	List of fees is available for each examination	4.27	1.44	85.3%	<b>High</b>
<b>A.31</b>	The department has agreements with health insurance bodies from outside the hospital	3.60	1.89	72.0%	<b>Moderate</b>
<b>A.32</b>	Exam appointments are available the reception office	2.30	1.84	46.0%	<b>Low</b>

<b>A.33</b>	Appointment usually be within few days	3.43	1.78	78.7%	<b>Moderate</b>
<b>Total Scores</b>		<b>3.23</b>	<b>1.46</b>	<b>64.6%</b>	<b>Low</b>
<b>Overall scores</b>				<b>58.2%</b>	<b>low</b>

## 5.4 Staffing

In this section, questions had been asked about the duties and responsibilities for the radiology technicians to assess the compliance level with the standards.

Results showed that 70.0% ( $m=3.5 \pm 1.0$ ) of radiology technicians comply with their duties and responsibilities. Specifically, results showed that only 32% of the departments provide informed consent to patients. In addition, results showed that the technicians did not pay attention to continues learning. See Table (5.4) for further detailed information.

**Table (5.4): The mean scores, standard deviation, and percentage, of the duties and responsibilities of the radiology technicians**

#	Question	Mean	SD	Percentage	Assessment
<b>B.01</b>	In each imaging unit, and at the start work, assigned RT performs sanity check on the equipment	4.60	0.81	92.0%	<b>High</b>
<b>B.02</b>	The RT takes all necessary steps to assure his own safety, patient safety, and follows the recommended equipment operation instructions to maintain the equipment	4.17	1.05	83.3%	<b>High</b>
<b>B.03</b>	The RTs adhere themselves to the institution uniform	3.50	1.59	70.0%	<b>Moderate</b>
<b>B.04</b>	The RTs make sure to wear ID badge	2.33	1.37	46.7%	<b>Low</b>
<b>B.05</b>	The chief RT performs inventory checks and report shortages to the department manager	4.23	1.04	84.7%	<b>Moderate</b>
<b>B.06</b>	The RT provides each patient with clean linens and gowns	3.23	1.59	64.7%	<b>Low</b>
<b>B.07</b>	The RT clearly explains the radiographic procedure to the patients	3.73	1.36	74.7%	<b>Moderate</b>
<b>B.08</b>	The RT obtains and documents consent form from each patient undertaking contrast media exams or intervention.	1.60	1.40	32.0%	<b>Low</b>
<b>B.09</b>	The RT provides help and assistance whenever there is a need for that	4.30	1.02	86.0%	<b>High</b>
<b>B.10</b>	All patients are served equally	4.27	0.90	85.3%	<b>High</b>
<b>B.11</b>	Dealing with patient information are kept in discrete manner	4.60	1.03	92.0%	<b>High</b>
<b>B.12</b>	The RT assists the radiologist when performing contrast media and/or interventional procedures	3.67	1.80	73.3%	<b>Moderate</b>
<b>B.13</b>	The staff is well adhered to the medical imaging guidelines and instruction	3.47	1.55	69.3%	<b>Low</b>
<b>B.14</b>	The imaging procedure is performed according to the referral request	4.50	0.97	90.0%	<b>High</b>
<b>B.15</b>	Sub-optimal radiographs are not handed to the patients	3.87	1.28	77.3%	<b>Moderate</b>

<b>B.16</b>	The RT checks the image quality before the patient leaves the imaging unit	4.27	1.01	85.3%	<b>High</b>
<b>B.17</b>	The RT provides the radiologist with the images for interpretation	2.40	1.73	48.0%	<b>Low</b>
<b>B.18</b>	Following the radiographic procedure, the RT explains to the patient the waiting time and result collection place	4.37	1.2	87.3%	<b>High</b>
<b>B.19</b>	The RT maintains good relationships with the rest of the staff	4.23	1.04	84.7%	<b>Low</b>
<b>B.20</b>	The RT responds efficiently to the urgent imaging requests from other departments	4.63	0.69	92.7%	<b>High</b>
<b>B.21</b>	The RT is updates him/herself with regards to medical imaging scientific news	2.10	1.15	42.0%	<b>Low</b>
<b>B.22</b>	The RT participates on the ongoing continuous education programs	1.60	1.19	32.0%	<b>Low</b>
<b>Total Score</b>		<b>3.5</b>	<b>1.0</b>	<b>70.0%</b>	<b>Moderate</b>

## 5.5 Efficiency

### 5.5.1 Rejected Film Analysis

In this section, questions had been asked about the process of analyzing the rejected film as an efficiency indicator in utilizing the resources used in radiology departments in addition to patient radiation dose.

Results generally showed that only 36.0% ( $m=1.8.7\pm1.17$ ) of radiology departments perform the rejected films analysis routinely. Therefore, this level indicates low efficiency in utilizing the supplies and resources and low effectiveness in the practice. See next table (5.5).

**Table (5.5): The mean scores, standard deviation, and percentage, of the rejected films analysis**

#	Question	Mean	SD	Percentage	Assessment
<b>C.01</b>	The chief RT performs periodic rejected films analysis	1.93	1.55	38.7%	<b>Low</b>
<b>C.02</b>	The chief RT performs a daily check for the rejected films in each unit	2.13	1.72	42.7%	<b>Low</b>
<b>C.03</b>	The x-ray films in the store are counted and add to it the number of films in the unexposed cassettes	2.10	1.69	42.0%	<b>Low</b>
<b>C.04</b>	The x-ray films in the dark room are counted	1.80	1.52	36.0%	<b>Low</b>
<b>C.05</b>	The repeated x-ray films are counted	2.13	1.63	42.7%	<b>Low</b>
<b>C.06</b>	The repeated x-ray film are classified according to film size	1.93	1.62	38.7%	<b>Low</b>
<b>C.07</b>	The chief RT analyze reasons behind the repeated exams	2.23	1.71	44.7%	<b>Low</b>
<b>C.08</b>	The repeated x-ray film are classified according to the reason behind repeating the exam	1.73	1.50	34.7%	<b>Low</b>

<b>C.09</b>	The RT with the highest repeat percentage is identified	2.00	1.66	40.0%	<b>Low</b>
<b>C.10</b>	The price of the repeated films is calculated	1.30	0.95	26.0%	<b>Low</b>
<b>C.11</b>	The percentage of repeated films out of the total films is calculated	1.43	1.00	28.7%	<b>Low</b>
<b>C.12</b>	Recent results are compared with old ones	1.70	1.44	34.0%	<b>Low</b>
<b>C.13</b>	The chief RT discuss the analysis results with the staff	1.60	1.25	32.0%	<b>Low</b>
<b>C.14</b>	Action are made following the reject/repeat analysis procedure	1.73	1.28	34.7%	<b>Low</b>
<b>C.15</b>	Reject analysis is repeated to check the efficiency of the introduced actions	1.70	1.32	34.0%	<b>Low</b>
<b>Total Score</b>		<b>1.8</b>	<b>1.17</b>	<b>36.0%</b>	<b>Low</b>

## 5.6 Safety

In this section, questions had been asked about the occupational safety, patient safety, in addition to infection control standards, and how do the radiology technicians complying with these standards and precaution. Results showed that the over all adherence to safety precautions was 65.4% ( $m=3.27\pm 1.44$ ), which indicates low adherence level to the JCI standards of safety.

### 5.6.1 Occupational and Patient safety

Results showed that only 61.2% ( $m=3.06\pm 1.45$ ) of the radiology departments and radiology technicians follow the radiation protection precautions and radiation safety standards. Specifically, results showed that only 33.3% of the departments have user manuals for each unit, 27.3% have technique charts for exposure factors in each unit, 28.7 have a radiation protection officer to regulate and supervise the utilization of radiation exposure in each unit, and 35.3% exclude technicians with high dosimeter readings, and only 32.0% have utilized the automatic exposure systems. In addition, the commitment of radiologists to review the request forms and reject them if not justified was low, See table (5.12) for further detailed information. See table (5.6) for more details.



### 5.6.2 Patient safety

Results showed that the radiology technicians in the West Bank hospitals have low adherence to patient radiation safety. Only 65.9% ( $m=3.29\pm 1.32$ ) of the radiology technicians comply with the radiation protection precautions for patient safety in radiology departments.

Specifically, 56.4% of the technicians provide protection for the patient companions during the examinations, 50.6% expose the requested area to radiation, and only 33.3 % utilize the digital radiography systems. See table (5.6) for more details.

### 5.6.3 Infection control precautions

Results showed that only 69.2% ( $m=3.46\pm 1.57$ ) of radiology departments and radiology technicians follow the infection control standards. Therefore, this level indicates low compliance with the standards of infection control in radiology departments. Specifically, results showed that there is absence of policies of the periodic medical examinations for the technicians, in addition to lack of emergency supplies. Moreover, the technicians' adherence to infection control was low in patients with protective or strict isolation. Otherwise, there was moderate compliance by the radiology technicians regarding to their personal safety. See table (5.12) for more details.

**Table (5.6): The mean scores, standard deviation, and percentage, of the occupational safety, patient safety, and infection control**

#	Question	Mean	SD	Percentage	Assessment
<b>Occupational Safety</b>					
<b>D.01</b>	Imaging units design (area, wall thickness, lead shielding) follows the international regulations	4.43	1.01	88.7%	<b>High</b>
<b>D.02</b>	Imaging units have facilities for patients with special needs	3.40	1.63	68.0%	<b>Low</b>
<b>D.03</b>	Imaging units are equipped with smoke detectors and central fire distinguishers	3.67	1.73	73.3%	<b>Moderate</b>
<b>D.04</b>	Imaging units are well ventilated and equipped with central cooling/heating	4.20	1.16	84.0%	<b>Moderate</b>
<b>D.05</b>	Doors in the imaging are firmly closed and open from inside only	3.40	1.57	68.0%	<b>Low</b>
<b>D.06</b>	Each imaging unit have radiation free operating console	4.47	1.17	89.3%	<b>High</b>
<b>D.07</b>	The imaging equipment are valid, tested, and operated within the international/national	4.30	1.21	86.0%	<b>High</b>

	acceptance limits				
<b>D.08</b>	calibration process for the imaging equipment is performed in accordance with the international standards	4.30	1.39	86.0%	<b>High</b>
<b>D.09</b>	Operation instruction are mounted in each imaging unit including the telephone numbers of the maintenance engineers	1.67	1.27	33.3%	<b>Low</b>
<b>D.10</b>	A list of exposure factors is mounted in each imaging unit	1.37	1.13	27.3%	<b>Low</b>
<b>D.11</b>	Every new imaging equipment is tested by the MOH for radiation leakage	3.73	1.72	74.7%	<b>Moderate</b>
<b>D.12</b>	The necessary certificates from the MOH are obtained for the imaging equipment including old ones. Periodic radiation leakage tests are performed in areas surrounding the imaging units	2.93	1.82	58.7%	<b>Low</b>
<b>D.13</b>	Imaging units are equipped with personal radiation protection tools (such as lead gown, lead gloves, and lead goggles)	3.43	1.33	67.7%	<b>Low</b>
<b>D.14</b>	The doors in the imaging units have radiation warning labels. Radiation warning red lights are mounted and efficiently working above these doors	3.40	1.57	68.0%	<b>Low</b>
<b>D.15</b>	The radiology department hires a radiation protection officer (who is responsible for controlling radiation doses used)	1.43	1.22	28.7%	<b>Low</b>
<b>D.16</b>	The staff adhere to the radiation protection standards when performing the examinations	3.33	1.42	66.7%	<b>Low</b>
<b>D.17</b>	The examinations are performed only when a referral request is presented	3.90	1.54	78.0%	<b>Moderate</b>
<b>D.18</b>	The radiologist approve the referral requests before performing the examinations	2.13	1.68	42.7%	<b>Low</b>
<b>D.19</b>	The radiologist rejects the requests that do not include enough justifications for the exam	2.13	1.77	42.7%	<b>Low</b>
<b>D.20</b>	The radiation workers wear radiation badges. The badges are read periodically	3.80	1.56	76.0%	<b>Moderate</b>
<b>D.21</b>	The RT adheres to the personal radiation safety regulations and refrains from staying un-necessarily in radiation areas	4.23	1.25	84.7%	<b>Moderate</b>
<b>D.22</b>	RTs who exceed the maximum permissible dose are given a compulsory leave of absent	1.77	1.50	35.3%	<b>Low</b>
<b>D.23</b>	RTs who report that they are pregnant given radiation free jobs	2.33	1.80	46.7%	<b>Low</b>
	<b>Total scores</b>	<b>3.06</b>	<b>1.45</b>	<b>61.2%</b>	<b>Low</b>
<b>Patient Safety</b>					
<b>D.24</b>	The RTs do not allow patient relatives/escorts to radiation potential areas	3.70	1.31	74.0%	<b>Moderate</b>
<b>D.25</b>	Patient's escort are given a lead apron when their presence is necessary in the imaging room	2.83	1.60	56.4%	<b>Low</b>

<b>D.26</b>	The imaging room door is firmly closed before starting the x-ray exposure	4.17	1.09	83.3%	<b>Moderate</b>
<b>D.27</b>	The RT adheres to the ALARA principle: The dose is kept as low as reasonably achievable	4.03	1.10	80.7%	<b>Moderate</b>
<b>D.28</b>	The exposure factors and patient position are checked to prevent possible repeat of the procedure	4.07	1.08	81.3%	<b>Moderate</b>
<b>D.29</b>	The procedure is thoroughly explained to the patient before the exam	3.57	1.50	71.3%	<b>Moderate</b>
<b>D.30</b>	The RT makes sure that only the region of interest is irradiated. Lead shield is used to cover nearby areas	2.53	1.17	50.6%	<b>Low</b>
<b>D.31</b>	The automatic exposure control is used	1.60	1.10	32.0%	<b>Low</b>
<b>D.32</b>	Developer/fixer chemicals are periodically checked	4.40	1.10	88.0%	<b>High</b>
<b>D.33</b>	When digital units (CR,DR) present, they are used so often to reduce the probability of repeating the exams	1.67	1.45	33.3%	<b>Low</b>
<b>D.34</b>	Abdomen and pelvis imaging is not performed to pregnant or possibly pregnant patients unless the exam is fully justified	4.07	1.46	81.3%	<b>Moderate</b>
<b>D.35</b>	Mobile x-ray units are used in the ICU only	2.93	1.93	58.7%	<b>Moderate</b>
<b>Total Score</b>		<b>3.29</b>	<b>1.32</b>	<b>65.9%</b>	<b>Low</b>
<b>Infection Control</b>					
<b>D.36</b>	Newly employed staff underwent lab, clinical, and physical examinations to exclude infectious diseases and physical limitations	3.60	1.80	72.0%	<b>Moderate</b>
<b>D.37</b>	Staff underwent periodic lab and clinical examinations to rule out infectious skin and respiratory diseases	1.73	1.41	34.7%	<b>Low</b>
<b>D.38</b>	Staff with infectious diseases are prevented from direct contact with patients until they are fully recovered	3.70	1.67	74.0%	<b>Moderate</b>
<b>D.39</b>	Staff uses gloves when handling patient fluids and secretions (example: blood, urine, sputum, etc.)	3.87	1.66	77.3%	<b>Moderate</b>
<b>D.40</b>	staff uses gloves when performing diagnostic procedures such as barium studies	3.70	1.76	74.0%	<b>Moderate</b>
<b>D.41</b>	Staff uses gloves when cleaning equipment	4.37	1.16	78.3%	<b>Moderate</b>
<b>D.42</b>	Hands are washed before and after using the gloves	4.37	0.93	78.3%	<b>Moderate</b>
<b>D.43</b>	Necessary precautions are implemented when handling patients (hands are washed before and after procedures, masks are used when needed, refraining from wearing jewelries, rings during working hours	3.47	1.57	69.3%	<b>Low</b>
<b>D.44</b>	CPR emergency trolley and DC shock are available in each imaging unit	3.33	1.75	66.7%	<b>Low</b>
<b>D.45</b>	Suction devices with sterile catheters are available	2.90	1.85	58.0%	<b>Low</b>
<b>D.46</b>	Non-expired sterile tools/materials are used	3.90	1.59	78.0%	<b>Moderate</b>
<b>D.47</b>	Catheters and IV needles are stored in a dedicated place	3.70	1.82	74.0%	<b>Moderate</b>
<b>D.48</b>	Patients with infectious diseases and classified as (Protective Precautions) are imaged at the start of the working day	2.23	1.73	44.7%	<b>Low</b>

<b>D.49</b>	Whenever its possible, infectious patients classified as (Strict Precautions) are imaged at the end of the working day	3.47	1.80	69.3%	<b>Low</b>
<b>D.50</b>	Mobile x-ray units are used to limit patient movement and reduce cross infection	2.90	1.87	58.0%	<b>Low</b>
<b>D.51</b>	linens are used to cover the x-ray tables, changed between patients, and sent to the laundry in a red bag	2.80	1.84	56.0%	<b>Low</b>
<b>D.52</b>	When a patient with infectious disease is imaged, the imaging equipment, and all used tools/materials are cleaned with disinfectant solution (chlorocept)	3.87	1.28	77.3%	<b>Moderate</b>
<b>D.53</b>	x-ray tables are cleaned with disinfectant solution (chlorocept)	3.40	1.52	68.0%	<b>Low</b>
<b>D.54</b>	x-ray cassettes are cleaned with disinfectant solution (chlorocept)	4.17	1.15	83.3%	<b>Moderate</b>
<b>D.55</b>	Floors in the radiology department are cleaned daily	4.43	1.01	88.7%	<b>High</b>
<b>D.56</b>	The disposal of potentially infected solutions is done directly in the sausage systems(not in the sinks)	2.83	1.80	56.7%	<b>Low</b>
<b>Total Scores</b>		<b>3.46</b>	<b>1.57</b>	<b>69.2%</b>	<b>Moderate</b>
<b>Overall scores</b>		<b>3.27</b>	<b>1.44</b>	<b>65.4%</b>	<b>low</b>

### 5.7 Finding related to the answers of the research questions 4-7

The quality of radiology and medical imaging services in West Bank hospitals was low. The radiologic technologists comply moderately with their duties and responsibilities. The efficiency in the usage of resources was low. Moreover, the adherence to safety precautions was low. See table (5.7)

**Table (5.7): Answers of the research questions 4-7**

<b>Q#</b>	<b>Research Question</b>	<b>Percentage</b>	<b>Assessment</b>
<b>4</b>	The adherence level for the organizations managerial and administrative structure against the JCI standards	58.2%	<b>Low</b>
<b>5</b>	The compliance level for the radiology staff to their duties and responsibilities in reference to the code of safe practice for the radiology technicians	70.0%	<b>Moderate</b>
<b>6</b>	The commitment level of the radiology departments in performing the rejected films analysis as quality indicator for efficiency	36.0%	<b>Low</b>
<b>7</b>	The adherence level of the radiology departments to safety precautions	65.4%	<b>Low</b>
<b>Total Scores</b>		<b>57.4%</b>	<b>Low</b>

## **Summary**

In this chapter showed the findings of the study, the answers of the research questions, and the level to which the radiology departments in the West Bank hospitals comply with the JCI standards for diagnostic radiology.

## **Chapter Six**

### **Discussion of Findings**

#### **Introduction**

This chapter includes analysis of the study findings in relation to previous studies. The characteristics of radiology departments in West Bank hospitals have been included in the discussion. The characteristics included site, type of provider, units, technician demographic factors (gender, level of education, and years of experience).. Furthermore, relationships between the independent variables and standards of quality of services in radiology departments were discussed in reference to the literature.

#### **6.1 Quality standards for the organizations / hospitals**

Comprehensive quality and performance improvement programs in radiology and medical imaging departments are highly recommended (Kruskal, 2009). In addition, the JCI standards for hospitals also indicate that radiology departments should establish their own quality control programs. This was explicitly stated on the standard A.O.P.6.8 “Quality control procedures should be in place, followed, and documented” (JCI 2008).

##### **6.1.1 Characteristics of the radiology departments**

Findings showed that all radiology and medical imaging departments provide routine x-ray services, but only 63.4% (n=19) have radiologist, 56.7% provide fluoroscopy (n=17), 56.7% provide U/S (n=17), 50%, provide CT (n=15), 16.7% provide mammography (n=5), 13.4%, provide interventional radiology (n=4), 6.7% provide MRI (n=2), and none of the departments provide nuclear medicine imaging.

In reference to the accreditation guidelines for radiology department from the Australian and New Zealand College of Radiologists, the basic equipment that must be available in order to get accreditation should be conventional radiology (including routine x-ray and fluoroscopy), ultrasound, CT, MRI, mammography, interventional radiology, and nuclear medicine imaging. This is not the case in the radiology departments in the West Bank hospitals this is mainly because the demand on these services is generally considered lower than other countries such as Australia.

Moreover, the population in the West Bank is smaller than that in other developed countries. Furthermore, there are many challenges for supplying the radiology departments with the required modalities to fit the accreditation prerequisites. They are: firstly, new equipment is very expensive, especially when most hospitals depend on donations for purchasing these modalities. Secondly, the fast and growing new technologies in medical imaging And finally, the lack of qualified human resources (radiologists & radiology technicians) needed for operating the equipment.

The number of radiologists in the West Bank is less than that in other specialties because there was no residency program in last period. Recently, a new program has been established in the Makassed hospital expecting the first graduates next year. Regarding technicians, most of them were not trained to operate advanced imaging modalities.

Radiology and medical imaging departments in West Bank Hospitals are not being operated according to the international standards. In reference to JCI 2008, standard A.O.P.6 states that “Radiology and diagnostic imaging services are available to meet patient needs, and all such services meet applicable local and national standards, laws, and regulations”. The results of this study showed that none of the departments have all units and only two departments have almost all the units. Moreover, 36.6% of departments provide only routine x-ray imaging service and do not have radiologist. This indicates that the radiological procedures and examinations are done in these departments without supervision or interpretation by qualified radiologist. This will definitely affect the quality.

According to the professional supervision and reporting standards for radiologists (RANZCR 2006) Standard A.1.4.1, “All studies shall be interpreted and reported by a radiologist”. Although the rest of departments have many units, none of these departments provide all the needed services. The reason for that is the lack of knowledge and experience, and because there were no procedure manuals for all units.

### **6.1.2 Organization / hospital management and administration**

The total mean score for this standard was low for the both parts of the checklist (58.2 %). For the first part of this section (51.8%), the result was probably affected by the first two questions, since none of the hospitals are applying the international standards, or have got the certificate from any accreditation body. Exceptionally, East Jerusalem hospitals have embarked on an international accreditation using JCI standards for hospitals but the process is still premature. Generally, hospital leaders should give priority to the quality improvement and patient safety in radiology departments. They should develop policy and strategic planning through hiring departmental quality coordinator as well as establishing and facilitating interdepartmental quality forums or adverse event reporting systems (Kruskal, 2009). Moreover, results were also affected by the last question, since only 10% of the hospitals give an additional leave for employees because of their exposure to radiation.

The analysis of the second part shows low compliance value (64.6%). Three questions were found responsible for this low value. Question A.16 (presence of procedure manuals) revealed that only 30% of the departments developed procedure manuals. Question A.17 (continuous learning program) showed that 28.7% of the departments have ongoing education programs. Question A.26 (presence of digital systems) revealed that only 32.7% of the departments utilize digital imaging modalities. Finally, question A.29 (presence of reception office) showed that only 46% of the departments have reception office.

Specifically, the educational program is useful for the technicians and should encompass staff training and self improvement (Kruskal 2009). Otherwise, it is highly recommended for the radiology departments to establish a full digitized radiology information system (RIS) including Patient Archiving Communication System (PACS) and Teleradiology.



This should increase the quality of services provided. The advantages of the above system are: 1- reduction of the repetition of the procedures, consequently, this will 2- reduce patient radiation dose. 3- Cost effectiveness, because there is no need for films and processing materials. 4- Images and patient data will be saved. This will allow physicians to access patients' profiles.

## **6.2 Staffing**

The quality standards for diagnostic radiology also include the practice of the radiology technicians in the quality improvement.

### **6.2.1 Demographic characteristics of the radiology staff**

Results showed differences in the distribution of radiology technicians according to their gender: 165 (93.7%) were males and only 11 (6.3%) were female. There are two reasons for this; firstly, most female technicians are newly graduated and traditionally this career thought to be dangerous to females. And, secondly, females do not prefer to work in evening and night shifts.

On the other side, since the results showed that only 6.3% of the technicians were female, this may affect the quality of services to female patients who need these services. In general, the female patients do not prefer the male technicians to perform the procedures on them. Therefore, this shortage in the number of female technicians could be indicator to how much leaders of the hospitals pay their attention to patient's satisfaction, and respect patient privacy. Ondategui-Parra 2004 indicates patient satisfaction in "customer satisfaction" in addition to ambulatory waiting time, patient complaints, referral physician satisfaction, and employee satisfaction as one of the main indicators for practice management in radiology department. Results of the study demonstrated that the adherence to the international standards was bolder in departments operated by both females and male technicians

In relation to their academic level, 28.9% of technicians have Diploma Certificate (n=51), 67% have Bachelor (n=118), 2.27 % have Master Certificate (n=4), 1.7 % other Certificate (n=3), and none of the technicians hold Doctorate certificate. Generally, the profession of radiologic technology aroused in West Bank in last decade of the previous century. In 1987, the Arab College of Medical Professions was the first institution in the West Bank that provides Medical Imaging specialty, and most of the radiologic technicians in the West Bank had graduated from this college, except few technicians who have studied in other countries.

Previously, the Medical Imaging program was two years only, and the graduates have had a Diploma degree. As soon as Al Quds University opened an upgrading program for radiologic technicians to complete the bachelor degree in medical imaging, many of technicians engaged this program for two main reasons, the first was financial to get allowance, and the second was to continue in their career advancement. Recently, there are three universities in the West Bank that provide the bachelor degree in Medical Imaging Technology. Furthermore, results showed that there are three technicians working in different radiology departments without certificates in medical imaging technology. Two of them are practical nurses working in Mammography unit and other is working in the routine x-ray unit.

According to experience, results showed that 64.6% of the technicians have less than 10 years of experience. This can be explained by the high number of new graduate from the universities in the West Bank, in addition to graduate technicians from other countries. Moreover, most hospitals have expanded their units which require hiring more technicians.

### **6.2.2 Radiology technicians' duties and responsibilities**

The total mean score was moderate, about 74% of the technicians comply with standards of their job description. Results were mainly affected by the answers of the questions B.07, B.11, B.20, B.24, and B.25 in which, results were: 53.3% of the technicians did not put identification card during the day shifts, 68% of the technicians did not provide an informed consent for patients especially in interventional examinations or in procedures when there is need for contrast administration, 52% of the technicians did not send images for interpretation by radiologists, and that might be due to the lack of radiologists, in addition,

technicians showed little concern in education and training on new technologies, this might be due to the absence of continuous education policies in almost all departments.

The QA program should include the means to provide appropriate training for all personnel with QA responsibilities and especially those directly involved with QC testing. A continuing education program is necessary to keep personnel knowledge up-to-date (Period 2000). Results also showed differences in applying the standards for job description of the technicians according to type of provider in favor of NGOs.

## **6.3 Efficiency**

### **6.3.1 Rejected Film Analysis standards**

It was strongly clear that the almost all radiology and medical imaging departments do not perform the rejected film analysis regularly, but some departments store the rejected films in order to selling them and not for quality indicator for the department. Results showed low commitments by the leaders of radiology departments and the hospital at all to conduct these analyses for the cost effectiveness and financial indicator. Otherwise, results of interview with radiology departments' leaders showed that they have permissible reject rate of 5%, in addition, in MOH hospital, head of radiology department made monthly statistics for resources used, but these statistics not include the repeated films.

Arvanitis (1990), conduct a study to show the reject films rate in 600 beds university hospital in Belgium, and found that the reject rate during 9 weeks was 7.6%. Also, in their study, (Dunn and Rogers 1997) found that the reject films rate was 8%. In relation to the Palestinian hospitals, although the leaders argued the reject films rate is about 5%, but results showed the percentage is greater. In other words, these results showed that managers of radiology departments do not have enough managerial or leadership skills in the assessment of utilizing the resources. In addition, this indicates that there is no supervision by the hospitals directors on the over expenditure on resources.

## **6.4 Safety**

### **6.4.1 Occupational safety**

In reference to JCI standards 2008, standard AOP.6.2 states: “A radiation safety program is in place, followed, and documented”. The radiation safety program should be applied for all units in which ionizing radiation is being used. The program addresses safety practices and preventive measures of the radiology and diagnostic imaging staff, medical staff, and patients. The radiation safety management program includes: 1- Written policies and procedures that support compliance with applicable standards, laws and regulations. 2- Availability of safety protective devices appropriate to the practices. And, 3-Orientation of all radiology and diagnostic imaging staff to safety procedures and practices.

In relation to study findings, results showed that the total mean scores were low, only 61.2% of the technicians comply with the standards for radiation safety. Results also showed differences in applying these standards among technicians according to service provider, sum of units in radiology departments, and gender of technicians. Results were affected mostly by the answers of the questions D.11, D.12, D.13, D.16, D.17, D.20, and D.21. These effects were due to the unavailability of procedure manuals for units, absence of exposure technique charts for each examination, radiation protection officer not in place, shortage of radiologists and female technicians, technicians who exceed the permissible doses continue in duties. In general, the best quality radiologic images are obtained through high radiation dose (Martin et al., 1998).

However, the best practice of radiologic technicians is to assure the maximum level of image quality with the minimum radiation dose to the patient. Leaders of radiology departments should obtain policies to ensure highest quality with lowest doses such as the commitments of technicians to use the automatic exposure; in addition, technique charts should be available in each unit. Otherwise, results showed that technicians were aware of the danger of radiation; therefore, almost all technicians have great commitments for their safety, in comparison to patient safety.

#### **6.4.2 Patient safety**

Regarding to patient safety in radiology department, radiation safety is mostly the essential aspect that should be applied in all imaging modalities in the each department. Unlike other medical departments, patient safety in radiology departments needs more attention. A radiation safety program should be in place, followed, and documented in all radiology departments. This includes leadership: Every organization should take into account the errors identifications. Besides that, all patient information must be documented especially in giving medication to prevent risk to patients and reduce unnecessary radiation dose (Borgstede and Znninger 2004).

The total percentage for the patient safety in radiology departments in the West bank hospitals was low (65.9%). This result was affected by the low compliance of radiology technicians with the radiation protection precautions. Generally, the radiology technicians do not protect the patients from the x-ray radiation during the examinations, since only 50% of the radiology technicians expose the requested area to radiation and protect the rest of body. Furthermore, 56.4% of the radiology technicians protect the patient escort with protective lead aprons when there is a need for their presence.

The main challenge for assuring patient safety in radiology department is to assess the accurate values of patient radiation doses during the examinations. Since the study revealed that only 36% of the radiology departments perform the rejected film analysis, this is another challenge to assess patient radiation doses. Patient radiation safety should involve both the radiology staff as well as the MOH regulations. Radiology departments should take steps to monitor and evaluate the radiation dose administered to the patient on a periodic time basis. MOH is expected to keep continuous evaluation of the radiation safety.

#### **6.4.3 Infection Control Standards**

The total mean score was low. A percentage of 69.2% of the departments and technicians apply the standards for general safety and infection control, in addition results were affected mainly by the answers of questions D.37, D.45, and D.47, because 65.3% of the hospital do not apply a policy for periodic physical and laboratory examinations for the technicians, in

order to maintain their health status and to prevent the spread of infectious diseases. Moreover, 42% of the department do not have the basic supplies for urgent patient care and life support such as central oxygen supply, suction, catheters, . . etc. Also, 56% of the departments do not have a policy for preventive precautions in patients with low immunity level.

Radiology and medical imaging department should always have barriers reconfigurations, separation of imaging equipments, cleaning procedures, personal protective equipments, and staff safety as essentials especially in pandemic or outbreak of infection (Tsou, 2003). Furthermore, although standards for patient safety such are central fire extinguishing systems were available (73.3%), but most of them were not working. Otherwise, technicians were at high level of personal hygiene for their safety.

## **Summary**

This chapter has discussed and described the findings of the study, in addition to the reasons that affect these findings. Moreover, findings of the study – in relation to the application of international standards for diagnostic radiology in West Bank hospitals -were compared with the international standards and with previous studies in the literature.

## **Chapter Seven**

### **Conclusions and Recommendations**

#### **7.1 Conclusion**

This was conducted to assess the level of applying the international standards in relation to the services provided in radiology and medical imaging departments in West Bank hospitals. The results of the study showed that the overall level of adherence to the international standards in radiology departments was moderate in structural and managerial description of the hospital, job description of the technicians, radiation safety precautions, and general safety and infection control standards. Moreover, results also showed that the compliance of radiology department to the analysis of rejected film was very low. In other words, the practice of radiology and medical imaging departments all around the West Bank do not meet the international standards and guidelines for these services at the maximum levels.

The majority of the departments do not apply either quality control or quality assurance, nor quality assessment as basic policies in order to establish a quality improvement programs. Furthermore, results showed that number and the types of the available modalities also did not match the international standards. On the other side, results showed that the majority of radiologic technicians were males, besides; most of them had bachelor degree in medical imaging technology. In addition, it was clear that there is a need for training programs on the new advanced technologies, because these new technologies is almost few in West Bank. Based on, the following research, management, and training recommendations are suggested:

## **7.2 Recommendations**

### **7.2 Management Recommendations**

- The Ministry of Health and the Palestinian medical imaging association (PMIA) should pay more attention to the regulation and controlling of practice in radiology departments.
- All hospitals should plan to implement a comprehensive quality assurance programs in radiology and medical imaging departments.
- All hospitals must develop policies and procedures for patient safety in radiology departments.
- All hospitals also give more attention to radiological examinations results to be interpreted by qualified radiologists.
- Heads of radiology departments should take into account that all examinations performed in radiology departments must be under supervision of senior and qualified technologists.
- Radiation safety programs should be implemented in all facilities in order to monitor, optimize, and reduce the radiation doses to patients.
- A system for the rejected film analysis should be designed to assure both the effectiveness and efficiency of the practice in all radiology modalities.

### **7.3 Training Recommendations**

- Ministry of health and all stakeholders should conduct continues education programs for radiology personnel.
- When new modalities installed, operators should have a sufficient training courses to effectively operate these equipment.

### **7.4 Research Recommendations**

- Since the study was conducted radiology departments in hospitals, it is crucial to conduct similar study in the medical centers that have x-ray units.
- More in depth studies should be conducted in relation to the adherence to the international standards in radiology departments in West Bank hospitals.



- Furthermore, studies should be conducted to determine the shortage in the number of radiologists in West Bank in comparison to other medical specialties.
- Conduct assessment studies to determine the accurate rejected films rate in radiology and medical imaging departments.
- Evaluate and determine the radiation doses received by patient during the procedures if possible.

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## Appendix A

**Al-Quds University**  
Jerusalem  
School of Public Health



**جامعة القدس**  
القدس  
كلية الصحة العامة

التاريخ: 2010/8/1  
الرقم: ك ص ع/2010

حضرة الدكتور سعيد الهموز المحترم  
مدير عام التعليم الصحي/ وزارة الصحة الفلسطينية

الموضوع: مساعدة الطالب ميسرة رمان

تحية طيبة وبعد،،،

نود إعلام حضرتكم بان الطالب ميسرة رمان ماجستير صحة عامة/ مسار إدارة صحية يقوم بإجراء بحث بعنوان:

"An assessment of Quality Of Service in Radiology and Medical Imaging Department in West Bank Hospitals"

نرجو مساعدة الطالب بالموافقة على إجراء مقابلات مع مدراء مراكز الأشعة في مستشفيات الضفة الغربية لتعبئة استبانة الدراسة، علماً بان المعلومات سوف تكون لأغراض البحث العلمي فقط.

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## Appendix B

D. M. O. MOH	Fax:00000000000	5 Aug 2010 10:43	P.01/01
		السلطة الوطنية الفلسطينية وزارة الصحة - نابلس الإدارة العامة للتعليم الصحي	
Palestinian National Authority Ministry of Health - Nablus General Directorate of Higher & Continuing Education			
Ref: .....	Date: .....	الرقم: 175/2010/10 التاريخ: 15/8/2010	
الاخ مدير عام الادارة العامة للمستشفيات المحترم... تحية واحترام...			
<b>الموضوع: تسهيل مهمة طلاب</b>			
تماشياً مع سياسة وزارة الصحة المتعلقة بتعزيز التعاون مع الجامعات والمؤسسات الأكاديمية بإتاحة فرص التدريب أمام الطلبة والخريجين والباحثين في المؤسسات الوطنية وإسهاماً في تنمية قدراتهم. يرجى تسهيل مهمة الطالب ميسرة رمان/ ماجستير صحة عامة - مسار ادارة صحية - جامعة القدس لاجراء مقابلات مع مدرء مراكز الاشعة في مستشفيات الضفة الغربية لتعبئة استبانته الدراسة بعنوان " An assessment of Quality of Services in Radiology and Medical Imaging Department in West Bank Hospital".			
مع الاحترام...			
 الدكتور سعيد الهموز مدير عام التعليم الصحي			
P.O. Box: 14 Tel.:09-2384771 -6 Fax: 09-2384777		ص.ب. 14 تلفون: 09-2384771-6 فاكس: 09-2384777	



## Appendix C

حضرات السادة رؤساء أقسام المحترمين

أنا طالب في كلية الصحة العامة \ جامعة القدس. أقوم بعمل دراسة عن مستوى جودة الخدمات المقدمة في أقسام الأشعة في مستشفيات الضفة الغربية كمتطلب للحصول على شهادة الماجستير. أتقدم بطلب مساعدتكم في تعبئة هذه الإستبانة التي ستستغرق بضع دقائق. علما أن جميع المعلومات الواردة فيها ستعامل بسرية تامة و ستستخدم لأغراض الدراسة فقط. و لكم حق الإشتراك أو الإنسحاب في أي وقت دون إبداء الأسباب.

مع الإحترام

ميسرة رمان

2010

## 1- معلومات ديموغرافية عن المؤسسة

□ الجنوب بيت لحم، الخليل.		□ الوسط رام الله، القدس، أريحا.		□ الشمال جنين، نابلس، طولكرم، قلقيلية، سلفيت، طوباس			مكان المستشفى			
□ غير ذلك:		□ الهلال الأحمر		□ وكالة الغوث		□ جمعيّة غير ربحية		□ خاص	□ حكومي	نوع المستشفى
Radiologist	X-Ray	Fluoroscopy	U/S	CT	MRI	NM	Mammography	Interventional	وحدات التصوير	
□	□	□	□	□	□	□	□	□	جنس الفنيين	
أنثى									ذكر	
دبلوم									بكالوريوس	
ماجستير									دكتورا	
غير ذلك									غير ذلك	
من 2 - 5 سنوات									من 6 - 10 سنوات	
من 11 - 15									16 فما فوق سنة	
أقل من سنتين									سنوات الخبرة للفنيين	

## 2. وصف المؤسسة الهيكلي و الإداري

لا	نعم	السؤال
		A.1 تطبيق المؤسسة أنظمة الجودة العالمية الخاصة في قسم الأشعة
		A.2 المؤسسة حاصلة على شهادة الجودة العالمية الخاصة بقسم الأشعة
		A.3 تقدم المؤسسة خدمات التصوير الطبي طيلة أيام الأسبوع
		A.4 تقدم المؤسسة خدمات التصوير الطبي يوميا بواقع أربع و عشرون ساعة يوميا
		A.5 يحتوي قسم الأشعة على كافة اجهزة التصوير الطبي

A.6	يتم عمل كل الفحوصات الإشعاعية بما في ذلك التصوير بالمواد الملونة و الإجراءات التداخلية					
A.7	جميع الأجهزة الموجودة في قسم الأشعة يتم ترخيصها من قبل وزارة الصحة					
A.8	جميع الفنيين و الأطباء في قسم الأشعة حاصلين على شهادات جامعية من معاهد و جامعات معترف بها لدى وزارتي الصحة و التعليم العالي					
A.9	جميع الفنيين و الأطباء يحملون تراخيص مزاولة للمهنة سارية المفعول من وزارة الصحة					
A.10	جميع الفنيين و الأطباء منتسبون إلى النقابات المهنية					
A.11	عدد الفنيين في قسم الأشعة كافي لتشغيل الأجهزة					
A.12	يتم صرف علاوة على الراتب للفنيين و الأطباء في قسم الأشعة بدل خطر التعرض للإشعاع					
A.13	يتم احتساب إجازة إضافية للفنيين و الأطباء في قسم الأشعة بدل خطر التعرض للإشعاع					
	السؤال	دائما	غالبا	احيانا	نادرا	غير موجود
A.14	تتم عملية صيانة دورية للأجهزة في القسم					
A.15	في حالة تعطل احد الأجهزة, تتم عملية الإصلاح بأسرع وقت					
A.16	كل إجراءات التصوير و كيفية القيام بها تكون موثقة بسجلات خاصة في كل وحدة تصوير					
A.17	يتم عقد دورات تدريبية للموظفين بشكل دوري بالإضافة إلى محاضرات و حلقات دراسية لمتابعة آخر المستجدات العلمية					
A.18	يتم تدريب فنيي الأشعة الذين تم تعيينهم مؤخرا على جميع الأجهزة الموجودة في قسم الأشعة من قبل الفنيين ذوي الخبرة					

A.19											يتم عمل فحص عملي من قبل مسؤول الفنيين للموظفين الجدد بعد فترة التدريب للتأكد من جاهزية إستلامهم للعمل بمفردهم
A.20											باستطاعة جميع فنيي الأشعة العمل على كل أجهزة التصوير الطبي الموجودة في قسم الأشعة بشكل جيد
A.21											مساحات وحدات التصوير الطبي واسعة و غير مغطاة
A.22											في كل وحدة تصوير, يوجد مكان مخصص لتبديل الملابس
A.23											توجد ارشادات معلقة على الجدران للتسهيل على المرضى
A.24											تتم مراقبة كل الفحوصات الإشعاعية من قبل مسؤول الفنيين أو مسؤول الوردية قبل إعطائها للمريض
A.25											تتم كتابة تقارير عن نتائج كل الفحوصات الأشعاعية من قبل الطبيب إختصاصي الأشعة
A.26											يتم كتابة كافة المعلومات الشخصية عن المريض على كل الفحوصات التي تم عملها له
A.27											يتم توثيق و تسجيل كل الفحوصات الإشعاعية بالإضافة إلى المواد التي تم إستخدامها في الفحوصات في كل وحدة
A.28											تتم عملية مراجعة للمصروفات و المدخولات من قبل قسم المحاسبة مع مسؤول قسم الأشعة
A.29											يتم استخدام أنظمة ارشفة محوسبة في قسم الأشعة

					يتم وضع لائحة الأسعار حسب تكلفة كل فحص	A.30
					يتم التعامل مع شركات التأمين بالنسبة للمرضى من خارج المستشفى	A.31
					يقوم قسم السكرتاريا في قسم الأشعة بحجز و إعطاء المواعيد للمرضى	A.32
					مواعيد الفحوصات للمرضى من خارج المستشفى تكون قريبة	A.33

### 3- مسؤوليات و مهام فنيي الأشعة

غير موجود	نادرا	احيانا	غالبا	دائما	السؤال	
					في كل وحدة تصوير, يقوم الفني الذي يعمل بهذة الوحدة بترتيب و تشغيل الأجهزة في بداية العمل و يتأكد من جهازيتها للعمل	B.1
					يقوم فني الأشعة بمهامه الوظيفية بشكل آمن للمحافظة على سلامته شخصيا, سلامة المرضى, و المحافظة أيضا على صلاحية الأجهزة و إطالة عمرها	B.2
					يلتزم فني الأشعة بالزي الرسمي للمؤسسة أثناء العمل	B.3
					يلتزم فني الأشعة بوضع بطاقة التعريف أثناء العمل	B.4
					يقوم فني الأشعة بتفقد المستلزمات و الأدوات اللازمة في كل وحدة و إعلام مشوول القسم عن النواقص	B.5
					يوفر فني الأشعة شراشف و مرايبيل نظيفة للمرضى و يقوم بتدليلها بين كل مريض و الذي يليه	B.6
					يقوم فني الأشعة بإستقبال المرضى و يشرح لهم عملية التصوير بشكل واضح	B.7

					يقوم فني الأشعة بأخذ موافقة المرضى عند الحاجة لإستخدام المادة الملونة أو عميلة أخذ العينة, و توثيق ذلك من خلال Consent Form	B.8
					يقدم فني الأشعة يد العون و المساعدة للمرضى إذا إستدعت الحاجة لذلك	B.9
					تتم معاملة جميع المرضى بشكل متساوي بدون تمييز	B.10
					تتم المحافظة على سرية و خصوصية المرضى	B.11
					يقوم فني الأشعة بمساعدة الطبيب إختصاصي الأشعة في الفحوصات الإشعاعية الملونة و التداخلية	B.12
					يتم الإلتزام باللوائح و القوانين العالمية الخاصة بالتصوير الطبي	B.13
					يتم القيام بالتصوير طبقا لطلب الطبيب الذي طلب الفحص	B.14
					لا يتم إعطاء الصور او الفحوصات للمرضى إذا لم تكن ذات جودة عالية	B.15
					يقوم فني الأشعة بالتأكد من جودة الفحوصات قبل خروج المريض من وحدة التصوير	B.16
					يقوم فني الأشعة بعرض الصور و الفحوصات على الطبيب إختصاصي الأشعة لكتابة التقارير	B.17
					بعد إنتهاء عملية التصوير, يقوم الفني بإعلام المرضى و إرشادهم بالنسبة لوقت الإنتظار و مكان إستلام النتائج	B.18
					يحافظ فني الأشعة على علاقات جيدة مع باقي الموظفين	B.19
					يلبي فني الأشعة بسرعة الطلبات المستعجلة والطارئة في الأقسام المختلفة	B.20

										B.21
										يتابع فني الأشعة آخر المستجدات على الساحة العلمية المتعلقة بالتصوير الطبي
										B.22
										يشترك فني الأشعة في برامج التعليم المستمر في المؤسسة

### تحليل الأفلام المعادة

غير موجود	نادرا	احيانا	غالبا	دائما	السؤال	
						C.1
					يقوم مسؤول الفنيين بعملية تحليل للأفلام المعادة بشكل دوري	
						C.2
					يتفقد مسؤول الفنيين الصور المعادة أو التي لم تنجح في كل وحدة بشكل دوري	
						C.3
					يتم عد الأفلام الموجودة في المخزن و يضاف عليها الأفلام التي في الشرائط الغير مستعملة او متعرضة للإشعاع	
						C.4
					يتم عد الأفلام التي في غرفة التحميص	
						C.5
					يتم عد الأفلام التي اعيدت	
						C.6
					يتم بيان عدد كل حجم من الأفلام التي أعيدت	
						C.7
					يقوم مسؤول الفنيين بتحديد السبب في إعادة الفحوصات	
						C.8
					يتم تحديد عدد الأفلام حسب سبب الإعادة	
						C.9
					يتم تحديد الموظف صاحب أكبر نسبة إعادة	
						C.10
					يتم حساب سعر الأفلام التي تم إعادتها	

					يتم تحديد نسبة الأفلام المعاده من الأفلام المستخدمة	C.11
					تتم مقارنة النتائج الحالية مع النتائج السابقة	C.12
					يقوم مسؤول الفنيين بإعلام باقي الموظفين بنتائج التحليل و مناقشته معهم	C.13
					يتم إتخاذ إجراءات حسب أسباب الإعادة	C.14
					تتم إعادة التحليل بعد أخذ الإجراءات للتأكد من نجاعتها	C.15

### إجراءات السلامة

غير موجود	نادرا	احيانا	غالباً	دائماً	السؤال	
<b>السلامة المهنية</b>						
					يتم تصميم وحدات و غرف التصوير حسب المواصفات الدولية من حيث سماكة الجدران, المساحة, ووضع الرصاص في الجدران و الأبواب	D.1
					يتم تجهيز وحدات التصوير بأنظمة تهوية (شفاط), بالإضافة إلى أنظمة تبريد و تدفئة مكنية	D.2
					تتم مراعاة ظروف المرضى من ذوي الإحتياجات الخاصة و الإعاقات في وحدات التصوير من حيث وجود أجهزة مساعدة في الحركة و في المرافق العامة	D.3
					توجد أنظمة إنذار من الحرائق و إطفاء مركزي في كل وحدات التصوير	D.4
					تغلق أبواب وحدات التصوير بشكل محكم بحيث لا يتم فتحها إلا من الداخل	D.5



					توجد لافتات تحذيرية من خطر الإشعاع على كل أبواب وحدات التصوير بالإضافة إلى ضوء أحمر فوق الأبواب	D.6
					يتم تجهيز مكان مغلق بإحكام و محمي من الأشعة للموظف كي يقوم بتشغيل الأجهزة	D.7
					يتم تجهيز غرف الأشعة بكل أدوات الحماية من الإشعاع مثل المرايل الواقية من الأشعة, القفازات, و النظارات . . . الخ	D.8
					يتم تجهيز قسم الأشعة بأجهزة صالحة للإستخدام و مطابقة للقوانين و المعايير الدولية و الوطنية	D.9
					تتم عملية تعبير الأجهزة الجديدة حسب المواصفات الدولية	D.10
					يتم فحص الاجهزة الجديدة في قسم الأشعة من قبل وزارة الصحة قبل بداية إستخدامها للتأكد من عدم وجود أي تسريب للإشعاع خارج وحدة التصوير	D.11
					يتم الحصول على تراخيص من وزارة الصحة لكل الأجهزة بما في ذلك القديمة منها و عمل قياسات بيئية في الأماكن المحيطة بقسم الأشعة بشكل دوري	D.12
					يتم وضع لوائح تبين كيفية إدارة و تشغيل الأجهزة بشكل واضح في كل وحدة تصوير, بالإضافة إلى أرقام هواتف مندوبي الصيانة كي يتم الإتصال بهم	D.13
					يتم وضع لوائح تحتوي على قيم الأشعة المناسبة لكل فحص	D.14
					يوجد في قسم الأشعة موظف مسؤول عن الحماية من الإشعاع تكون مهامه متابعة و مراقبة كميات الأشعة المستخدمة في الفحوصات	D.15

					يتم الإلتزام التام بقوانين الحماية من الأشعة في كل الفحوصات الإشعاعية و التأكد من تطبيقها من قبل الموظفين	D.16
					يتم عمل فحوصات الأشعة فقط بوجود طلب من الطبيب المعالج يشرح فيه أسباب طلب الفحص	D.17
					يقوم الطبيب إختصاصي الأشعة بدراسة الطلبات قبل عملها	D.18
					يقوم الطبيب إختصاصي الأشعة برفض الطلبات التي لا تستوفي الشروط المنسبة من حيث تبرير إستخدام الأشعة للمرضى	D.19
					يحمل كل العاملين في قسم الأشعة أجهزة قياس للأشعة و تتم قرانتهما بشكل دوري	D.20
					يحافظ فني الأشعة على سلامته الشخصية من خلال الإلتزام بقواعد المهنة و الإبتعاد عن مصدر الإشعاع قدر الإمكان	D.21
					يتم إبعاد الموظفين الذين تعرضوا لكميات أشعة أعلى من المسموح به عن العمل بالأشعة	D.22
					يتم إبعاد الموظفات في القسم في حالة الحمل عن التعرض المباشر للأشعة	D.23
<b>سلامة المرضى</b>						
					يقوم فني الأشعة بإبعاد مرافقي المرضى عن مصدر الإشعاع	D.24
					عند الحاجة لوجود مرافق لمساعدة المريض أثناء الفحص, يقوم فني الأشعة بحماية المرافق من خلال إستخدام واقي الرصاص	D.25
					يتم التأكد من إغلاق غرف الأشعة بإحكام قبل البدء بالتصوير	D.26

					يقوم فني الأشعة باستخدام أقل كمية ممكنة من الأشعة مع المحافظة على جودة جيدة للفحوصات	D.27
					يتم التأكد من قيم الأشعة, الشرائط, ووضعية المريض المناسبة لعمل الفحص قبل التصوير حتى لا يتم إعادة التصوير	D.28
					يتم إعطاء المرضى إرشادات واضحة قبل البدء بالفحص, والتأكد من فهم المريض لها	D.29
					يقوم فني الأشعة بتعريض الجزء المراد تصويره فقط, و حماية باقي الأعضاء باستخدام واقي الرصاص	D.30
					يتم استخدام أنظمة أشعاع تلقائية Automatic Exposure التي تعطي كمية إشعاع ملائمة حسب حجم المريض	D.31
					يتم التأكد من صلاحية مواد التحميص و جهازيتها	D.32
					يتم استخدام الأجهزة الرقمية – CR, DR - ( إن وجدت) أكثر ما يمكن للتخفيف من نسبة الإعادة	D.33
					يتم إستبعاد النساء في مرحلة الحمل أو الشك بوجود حمل من عمل أي تصوير لمنطقة البطن أو الحوض إلا بوجود حاجة ماسة لذلك	D.34
					يتم إستخدام أجهزة التصوير المتحركة للمرضى في أقسام العناية المكثفة فقط	D.35
<b>أستخدام أساليب مكافحة العدوى و سلامة المرضى</b>						
					يتم عمل فحوصات مخبرية و سريرية لكل العاملين الجدد للتأكد من خلوهم من الأمراض المعدية, الأمراض العضوية, أو الإعاقات البدنية	D.36

					يتم عمل فحوصات مخبرية و سريرية بشكل دوري لكل العاملين الذين على رأس عملهم للتأكد من خلوهم من الأمراض المعدية مثل الأمراض الجلدية أو أمراض الجهاز التنفسي	D.37
					يتم أستبعاد الموظفين المصابين بالأمراض المعدية من التعامل مع المرضى لحين توقيع الكشف الطبي بخلوهم منها	D.38
					يتم ارتداء القفازات عند التعامل مع أي من إفرازات المرضى ( دم ، بول ، براز ، بصاق .... الخ )	D.39
					يتم ارتداء القفازات عند التعامل مع أي من الاختبارات التشخيصية مثل حقنة شرجية بالباريوم	D.40
					يتم ارتداء القفازات عند إجراءات النظافة	D.41
					يتم غسل اليدين بالماء والصابون قبل وبعد استخدام القفازات، وبعد اي إجراء	D.42
					يتم أخذ الاحتياطات اللازمة مع جميع المرضى (غسل الأيدي قبل وبعد الإجراء، لبس الكمامة كلما لزم الأمر، عدم ارتداء المجوهرات والخواتم والساعات أثناء فترة العمل)	D.43
					توجد عربة إسعافات أولية باستمرار لحالات توقف القلب أو الصدمات anaphylactic shock في كل وحدات التصوير	D.44
					توجد أجهزة شفط مع قساطر معقمة لأي طوارئ طول الوقت	D.45
					يتم استخدام الأشياء المعقمة فقط وإلا يكون تاريخ تعقيمها منتهى	D.46
					يتم حفظ القساطر والإبر الوريدية في مكان مخصص	D.47

					يتم التعامل مع المرضى المعرضين للعدوى والمصنفين بالاحتياطات الوقائية ( Protective Precautions ) في بداية اليوم لحمايتهم	D.48
					يتم التعامل مع المرضى المعديين والمصنفين بالاحتياطات التامة Strict Precautions لآخر الحالات (إن أمكن) حماية للآخرين	D.49
					يتم استخدام جهاز الأشعة المتنقل لتقليل تحرك المرضى واحتكاكهم مع مرضى آخرين	D.50
					يتم استخدام الملاءات لاستعمال واحد لتغطية طاولة الأشعة ويتم التخلص منها بعد ذلك بوضع الملاءة داخل كيس أحمر وترسل إلى المغسلة	D.51
					تغسل وتنظف طاولة الأشعة وكل المعدات التي استعملت مع المريض المعدي مباشرة باستخدام مطهر (كلور)	D.52
					تطهر الطاولات باستخدام مطهر (كلور)	D.53
					تنظف شرائط الأشعة باستخدام مطهر (كلور)	D.54
					تنظف الأرضيات يومياً بالماء والصابون	D.55
					يتم التخلص من السوائل الملوثة في المراحيض وليس في الأحواض (المغسل)	D.56

## Appendix D

### A questionnaire of quality of services in radiology and medical imaging departments

Dear head of radiology department,

We are trying to assess the quality of the services provided in radiology and medical imaging departments in West Bank hospitals. We need your cooperation to accomplish this study.

Please chose the most appropriate phase that answer each question

5-Always, 4- Mostly, 3- Sometimes, 2- Rare, and 1- Never

#### A. Structural and managerial description of the hospital

#	Question	Y	N					
A.01	The organization applies the JCI standards for quality in radiology department							
A.02	The organization holds the accreditation certificate for radiology department from the JCI							
A.03	The organization provides the radiology services 7 days a week							
A.04	The organization provides the radiology services 24 hours a day							
A.05	Radiology department has all types of medical imaging equipment							
A.06	All types of imaging examinations including those with contrast medium and interventional radiology are performed							
A.07	All the equipment in radiology department are licensed by Ministry of Health							
A.08	All the technicians and radiologists hold degrees from educational institutes recognized by both; Ministries of Health and High Education							
A.09	All the technicians and radiologists hold a valid license of practice from the Ministry of Health							
A.10	All the technicians and radiologists are members of professional unions							
A.11	Number of technicians is appropriate for equipment operating							
A.12	Radiation workers receive additional salary allowance							
A.13	Radiation workers receive additional leave days							
#	Question	5	4	3	2	1		
A.14	Periodic preventive maintenance is performed							
A.15	The down time of the equipment is short							
A.16	Procedure manuals are founded in each imaging unit							
A.17	Newly hired RTs are trained on all imaging modalities by experienced existed ones							
A.18	Following their training period, newly hired RTs are evaluated by the chief RT							
A.19	All RTs in the department can efficiently operate all types of the imaging equipment							
A.20	The department provide continuous education programs							
A.21	The space of the imaging rooms is appropriate							
A.22	The imaging rooms have changing cubicles							

<b>A.23</b>	Direction signs are available on walls					
<b>A.24</b>	The senior RT checks the imaging results before dispatching					
<b>A.25</b>	All imaging examinations are interpreted by qualified radiologists before dispatching					
<b>A.26</b>	Patient's information is presented on the hard and soft copies of all imaging results					
<b>A.27</b>	All procedures and disposables are documented					
<b>A.28</b>	Chief technician is involved in the inventory process					
<b>A.29</b>	The radiology department utilize digital documentation					
<b>A.30</b>	List of fees is available for each examination					
<b>A.31</b>	The department has agreements with health insurance bodies from outside the hospital					
<b>A.32</b>	Exam appointments are available the reception office					
<b>A.33</b>	Appointment usually be within few days					

### **B. Standards of job Description of the technologists**

<b>#</b>	<b>Question</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>B.01</b>	In each imaging unit, and at the start work, assigned RT performs sanity check on the equipment					
<b>B.02</b>	The RT takes all necessary steps to assure his own safety, patient safety, and follows the recommended equipment operation instructions to maintain the equipment					
<b>B.03</b>	The RTs adhere themselves to the institution uniform					
<b>B.04</b>	The RTs make sure to wear ID badge					
<b>B.05</b>	The chief RT performs inventory checks and report shortages to the department manager					
<b>B.06</b>	The RT provides each patient with clean linens and gowns					
<b>B.07</b>	The RT clearly explains the radiographic procedure to the patients					
<b>B.08</b>	The RT obtains and documents consent form from each patient undertaking contrast media exams or intervention.					
<b>B.09</b>	The RT provides help and assistance whenever there is a need for that					
<b>B.10</b>	All patients are served equally					
<b>B.11</b>	Dealing with patient information are kept in discrete manner					
<b>B.12</b>	The RT assists the radiologist when performing contrast media and/or interventional procedures					
<b>B.13</b>	The staff is well adhered to the medical imaging guidelines and instruction					
<b>B.14</b>	The imaging procedure is performed according to the referral request					
<b>B.15</b>	Sub-optimal radiographs are not handed to the patients					
<b>B.16</b>	The RT checks the image quality before the patient leaves the imaging unit					
<b>B.17</b>	The RT provides the radiologist with the images for interpretation					
<b>B.18</b>	Following the radiographic procedure, the RT explains to the patient the waiting time and result collection place					
<b>B.19</b>	The RT maintains good relationships with the rest of the staff					
<b>B.20</b>	The RT responds efficiently to the urgent imaging requests from other departments					

<b>B.21</b>	The RT is updates him/herself with regards to medical imaging scientific news					
<b>B.22</b>	The RT participates on the ongoing continuous education programs					

### C. Rejected film analysis

#	Question	5	4	3	2	1
<b>C.01</b>	The chief RT performs periodic rejected films analysis					
<b>C.02</b>	The chief RT performs a daily check for the rejected films in each unit					
<b>C.03</b>	The x-ray films in the store are counted and add to it the number of films in the unexposed cassettes					
<b>C.04</b>	The x-ray films in the dark room are counted					
<b>C.05</b>	The repeated x-ray films are counted					
<b>C.06</b>	The repeated x-ray film are classified according to film size					
<b>C.07</b>	The chief RT analyze reasons behind the repeated exams					
<b>C.08</b>	The repeated x-ray film are classified according to the reason behind repeating the exam					
<b>C.09</b>	The RT with the highest repeat percentage is identified					
<b>C.10</b>	The price of the repeated films is calculated					
<b>C.11</b>	The percentage of repeated films out of the total films is calculated					
<b>C.12</b>	Recent results are compared with old ones					
<b>C.13</b>	The chief RT discuss the analysis results with the staff					
<b>C.14</b>	Action are made following the reject/repeat analysis procedure					
<b>C.15</b>	Reject analysis is repeated to check the efficiency of the introduced actions					

### D. Safety Precautions

#	Question	5	4	3	2	1
<b>Occupational Safety</b>						
<b>D.01</b>	Imaging units design (area, wall thickness, lead shielding) follows the international regulations					
<b>D.02</b>	Imaging units have facilities for patients with special needs					
<b>D.03</b>	Imaging units are equipped with smoke detectors and central fire distinguishers					
<b>D.04</b>	Imaging units are well ventilated and equipped with central cooling/heating					
<b>D.05</b>	Doors in the imaging are firmly closed and open from inside only					
<b>D.06</b>	Each imaging unit have radiation free operating console					



<b>D.07</b>	The imaging equipment are valid, tested, and operated within the international/national acceptance limits					
<b>D.08</b>	calibration process for the imaging equipment is performed in accordance with the international standards					
<b>D.09</b>	Operation instruction are mounted in each imaging unit including the telephone numbers of the maintenance engineers					
<b>D.10</b>	A list of exposure factors is mounted in each imaging unit					
<b>D.11</b>	Every new imaging equipment is tested by the MOH for radiation leakage					
<b>D.12</b>	The necessary certificates from the MOH are obtained for the imaging equipment including old ones. Periodic radiation leakage tests are performed in areas surrounding the imaging units					
<b>D.13</b>	Imaging units are equipped with personal radiation protection tools (such as lead gown, lead gloves, and lead goggles)					
<b>D.14</b>	The doors in the imaging units have radiation warning labels. Radiation warning red lights are mounted and efficiently working above these doors					
<b>D.15</b>	The radiology department hires a radiation protection officer (who is responsible for controlling radiation doses used)					
<b>D.16</b>	The staff adhere to the radiation protection standards when performing the examinations					
<b>D.17</b>	The examinations are performed only when a referral request is presented					
<b>D.18</b>	The radiologist approve the referral requests before performing the examinations					
<b>D.19</b>	The radiologist rejects the requests that do not include enough justifications for the exam					
<b>D.20</b>	The radiation workers wear radiation badges. The badges are read periodically					
<b>D.21</b>	The RT adheres to the personal radiation safety regulations and refrains from staying unnecessarily in radiation areas					
<b>D.22</b>	RTs who exceed the maximum permissible dose are given a compulsory leave of absent					
<b>D.23</b>	RTs who report that they are pregnant given radiation free jobs					
<b>Patient Safety</b>						
<b>D.24</b>	The RTs do not allow patient relatives/escorts to radiation potential areas					
<b>D.25</b>	Patient's escort are given a lead apron when their presence is necessary in the imaging room					
<b>D.26</b>	The imaging room door is firmly closed before starting the x-ray exposure					
<b>D.27</b>	The RT adheres to the ALARA principle: The dose is kept as low as reasonably achievable					
<b>D.28</b>	The exposure factors and patient position are checked to prevent possible repeat of the procedure					
<b>D.29</b>	The procedure is thoroughly explained to the patient before the exam					
<b>D.30</b>	The RT makes sure that only the region of interest is irradiated. Lead shield is used to cover nearby areas					
<b>D.31</b>	The automatic exposure control is used					
<b>D.32</b>	Developer/fixer chemicals are periodically checked					
<b>D.33</b>	When digital units (CR,DR) present, they are used so often to reduce the probability of repeating the exams					

<b>D.34</b>	Abdomen and pelvis imaging is not performed to pregnant or possibly pregnant patients unless the exam is fully justified					
<b>D.35</b>	Mobile x-ray units are used in the ICU only					

<b>Infection control standards</b>						
<b>D.36</b>	Newly employed staff underwent lab, clinical, and physical examinations to exclude infectious diseases and physical limitations					
<b>D.37</b>	Staff underwent periodic lab and clinical examinations to rule out infectious skin and respiratory diseases					
<b>D.38</b>	Staff with infectious diseases are prevented from direct contact with patients until they are fully recovered					
<b>D.39</b>	Staff uses gloves when handling patient fluids and secretions (example: blood, urine, sputum, etc.)					
<b>D.40</b>	staff uses gloves when performing diagnostic procedures such as barium studies					
<b>D.41</b>	Staff uses gloves when cleaning equipment					
<b>D.42</b>	Hands are washed before and after using the gloves					
<b>D.43</b>	Necessary precautions are implemented when handling patients (hands are washed before and after procedures, masks are used when needed, refraining from wearing jewelries, rings during working hours					
<b>D.44</b>	CPR emergency trolley and DC shock are available in each imaging unit					
<b>D.45</b>	Suction devices with sterile catheters are available					
<b>D.46</b>	Non-expired sterile tools/materials are used					
<b>D.47</b>	Catheters and IV needles are stored in a dedicated place					
<b>D.48</b>	Patients with infectious diseases and classified as (Protective Precautions]) are imaged at the start of the working day					
<b>D.49</b>	Whenever its possible, infectious patients classified as (Strict Precautions) are imaged at the end of the working day					
<b>D.50</b>	Mobile x-ray units are used to limit patient movement and reduce cross infection					
<b>D.51</b>	linens are used to cover the x-ray tables, changed between patients, and sent to the laundry in a red bag					
<b>D.52</b>	When a patient with infectious disease is imaged, the imaging equipment, and all used tools/materials are cleaned with disinfectant solution (chlorocept)					
<b>D.53</b>	x-ray tables are cleaned with disinfectant solution (chlorocept)					
<b>D.54</b>	x-ray cassettes are cleaned with disinfectant solution (chlorocept)					
<b>D.55</b>	Floors in the radiology department are cleaned daily					
<b>D.56</b>	The disposal of potentially infected solutions is done directly in the sausage systems(not in the sinks)					

## Appendix E

#	Name Expert	Specialty
1.	<b>Dr. Motasem Hamdan</b>	PhD. Instructor of Health Management an Policy, School of Public Health, Al Quds University.
2.	<b>Dr. Adnan Lahham</b>	PhD. Dean of College of Science and Technology, Head of Geology Department, Al Quds University.
3.	<b>Dr. Ghassan Sarhan</b>	PhD. Instructor, Faculty of Art, Al Quds University.
4.	<b>Dr. Ali Sha'ar</b>	PhD in Quality Improvement.
5.	<b>Dr. Bassam Irshaid</b>	MD. Consultant Radiologist, FRCR.