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Assessment of diagnostic ultrasound services in palestine toward national diagnostic reference levels

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Assessment of diagnostic ultrasound services in palestine toward national diagnostic reference levels

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Dedication

I am most deeply grateful to my whole loving family for the support and the patience during the writing process. I sincerely want to thank my dear wife who provided pragmatic and objective views, help and support, and also for the patience, persistence, and encouragement. The presence of our children brings the most precious moments in my life.

Mohammad Mashahreh

Declaration:

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

Mohammad Hasan Ahmad Mashahreh

Signed .....

Date: 15.12.2019

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Abstract

Objective: The study was conducted to provide national diagnostic reference levels for ultrasound reporting.

Methods and Materials: The study was carried out in radiology and medical imaging departments in the three sectors representing the Palestinian health system, particularly inside governmental, non-governmental and private health sectors. The sample size comprised 600 ultrasound (u/s) reports of abdomen and pelvis u/s procedures. U/S reports were collected and followed in terms of record name, record number, findings, and all criteria followed the worldwide report of American College of Radiology (ACR).

Results: The Palestinian private health sector u/s report for pelvis and abdominal examinations correlates (P value=0.001) with the ACR standards compared to other Palestinian health sectors. Regarding report structure sections, in the history and indication, our results showed that this section was completely absent from the governmental sector reports. Moreover, the limitation section was absent from all governmental and NGO (u/s) reports while it existed in just 19% of the private sector (u/s) reports. Likewise, in the conclusion section of the report structure, the most noteworthy rate was again in the Palestinian private health sectors as 80% of their (u/s) reports .On the contrary, all the reports included a finding section .Finally, in the previous study section of the report, our results indicated that the highest percentage was in the private health sector, as represented by 57% of their (u/s) reports. When the relationship between the quality of the (u/s) report and health sector was investigated, the results showed that the sort of health sector has a positive effect on the quality of the (u/s) report ,where the Palestinian private health sector got the highest quality in writing reports of the ultrasound compared to other sectors.

Conclusion: The Palestinian private health sector have the highest quality u/s reports among Palestinian health sectors.

تقييم التقارير التشخيصية بالموجات فوق الصوتية للبطن والحوض
بين القطاعات الصحية الفلسطينية

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ملخص

هدف الدراسة :أجريت الدراسة لتوفير مستويات مرجعية تشخيصية وطنية لتقارير جهازالموجات فوق الصوتية.

منهجية البحث :أجريت الدراسة في أقسام الأشعه والتصوير الطبي في القطاعات الثالثة التى تمثل النظام الصحي الفلسطيني :القطاعات الصحية الحكومية وغير الحكومية والخاصة .بلغ حجم العينة **600**تقريرا بالموجات فوق الصوتية (U.S)لمنطقتي البطن والحوض وتقاريرجهاز الموجات فوق الصوتية تم جمعها ومتابعتها من خلال كتابة اسم المريض ورقم التسجيل والنتائج، وجميع المعاييرالمتبعة في التقرير العالمي للكلية الأمريكية للاشعة.

النتائج :تلتزم تقاريرجهازالموجات فوق صوتية لفحوصات الحوض والبطن في القطاع الصحي الفلسطيني الخاص التزاما قويا بمعاييرالكلية الأمريكية للالشعة مقارنة بقطاعات الصحة الفلسطينية الأخرى .فيما يتعلق بأقسام هيكل التقرير في التاريخ المرضي والأعراض المرضية، تظهر نتائجنا أن هذا القسم كان غائبا تماما عن تقارير القطاع الحكومي .علاوة على ذلك، كان قسم المعوقات غائبا عن جميع التقارير الحكومية وغير الحكومية، بينما كان موجودا في **719** فقط من تقارير القطاع الخاص . وبالمثل، في جزء الخلاصة من هيكل التقرير، كان المعدل الاكثر وجودا مرة أخرى في القطاعات الصحية الخاصة الفلسطينية حيث بلغ **780** من تقاريرهم .أما قسم النتائج، كانت جميع التقارير في العينة تحتوي على هذا القسم .أخيرا في أقسام الدراسة السابقة من التقرير، أشارت نتائجنا إلى أن أعلى نسبة كانت في قطاعات الصحة الخاصة حيث بلغت **757** من تقاريرهم .أما فيما يخص العلاقة بين جودة تقرير **(U.S)** ونوع القطاع الصحي الذي قدم التقارير، وجدت النتائج أن نوع القطاع الصحي له تأثير إيجابي على جودة التقرير، حيث حصلت القطاعات الصحية الخاصة الفلسطينية على أعلى جودة في كتابة تقاريرالموجات فوق الصوتية مقارنة بالقطاعات الأخرى.

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Listof Abbreviations

U/S: Ultrasound

MRI: Magnetic Resonance Imaging

3-D: Three Dimensional

TDI: Tissue Doppler Imaging

AAA: Abdominal Aortic Aneurysm

L: Lumbar

S: Sacrum

CT: Computed Tomography

ACR: American College of Radiology

NGO: Non-Governmental Organization

CPT: Current Procedural Terminology

GP: General Practitioner

SR: Structure Report

FTR: Free Text Report

ESR: European Society of Radiology

LV: left ventricle

IRRR : Image Rich Radiology Reports

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CHAPTERONE

Introduction

Medical u/s imaging is an essential service in the diagnosis and monitoring of disease. When a patient has undertaken a radiology examination,a radiologist or a radiographer usually reports on these images summarizing the findings and making recommendations. This report is sent to the physician who referred the patient to discuss the results and act on any findings. Therefore, accurate and clear reporting is critical for proper across-care communication and the provision of quality and safe healthcare. Despite the lack of concordance in what constitutes a "good" ultrasound (u/s) report, there is some agreement around the necessary elements of a satisfactory report[1, 2].The American College of Radiology (ACR) standard of correspondence provides brief common sense guidelines concerning the wording of reports[3].

Medical u/s imaging framework is of an at most significance in the finding and assessment of the abdominal cavity, clinical u/s performs tests for kidney, liver, gallbladder, bile ducts, pancreas, spleen, stomach aorta and other blood vessels. Furthermore, it can be used to analyze abdominal pain or distention, unusual liver capacity, kidney stone, gallstones and Abdominal Aortic Aneurysms (AAA)[4].

An interventional u/s might be utilized for biopsy guiding. Furthermore, Doppler u/s image can assist radiologists with seeing and diagnosing, blockage to blood stream, narrowing of vessels, tumors and congenital vascular abnormalities, reduce or absent blood flow to various organs such as the testes or ovary, increased blood flow which may be a sign of infection [5].

Hazel Edward et al. (2014)reported that, it was essential for the management of the patient that radiologist produce reports based on their study that were accurate and clear. Perfect report should endeavor to respond to the first clinical inquiry, subsequently recommend instructive asset that are accessible to improve poor report composing .They proposed a system, which professionals may find helpful when constructing u/s reports[6].

Collard et al. (2-14)reported that improvement in reporting skills of radiology residents with a structured reporting curriculum, significantly improved the detailing scores of the residents through their residency preparing. This demonstrated that there might be an advantage in utilizing a sorted out announcing educational plan to follow occupant progress in creating reports that may improve patient consideration[7].

Speets et al. (2006) revealed the importance of the upper abdominal u/s in general practice, and improved diagnosis for64% of patient after upper abdominal u/s. Abdominal u/s considerably diminished the quantity of planned referrals to a therapeutic authority[5].

Acute pelvis pain, characterized as the unexpected beginning of lower abdominal or pelvis pain enduring less than 3 months[8] is a regular urgent clinical presentation. Women frequently present to the emergency department after hours. More than 33% of women of reproductive age experience non-menstrual pelvis pain[9].

Acute pelvis pain can represent an analytic test on the grounds that the clinical history, manifestations, and physical assessment discoveries are regularly vague, and the clinical presentation of the hidden gynecologic, obstetric, urologic, and gastrointestinal conditions regularly differ broadly and much of the time unclear. Although some of the common conditions, for example, ruptured or hemorrhagic ovarian cysts are self-limiting, it is basic that pressing conditions that may require a medical procedure, for example, ovarian torsion, pelvic inflammatory disease, and appendicitis, be viewed as when a premenopausal woman has acute pelvic pain[8].

The ACR appropriateness criteria list pelvic sonography as the favored first-line imaging methodology in the assessment of acute pelvis pain in pregnant women and non-pregnant women of reproductive age when an obstetric or gynecologic condition is suspected and in the starting evaluation of a suspected non-gynecologic condition in a pregnant patient[10].

Maiorana et al. (2011)showed that u/s finding of pelvis endometriosis was the primary line indicative strategy for the analysis of pelvic endometriosis. Rectal endoscopic sonography could recognize the nearness and the degree of wall infiltration of bowel sites in any case in patients with a predictable clinical doubt of profound endometriosis MRI is a decent "across the board" assessment to analyze and characterize the definite degree of deep infiltrating endometriosis[11].

Some studies investigated the impact of u/s report, particularly the impact of abdomen and pelvis u/s reports[12]. The primary goal of this research is the evaluation of the reporting of ultrasound (u/s) findings of the abdominal and pelvic regions in order to improve, optimize and standardize the reporting of u/s findings and facilitate communication across healthcare specialties.

1.1 Problem statement

Ultra-sound of the abdomen and the pelvis is considered a key diagnostic tool in the healthcare system. In Palestine, there is a diversity in the method of ultrasound reporting between the different healthcare premises. This diversity originates from the lack of standardization and quality control in the radioimaging field in general which is consequently reflected on the accuracy and the quality of reporting. Thus, there is an urgent need to evaluate the reporting system used in the abdominal and the pelvic ultrasound in the different healthcare sectors to roadmap policies and to improve the reporting system to meet the American Standards of Radiology.

1.2 Study objective

The objective of this study was toassess the reporting quality of diagnostic abdominal and pelvic u/s service in the Palestinian healthcare premises in order to establish national ultrasound reporting meeting the international standards applied by the American College of Radiology.

1.3 Research questions

1. Does Palestinian reporting of abdominal and pelvic u/s adhere to the model provided by the ACR?
2. Are there differences between the Palestinian healthcare sectors (governmental, non-governmental, and private)in their commitment to the report format provided by the ACR?

1.4 Research hypotheses

- There isnostatistically significant differences between Palestinian reporting of abdominal and pelvic u/s and the model provided by the ACR.

- there is no statistically significant differences between the Palestinian health sectors in their compliance with the report format provided by the ACR

1.5 Research significance

Accurate and clear reporting of u/s imaging is key to better communication across healthcare practitioners and providing safe and evidence-based healthcare. The core of this study was to evaluate the current Palestinian reporting models for pelvic and abdominal u/s. Based on the findings of this assessment, a national standardized reporting system will be established to be adopted across Palestinian healthcare sectors.

CHAPTER TWO

literature review

2.1 Ultrasound

Medical u/salso referred to as diagnostic ultrasonography or ultrasonography, a diagnostic imaging technique supported the appliance of u/s. It produces an image of internal body structures like tendons, muscles, joints, blood vessels, and internal organs. It's aim is commonly to search out the presence of an illness or to exclude pathology. U/S are sound waves with frequencies that are higher than those of hearable to humans (>20,000 Hz). Inaudible images, conjointly referred to as sonograms, are created by causing pulses of u/s into tissue employing a probe. The u/s pulses echo off tissues with completely different reflection properties and are recorded and displayed as animage[13, 14].

U/S is one of the greatest used medical imaging systems because of its several advantages. Compared to x-ray and magnetic resonance imaging, it is a comparatively inexpensive low risk imaging modality supplying real-time information bedside. The pace with that medical imaging systems develop is nowadays very quick, and ultrasound scanners are no exception[15].

During the last twenty years, u/s scanners and its appurtenant methods have become much more refined. The rapid development is a result of and goes hand in hand with the development of technology. The development of faster processors and high capacity data memories has allowed the use of much more computationally demanding methods than previously possible[16].

Firstly, u/s scanners were just an imaging system. The quick acceleration of the development rate of u/s techniques started in the late eighties and early nineties when the concepts of blood flow imaging[17] and Tissue Doppler Imaging (TDI) were introduced[18], and the u/s scanners started to consist measuring function or modality, than

only a pure representation of an image. The two concepts have triggered the progress of a various number of methods for the assessment of functional variables, such as strain and strain
rate. In addition to, the recent introduction of u/s transducers with three-dimensional (3-D) capabilities have enabled seemingly more accurate rendering of volumes, such as the volume of the left ventricle (LV). The functional variables provide opportunities to use the ultrasound scanners not only for diagnostic purposes but also for treatment follow-up and patient monitoring purposes. If the u/s scanners are intended to be used for treatment follow-up or in monitoring situations it is necessary that the measurements are correct and robust over time.

From a patient safety perspective, this development has led to a situation where new testing and assessment methods are needed to supplement earlier methods, such as gray scale resolution phantoms. Anyway, this is a highly neglected area which may induce a risk of wrong clinical decision making. The testing of u/s scanners has for a long time been focusing on resolution, image quality, and flow velocities[19, 20].Noticeably, there is despite a massive effort by several groups no international consensus about a complete quality assurance protocol for u/s devices. When new medical devices and methods are developed and introduced on the market they are often favorably evaluated by phantom setups or against a reference method. These evaluation studies, which are almost invariably based on just one particular device, often conclude that the novel method is accurate and reliable[21, 22]. This is a most widely conclusion, which can lead to the use of inferior devices. The fact that one specific device has been evaluated favorably does not mean that all devices of that kind works well. It is very necessary that the credibility of a method is not confused with the function of a particular device.

2.2 Abdominal ultrasound

The abdomen is a part of the body between the chest and pelvis, in people at large and in different vertebra[23]. Abdomen is that the anterior a part of the abdominal region of the trunk. The realm concerned by the abdomen is termed the abdomen[24, 25].

In humans, the abdomen extends from the chest at the pectoral diaphragm to the pelvis at the girdle brim. The girdle brim extends from the lumbosacral joint (L5 and S1) to the

ossymphysis and is that the fringe of the pelvis body of water. The house on top of this body of water and bottom the pectoral diaphragm is termed the abdomen. The boundary of

the abdomen is that the wall anteriorly and also the serous membrane surface posteriorly. The abdomen could be a massive body cavity lined by the abdominal muscles, at anterior and conjointly to the edges, and by a part of the spine. Lower ribs can even enclose anterior and lateral walls. The abdomen is never-ending with, or more, the cavity. It's joined to the pectoral depression throughout the diaphragm. Structures, for instance, the aorta, inferior vein and esophagus undergo the diaphragm. Each the abdomen and girdle cavities are lined by a real layer referred to as the membrane bone serous membrane. This layer is in keeping with the self-generated serous membrane covering the organs[26].

The abdominal cavity consist nearly organs of the digestive system, including: liver, intestines, pancreas are connected with the rest of the system through different ducts. The urinary system including: bladder and glandula- suprarenalis also lie within the abdomen, along with many blood vessels including the aorta and inferior vena cava. The urinary bladder, uterus, fallopian tubes, and ovaries may be seen as either as pelvis organs. Lastly, the abdomen contains a membrane called the peritoneum. A fold of peritoneum may completely enclose certain organs, while it can cover only one side of organs that always lie near to the abdominal wall. This is known by retro-peritoneum, renal and ureters are called as retroperitoneal organs[27].

2.2.1Indications of abdominal ultrasound image

Abdominal pain is one in every of the foremost widely known facet effects inciting patients to go to emergency clinics. Among such folks, varied patients have real diseases and need procedure. Determination might comprise of intense associate infected appendix, obstruction and totally different real conditions, as an example, gut mortification and internal organ volvulus[28]. Right and transient conclusion is basic for the correct administration of patients.

Determination of patients with abdominal pain is chiefly settled by imaging systems, as an example, radiography, abdomen tomography US, CT and MRI[29]. Among these, abdomen U.S. may be a non-invasive procedure that is promptly accessible at the most medical

clinics in any event, throughout off-hours (ends of the week, evenings and occasions) and may be performed at the bedside[30].

Abdominal US is essential for the determination of disorder within the cavity in patients with abdominal indications[31, 32]. In growth, abdominal U.S. is likewise useful for the conclusion of robust organ conditions, as well as intense inflammation, intense redness[31, 32] . Abdominal U.S. is in addition valuable within the analysis of gut malady captivated with pathological findings[33, 34]. Diagnostic criteria with abdominal U.S. are designed up for intense a damaged appendix and colonic diverticulitis[35, 36],and large intestine malignancy may be determined to own abdominal US[37]. In varied cases, patients are analyzed by a mixture of research facility info and symptomatic imaging discoveries captivated with manifestations and physical assessment. With relation to symptomatic imaging, CT is recommended because the route methodology[38]. In addition, CT isn't promptly accessible throughout off-h at the most of medical clinics. In these cases, abdominal US is that the route methodology performed.

2.3Pelvic ultrasound

The pelvis is either the lower some portion of the trunk of the chassis between the abdomen and therefore the thighs, here and there to boot known as bony pelvis, or girdle skeleton. The girdle space of the trunk incorporates the bony pelvis, the girdle depression, the girdle floor, below the cavum, and therefore the region, beneath the girdle floor. The girdle skeleton is framed within the region of the rear, by the bone and therefore the os anteriorly and to at least one facet and right sides, by a handful of hip bones[39, 40].

The two hip bones associate the spine with the lower appendages. They’re appended to the bone posteriorly, related to each other anteriorly, and got beside the 2 femurs at the hip joints. The gap incased by the bony pelvis, known as the cavum, is that the phase of the body beneath the abdomen and essentially includes of the regenerative organs (sex organs) and therefore the body part, whereas the girdle floor at the bottom of the great depression helps with supporting the organs of the abdomen. In mammals, the bony pelvis contains a gap within the middle, considerably larger in females than in males. Their young taste this gap after they are born.

US is that the key methodology for the assessment of substance of the feminine pelvis. It permits ready and transportable imaging of the womb, ovaries, and completely different structures at a smart expense, while not radiation. Absence of illumination is important since the ovary is particularly touchy to radiation particularly in vernal patients and people of fertile age. Historically girdle United States of America is performed TA. The gel is about on the heal the bladder allowing transducer contact while not mediating air on the skin surface limiting "beam" entry .urine or fluid accessorial to the bladder helps carry very little within superiorly, out of the pelvis creating a perfect acoustic window and averting viscus air from refracting or corrupting the u/s beam. The United States of America crosses the pelvis unrestricted through bladder liquid, insonating girdle substance and coming to the transducer device to be ready by the machine .

Images are gotten in the midline sagittal plane just as parasagittal planes calculated to the periphery of each hemi pelvis. Correspondingly, transverse plane images are acquired by calculating superiorly and poorly from a mid-bladder position. Continuous US permit the unobtrusive calculating of the transducer to acquire the best anatomic images regardless of whether the structures are not in flawless longitudinal or transverse plane arrangement. The uterus is normally situated in the midline, and the ovaries and adnexa are typically discovered horizontal to the uterus. Be that as it may, much the same as a uterus may not be midline, the situation of the ovaries is to some degree variable, perhaps in the low, mid, or upper pelvis. They may, now and again, be found in the midline, better than the uterus[41-43].

2.3.1 Indications of pelvic ultrasound image

- Examination of the typical pelvis substance including the uterus, ovaries, and adnexal structures.
- Masses palpated on physical assessment can be additionally assessed with US. Some regularly palpated masses incorporate huge ovarian tumors, innate variations from the norm of uterine shape (frequently noted in pregnancy), and uterine fibroids.
- Patients who present with pelvis pain can be assessed by US. Regularly the conclusions of pelvis inflammatory disease, ovarian torsion, ectopic pregnancy, and

ordinary pregnancy are made. Less frequently during pelvis US, appendicitis, inflammatory bowel disease, or diverticulitis is diagnosed.

- Abnormal vaginal bleeding can be identified with conceivable pregnancy, known pregnancy, menses, precocious puberty, and postmenopausal bleeding.
- US can be used for evidence of ascites or other free liquid.
- In the male patient, pelvis US can assess the prostate and fundamental vesicles. The prostate, especially when searching for malignancy, is best evaluated with a transrectal probe.
- US can be used for help with performing needle biopsies and desire of free liquid.

2.4 Report structure

It must be the main objective of the report is to cover the needs of the radiation rays world who works at the clinic or talk about reports during meeting, with respect to private report, the radiologist lacks this advantage.The most significant need is to give suitable conclusion to the patient as quickly as time permits and the least material good cost and we as a whole realize that early determination is one of the principle columns in the treatment and the purpose behind its prosperity, along these lines the report must be clear, realizing that there is a difference of the radiologist supplanted, it is conceivable that the referral is an expert radiologist or general practitioner[44].

Chronicled studies of clinicians for the most part concede to a few standards with respect to the sections of the radiology report. The perfect radiology report pursues rationale and inductive structure to depict the outcome pursued by talking about the differential finding and end this is like the structure of the logical report bolsters the thought that the radiologic study is a logical report and the test[45]. The American school of radiology hand book for inhabitant partition the radiology report individual information (Age, Gender, Id), and restorative history, past history, limitation, finding, conclusion[45].

2.4.1 Patient information

This part is the first item in the report and the most important one in terms of identifying the patient and his major demographic information. Thus, it is viewed as the first and significant manual for the patient restorative record, it

is supposed to incorporate the patient name and date of birth and one of the accompanying: address, national heath identifier, patient clinic identifier, clinic attendance code or other similar identifier [45].

This part is reference in identifying the patient in case any of the healthcare providers needs to go back to the medical records.

2.4.2 History and previous section

This part of the report is considered as the most important part in identifying the patient medical history and the patient family history. Information regarding the patient medical history includes unfavorably susceptible tests that the patient had performed and may be related to the suggested diagnosis, and the history of medication that the patient has been taking with a special focus on chronic diseases' medications and also current medications for a disease that the [patient might suffer from at the time of performing the ultrasound. In addition, it may incorporate hereditary illness that the patient suffer from. The other side of this part of the report focuses on the hereditary or familial diseases in the patient family as this might indicate a certain disease the patient started to suffer from and may help with the diagnosis and the interpretation of the results [3, 46, 47].

2.4.3 Limitation

For limitations were taken, for organs had not been totally examined, all reasons ought to be clearly indicated. For example: Pancreas obscured by gasses in internal organ, contracted bladder, patient not fasted. Native apply ought to recommend more investigations to clarify the identification e.g.: X-ray, CT imaging or different invasive procedure[48].

2.4.4 Finding

In this part of the report, the radiologist should explain in details his finding in the u/s. covering each and every organ that he tested. In explicating the findings, the radiologist should utilize basic words that are clear enough and that are not leading to confusion to the clinicians who are going to depend on this record to follow up in diagnosing and treating the patient[49]. Along these lines, it is of highest significance to guarantee the importance of this part of the report and to avoid the utilization of ambiguous terms that could prompt medical error and patient harm[48].

2.4.5 Conclusion

The conclusion is usually the last part of the report. It should provide a concise, clinically relevant interpretation of the previously described imaging observations, and include a comparison with previous studies where appropriate. If findings are normal or likely non- significant, this should be stated explicitly. Where there is an accepted classification of imaging findings that affects management, this should inform the report descriptors and conclusion. So, when the treating physician arrive to the end of the report, it should contain summary statement that states the decision about the radiological finding and the proposal for further management. This brief end is essential in empowering the report to be conveyed viably to the allude [47, 49-53]. The conclusion is where the radiologist can use clinical judgment taking time and thought to separate the important from the incidental and answer the clinical question. However, the degree of certainty should also be mentioned in the conclusion[51].

2.5 Previous studies

This part of the radiology report should focus on the previous imaging that the patient had performed. So, the radiologist indicate based on the comparison with the previous studies if he is assessing or encountering something new or different in the patient's ultrasound compared to the previous images. Radiology reports are the primary form of communication between radiologist and clinician, and they must be structured in such a way to allow easy transfer of information. They are important medico-legal documents and whilst accuracy of reports is vital. When a clinician requests a radiological examination they are requesting the opinion of a radiologist, and this should be clearly conveyed in the report. He presents a survey of radiology detailing, featuring the significance of report structure and language to assist radiologists with improving the clearness, quickness, relevance, and comprehensibility of reports[54]. Bhavik N. Patel et al. (2017) reported in an article entitled "Image-Rich Radiology Reports: A Value-Based Model to Improve Clinical Workflow" that referring physicians and radiologist both believe IRRR would add value by improving communication with the potential to improve the workflow efficiency of referring physicians[55] and also Ernst and his colleagues reported in their study about head and neck U.S examinations and the value of the comparison[55].

CHAPTER THREE

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Methodology

In this chapter, the researcher presents the sample and population of the study, study settings, methodology of the research, design, tools, procedures and statistical analysis. The primary goal of this study was to evaluate reports of abdominal and pelvic us imaging in concordance to the ACR, and compare the reporting across the three Palestinian healthcare sectors; governmental, non-governmental and private. The researcher obtained the permission from the Palestinian Ministry of Health to examine the abdominal and pelvic u/s imaging reports produced by the radiology and medical imaging departments in (total number of hospitals and number of hospitals in each sector).

3.1 Materials and methods

The study was conducted by collecting abdominal and pelvic u/s imaging reports from radiology departments of governmental and non-governmental hospitals in Palestine. The data collected from medical files of all the radiology departments included ; governmental, non-governmental and private Atotal of 600 reports were reviewed and evaluated for their concordance to the ACR reporting style.

3.2Research setting

The study was conducted in the radiology departments across the three healthcare sectors in Palestine; governmental, non-governmental and private. A total of 600 u/s reports were retrieved from the radiology departments. These departments were distributed across healthcare sectors as the following: governmental, non-governmental, and private.

3.3 Sample and population

The study population included all patients' medical reports who required abdominal and pelvic u/s examination in the study centers. Reports were printed and evaluated in terms of structure (patient information, history, indication, previous study, limitation, findings and conclusion). The size of the sample consisted of 600 reports; 200 reports from each healthcare sector. Reports were randomly selected from each department, governmental, nongovernmental and private sectors

3.4 Inclusion criteria

patients undergoing abdominal or pelvic us imaging during the period July 2019 to August 2019 were randomly selected

3.5Exclusion criteria

No exclusion criteria

3.6 Research design

This cross-sectional study was conducted by collecting abdominal and pelvic u/s imaging reports from radiology departments across the three healthcare sectors. Reports were reviewed in terms of structure and compared to the standard structure of the ACR report. Adherence to the structure was also compared across the healthcare sectors.

3.7 Data collection methods

All u/s reports were printed and evaluated by comparing there structure to the standard ACR report provided in appendix 1. The standard ACR report is composed of 6 major sections; patient information, history, indication, previous study, limitation, findings and conclusion. Reports were evaluated in terms of presence of each of the sections and the total number of sections in the report.

Ethical considerations

1. Permission's of the study was obtained from the Palestine ministry of health, and permission's was given to each of the Palestinian heath sectors participating in the study.

2. Permissions of the study were obtained from the Hospital management for the private sector.
3. Permissions of the study were obtained from the hospital management for the NGOs.

3.8 Statistical Analysis

Data were entered and analyzed using (SPSS 24.0) software .Descriptive statistics were used to describe the main characteristic of the sample. This includes: frequencies, means, standard deviations, and percentages. Continuous variables were expressed as mean ± standard deviation while categorical variables were given as frequencies and percentages.

To study the difference in the quality of ultrasound report among the three different healthcaresectors , we usedMann–Whitney (U test) andKruskal–Wallis test.

CHAPTER FOUR

Results

In this study ,we collected600 u/s reports. Figure 4.1 shows the distribution of our study sample. Form each of the three healthcare sectors we included almost the same number of reports.

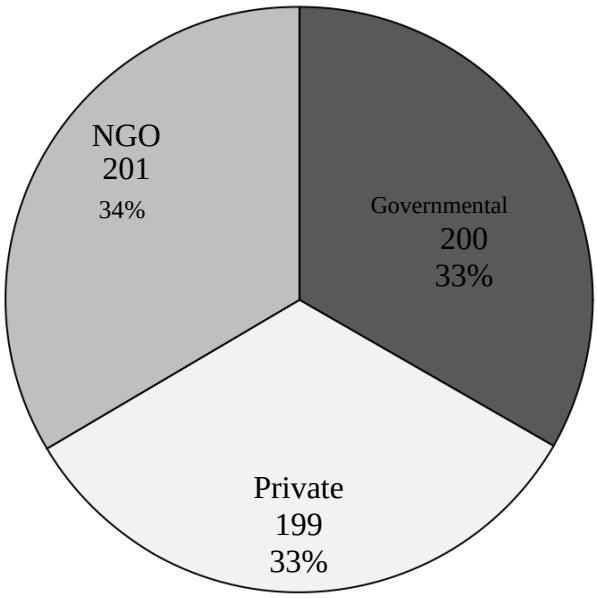

Figure 4.1: Distribution of u/s reports by healthcare sector.

For each of the 600 reports, we examined coverage for the six sections in the model provided by the ACR. All the reports covered the patient information section and 99.8% covered the findings section. As for the conclusion section, it was covered in two thirds the reports. On the other hand, history and indication and previous study sections were covered in 28.8% and 37.0% of the u/s reports, respectively. Finally, the limitations section was covered in only 37 reports. (Table 4.1)

We further compared the coverage for each section of the report by healthcare sector. As we mentioned earlier, the patient information section was completed in all the 600 reports. This section includesthe patient's name and other identifying information such as sex and age . (Table 4.1)

Our study showed that in u/s reports from the governmental sector, the history and indication section was always missing. As for the NGOs' reports, around one forth the

reports covered this section. Further, this section was covered in around 60 % of the private sector's reports. The difference in the proportion of completed reports were significantly different between the three sectors in regard to this part. (Table 4.1)

Concerning the previous study section, our results revealed that this section was missing in 99.5% of governmental u/s reports. On the other hand, in 57% of NGOs' u/s reports this section was covered. Meanwhile, the coverage for this section in private sector's reports was 53.3%. (Table 4.1)

For the limitations' section, the data analysis showed that in u/s reports from the governmental sector and NGOs, this section was never covered. As for the private sector, this section was covered in only a small proportion of the u/s reports (18.6%). The differences in coverage rate were significant (p-value <0.0001). (Table 4.1)

With respect to the findings section, almost all the reports from all healthcare sectors included this section without any significant differences.(Table 4.1)

Finally, regarding the conclusion section, our study revealed that this section was missing in 63% of governmental sector's reports. In the NGOs' reports, the conclusion section covered in 71% of reports. The highest rate was again in the private healthcare sector, where 80% of their u/s reports included the conclusion section (Table 4.1). the difference between the sectors was significant with a p-value of <0.0001.

Table 4.1: Comparison between healthcare sectors by the proportion of reports in which each section was completed .

Report section	**Governmental N (%)**	**Private N (%)**	**NGO N (%)**	**Total N (%)**	**P-value**
Patient information	200 (100.0)	199 (100.0)	201 (100.0)	600 (100.0)	-
History & Indication	0 (0.0)	125 (62.8)	48 (23.9)	173 (28.8)	<0.0001
Previous study	1 (0.5)	106 (53.3)	115 (57.2)	222 (37.0)	<0.0001
Limitations	0 (0.0)	37 (18.6)	0 (0.0)	37 (6.2)	<0.0001
Findings	200 (100.0)	199 (100.0)	200 (99.5)	599 (99.8)	0.370
Conclusion	74 (37.0)	160 (80.4)	142 (70.6)	376 (62.7)	<0.0001

After examining the coverage of each of the sections in u/s reports and comparing the rates between the three healthcare sectors, we examined the overall adherence to the ACR

reporting model. For each report, a score was given based on the number of covered sections. Table 4.2 shows the average score for the abdominal and pelvic u/s reports and

compare between the average scores for each of the three healthcare sectors. In addition, table 4.2 shows the minimum and maximum scores for each of the sectors.

Governmental u/s reports covered an average of only two sections of the ACR standard reports with a maximum of four sections, reports from the private sectorand the NGOs sector covered on average four sections of the standards ACR report with a maximum of five sections out of six for NGOs' reports and six out of six for private hospitals.

To compare the average score by healthcare sector, Kruskal–Wallis test was used. The result of the Kruskal–Wallis test showed significant difference in the score between the three healthcare sectors (p-value <0.0001).

Table 4.2: Description of total scores by healthcare sector.

Health sector	**Score (mean ± SD)**	**Range**
Governmental	2.4 ± 0.5	2 - 4
Private	4.2 ± 1.3	2 - 6
NGO	3.5 ± 0.9	2 - 5
Total	3.3 ± 1.2	2 - 6

Finally, we examined the distribution of reports by healthcare sector and number of completed sections. From the total 600 u/s reports, only a small proportion (4.5%) covered all the six sections from the standard ACR report, all of which were from the private sector. The majority of reports (about 60%) covered only between 2-3 sections. In the governmental sectors . More than 60% of the reports covered only two sections and only one report covered 4 sections, which was the maximum number of covered sections in this healthcare sector. About 70% of the u/s reports from the private sector covered between 3-5 sections, while more than 70% of the u/s reports from NGOs' covered between 3-4 reports. (Table 4.3)

Table 4.3: Distribution of reports by number of covered sections in the three healthcare sectors .

No. of covered sections	Governmental N (%)	Private N (%)	NGO N (%)	Total N (%)
2	126 (63.0)	18 (9.0)	28 (13.9)	172 (28.7)
3	73 (36.5)	62 (31.2)	65 (32.3)	200 (33.3)
4	1 (0.5)	18 (9.0)	85 (42.3)	104 (17.3)
5	0 (0.0)	74 (37.2)	23 (11.4)	97 (16.2)
6	0 (0.0)	27 (13.6)	0 (0.0)	27 (4.5)

CHAPTER FIVE

Discussion

U/S assessment is a fast, non-invasive technique, and radiation free examination with a wide assortment of clinical applications. It is a medical test utilized for diagnosis, because of its properties of great resistance, elements and minimal effort[57]. Generally, u/s assessment has been a piece of the Radiology clinic[58].The current study was conducted to evaluate the quality of reporting for pelvic and abdominal u/s imaging. The findings of this assessment study were accepted for publication at the Journal of Medicine and Medical Sciences[59].

Radiologist documentation is an important prerequisite for exact Current Procedural Terminology® (CPT®) coding[60, 61]. Deficient documentation can bring about generally avoidable under coding, with related loss of real income [62, 63].Alternately, wrong documentation can bring about over coding[62]. Consequently, radiologists have been urged to precisely and totally report the administrations they give, with the goal that coders can effectively apply procedural codes[62, 63].

The radiology report is the essential technique for correspondence among radiologist and referrer. In spite of this, radiologists get next to no proper preparing with respect to the structure of the radiology report and furthermore its significance as a medical legal document. It is essential to present an audit of radiology detailing, featuring the significance of report structure and language to assist radiologists with improving the clearness, quickness, congruity, and intelligibility of reports[56].

In our study, the quality of u/s reporting was assessed in reference to the ACR standard report. Then, we compared the quality of reporting between the three major healthcare providing sectors in Palestine; governmental, non-governmental and private.We determined the quality of the reports based on the number of covered sections in each report. The private sector's reports showed the best quality followed by NGOs then governmental. The majority of the governmental sector's reports covered only two sections out of the total six sections of the ACR standard report. NGOs and private sectors' reports covered on average four sections of the ACR standard report. Our findings showed that

from all the 600 u/s reports of the pelvis and abdomen, 27 reports were complete and covered the six sections. All of these reports were from the private sector.

Duszak et al. (2012) assessed physician documentation deficiencies in abdominal ultrasound reports using standard Current Procedural Terminology® (CPT®) criteria consisting of eight elements .The study reported complete documentationsin 75% of the reports and 13.5% of the reports documented ≤4 elements. In addition, the study reported that incomplete documentation in lost professional income and that structured reporting may decrease lost revenue. Moreover, the study showed similar differences in the quality of reporting by healthcare sector [64].

The ACR standards for u/s reporting divides the radiology report into six sections; patient information, history and indication, previous study, limitation, finding, and conclusion[45]. In this study, the patient's information section was always covered.

In the history and indication section, when accessible, the clinical inquiry ought to be distinguished and recorded, to encourage responding to the inquiry. Theclinician will recognize that the radiologist has noticed the inquiry and maybe acquire from the report what's left. The clinical history is frequently fused consequently into the report on Current Procedural Terminology (CPT). If by chance no appropriate history was given, expressing this in the report may help pass on any indicative vulnerability[3, 46, 56].Weiner (2005)reported that this section was commonly uncovered by radiologists (48%) in chest and bone x-rays' reports [65]. History and indication section in the current results was found to be absent from the governmental sectors reports. However, only 24% of the reports from the NGOs sector covered the history and indication section while 63% of the private healthcare sector's reports covered this section.

In previous study section, our results unveiled that this section was missing in 99.5% of governmental sector's u/s reports. On the otherhand , it was covered in 53% of NGOs' u/s reports and 57% of private sector's. Not recording the history section in u/s report influences diagnosis.

Regardless of the differences between different reporting standards, all u/s guidelines and manuals emphasized on the importance of the limitation sections and stated that "*any limitations should be stated and, if a relevant organ has not been fully examined, the reason(s) should be indicated*",[66]. Moreover, Hazel Edwards (Professor of radiology from

Lister Hospital, UK), emphasized that if technical limitations prevented areas or organs from being examined properly, then specific comments to that effect should be made in the report[6].In this study, the total number of reports covering this section was only 37, all of which were from the private sector.

The findings section of the reports was one of the two sections covered in almost all the repots. Yet, we didn't examine the quality of reporting for this section. Reporting guidelines emphasize on the importance of utilizing clear wording when reporting the findings as sometimes even the terms proximal and distal can cause some misunderstanding[52].Therefore, it is of highest significance to guarantee the report is right and maintains a strategic distance from the utilization of uncertain terms that could prompt mistake and patient mischief[47]. Failure to describe the findings or to include an appropriate impression or differential diagnosis limits the examination's value to other healthcare providers.[65]

The conclusion is the most significant part of the radiology report. It ought to contain outline proclamations that incorporate decisions about the radiological findings and recommendations for further management. The accurate section of the conclusion is probably not going to have any critical effect on the clearness of the report, and it might be named impression. Whatever the case, a compact conclusion is imperative in empowering the report to be conveyed adequately to the referrer[48-52]. A review of the demeanors of clinicians have demonstrated that it might be the main part of the report that is read[49]. This section was commonly covered in reports from private and non-governmental sectors, but not in reports from the governmental sector.

In summary, our findings indicate that inadequate reporting of u/s of the pelvis and abdomen is very common. The governmental healthcare sector showed the lowest quality for reporting while the private sector showed the best quality. Inadequate reporting of u/s examination can lead to inadequate communication between healthcare providers. This communication breakdown may result in repeat examinations, which increase costs and may potentially delay patient care[65]. Factors that could lead to poor reporting include staff shortage and work overload, inexperience of the staff, inadequacy of clinical information to the reporting radiologist, unavailability of previous studies or reports for comparison, in addition to the absence of standardized national guidelines and auditing for reporting and communicating radiology examinations.

CHAPTER SIX

Conclusions, limitations and recommendations

6.1Conclusions

The sort of health sectors has a good effect on the quality of the u/s report. The private sectors produce quality u/s reports that are better than other health sectors.

6.2 Limitations

1. The study was conducted in some hospital and thus the result can't be generalized.
2. Researcher faces some problems in data collection in the three health sectors.
3. There are a limited number of articles about the subject,which made some difficulties.
4. The study didn’t examine the quality of the reports qualitatively considering the terminology and appropriateness of reporting in each section.

6.3Recommendations

1. Reduce pressure at radiologist by reducing the number of patients, to give him time to fill the reports completely.
2. More workshops that aims to increase the knowledge in adherence of radiologist to guidelines are needed.
3. Further assessment studies to provide follow-up.

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Appendix 1

Patient information	
ID	
Name	
Age	
Gender	

History	
Indication	

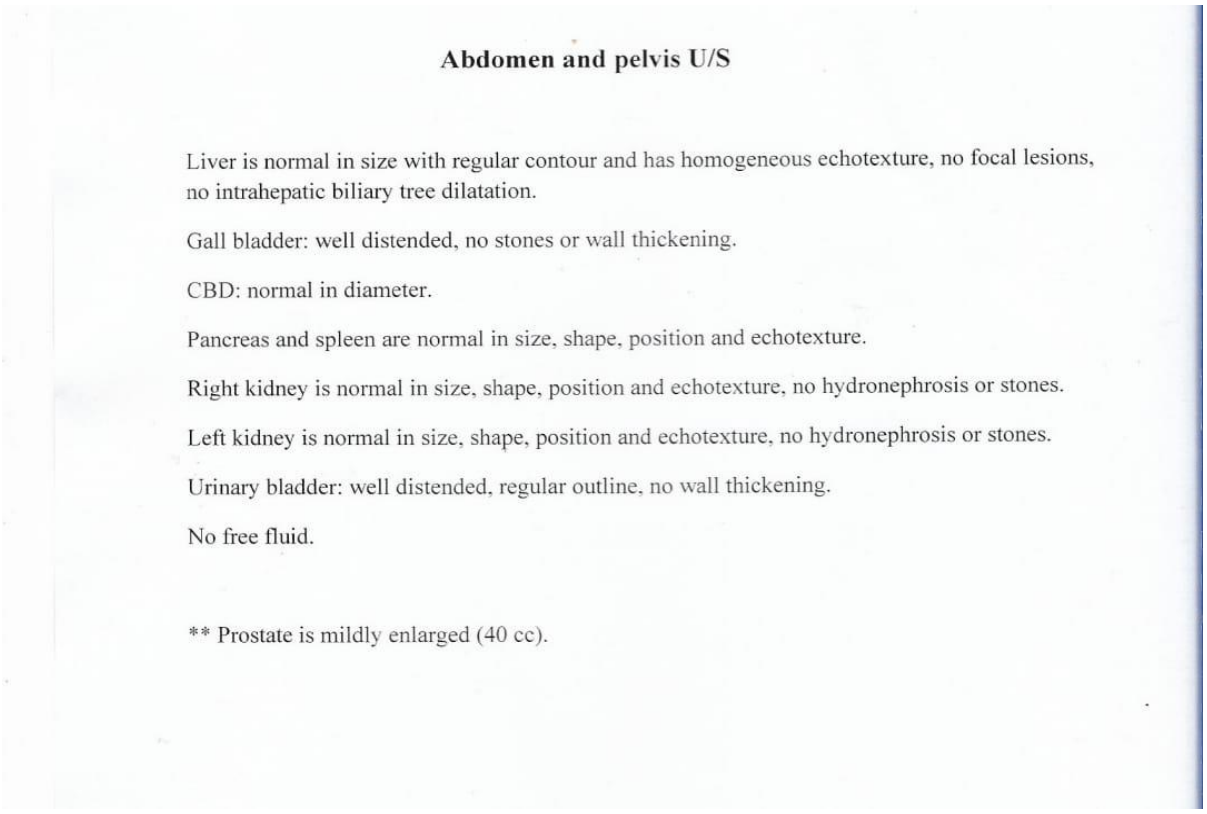
Previous study	

Limitation	

Findings	
Organ	
Measurements	
Characteristics (Texture & Vascularity)	
Abnormal findings	
Conclusion	

Appendix 2

Private Sector



Abdomen and pelvis U/S

Liver is normal in size with regular contour and has homogeneous echotexture, no focal lesions, no intrahepatic biliary tree dilatation.

Gall bladder: well distended, no stones or wall thickening.

CBD: normal in diameter.

Pancreas and spleen are normal in size, shape, position and echotexture.

Right kidney is normal in size, shape, position and echotexture, no hydronephrosis or stones.

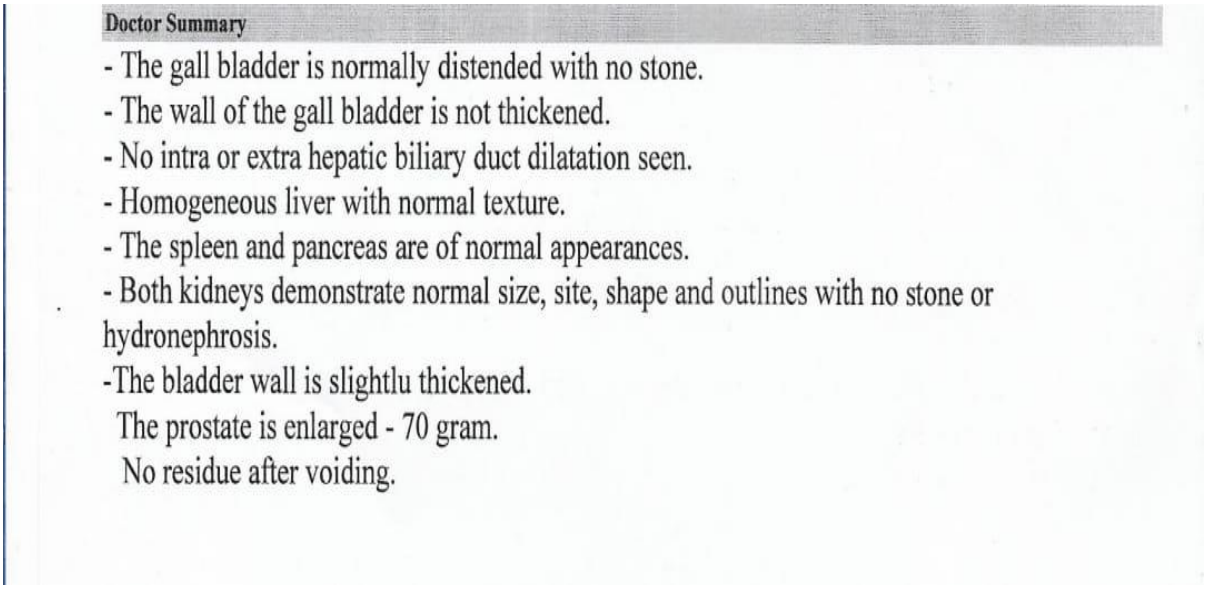
Left kidney is normal in size, shape, position and echotexture, no hydronephrosis or stones.

Urinary bladder: well distended, regular outline, no wall thickening.

No free fluid.

** Prostate is mildly enlarged (40 cc).

NGO Sector



Doctor Summary

- The gall bladder is normally distended with no stone.
- The wall of the gall bladder is not thickened.
- No intra or extra hepatic biliary duct dilatation seen.
- Homogeneous liver with normal texture.
- The spleen and pancreas are of normal appearances.
- Both kidneys demonstrate normal size, site, shape and outlines with no stone or hydronephrosis.
-The bladder wall is slightlu thickened.
The prostate is enlarged - 70 gram.
No residue after voiding.

Result:

Exam:
Radiology Exam Name US0002 ULTRASOUND ABDOMEN & PELVIS
30/08/2017 11:56

Urinary Tract U/S

Right Kidney: Average size and position with increase in echogenicity

Left Kidney: Average size with normal echogenicity and position

Urinary Bladder: empty.

No free fluid.

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Research Article

Assessment of diagnostic ultrasound for abdomen and pelvis service in Palestine towards national diagnostic reference levels for ultrasound reporting

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ABSTRACT

Objective: The study was conducted to provide national diagnostic reference levels for ultrasound reporting.

Materials and methods: The study carried out in radiology and medical imaging departments in the three sectors representing Palestinian health system, particularly inside governmental, nongovernmental and private health sectors. The sample size comprised 600 ultrasound (u/s) reports of abdomen and pelvis u/s procedures. U/S reports collected and followed in term of record name, record number, finding and all criteria followed in the worldwide report of American College of Radiology (ACR).

Results: The Palestinian private health sector u/s report for pelvis and abdominal examinations correlates (P value=0.001) with the ACR standards compared to other Palestinian health sectors. Regarding to report structure sections, in the history and indication, our results show that this section was completely absent from the governmental sector reports. Moreover, the limitation section was absent from all governmental and NGO (u/s) reports, while existed in just 19% of private sector (u/s) reports. Likewise in conclusion section of report structure, the most noteworthy rate was again in the Palestinian private health sectors as 80% of their (u/s) reports. On contrary finding section, all reports in the sample were having this section. Finally in previous study sections of the report, our results indicated that the highest percentage was in private health sectors as 57% of their (u/s) reports. Latest in the relationship between the quality of the (u/s) report and health sector type that gave the reports, the results found the sort of health sector has a positive effect on the quality of the (u/s) report. Where the Palestinian private health sectors got the highest quality in writing reports of the ultrasound compared to other sectors.

Conclusion: The Palestinian private health sectors have the highest quality u/s reports among Palestinian health sectors.

Keywords: Ultrasound report, Pelvic examination, Abdomen examination, Health organizations, American college radiology

Abbreviations: US: Ultrasound; MRI: Magnetic Resonance Image; AAA: Abdominal Aortic Aneurysm; ACR: American College Radiology; NGO: Non-Governmental Organization; CPT: Current Procedural Terminology; GP: General Practitioner.

INTRODUCTION

This research looks to give an administration to improve the nature of ultrasound (u/s) reporting of abdomen and pelvis region procedures. Despite the fact that there is a worldwide accord in the composition of reports in some key pats, there are minor contrast including the nature of the report differs from great to excellent to perfect [1,2]. The ACR standard of correspondence provides only brief common sense guidelines concerning wording of reports [3].

Medical u/s imaging modality is one of the most safety devices for the patient to be re-established to by the discovery of sicknesses, so the patient must follow the best possible and precise strategy and answer all the

inquiry posed by the specialist clearly and precisely and therefore accomplish a decent advance to get high quality diagnosis. The rules of expert u/s practice and worldwide convention accomplishes perfect high quality medical reports [4].

Medical u/s imaging framework is of an incredible significance in the finding and assessment of the abdominal cavity, clinical u/s performs tests for, kidney, liver, gallbladder, bile ducts, pancreas, spleen, stomach aorta and other blood vessels. Furthermore, it can used to analyzed, abdominal pain or distention, unusual liver capacity, kidney stone, gallstones and Abdominal Aortic Aneurysms (AAA) [5].

An interventional u/s might be utilized for biopsy guiding. Furthermore, Doppler u/s image can assist radiologists with seeing and diagnosing, blockage to blood stream, narrowing of vessels, tumors and congenital vascular abnormalities, reduce or absent blood flow to various organs such as the testes or ovary, increased blood flow which may be sign of infection [6].

Hazel Edward et al detailed that, it is essential for the management of the patient that radiologist produce reports based on their study that are accurate and clear. Perfect report should endeavor to respond to the first clinical inquiry, subsequently recommend instructive asset that are accessible to improve poor report composing. At long last, they propose system, which professionals may discover helpful when constructing u/s reports [7].

Hael D. Collard MA and Lisa H. Lowe announced that Improvement in reporting skills of radiology residents with a structured reporting curriculum, as result residents' detailing scores indicated significant improvement through the span of their residency preparing. This demonstrates there might be an advantage in utilizing a sorted out announcing educational plan to follow occupant progress in creating reports that may improve patient consideration [8].

Speets et al revealed that upper abdominal u/s in general practice, therefore it was discovered foreseen the board by the GP change in 64% of patient after upper abdominal u/s. Abdominal u/s considerably diminish the quantity of planned referrals to a therapeutic authority and progressively patient could be consoled quiet their GP [5].

Acute pelvis pain, characterized as the unexpected beginning of lower abdominal or pelvis pain enduring less than 3 months [9] is a regular urgent clinical presentation. Women frequently present to the emergency department after hours. More than 33% of Women of regenerative age experience non menstrual pelvis pain [10].

Acute pelvis pain can represent an analytic test on the grounds that the clinical history, manifestations, and physical assessment discoveries are regularly vague, and the clinical presentation of the hidden gynecologic, obstetric, urologic, and gastrointestinal conditions regularly differ broadly and can much of the time cover. Although some of the common conditions, for example, ruptured or hemorrhagic ovarian cysts are self-limiting, it is basic that pressing conditions that may require mediation, on the other hand medical procedure, for example, ovarian torsion, pelvis inflammatory disease, and appendicitis, be viewed as when a premenopausal woman has acute pelvis pain.

The ACR appropriateness criteria list pelvis sonography as the favored first-line imaging methodology in the assessment of acute pelvis pain in pregnant women and non-pregnant women of regenerative age when an obstetric or gynecologic condition is suspected and in the starting evaluation of a suspected nongynecologic condition in a pregnant patient [11].

Maiorana et al detailed that u/s finding of pelvis endometriosis, as results had demonstrated that u/s is the primary line indicative strategy for the analysis of pelvis endometriosis. Rectal endoscopic sonography could recognize the nearness and the degree of wall infiltration of bowel sites. In any case, in patients with a predictable clinical doubt of profound endometriosis. MRI is a decent "across the board" assessment to analyze and characterize the definite degree of deep infiltrating endometriosis [12].

There are a couple of studies inquired about on appraisal the impacts of u/s report, particularly the impact of abdomen and pelvis u/s reports. Therefore, the purpose of this study is to assess the quality of diagnostic u/s in the abdomen and pelvis service in Palestine health system towards national diagnostic reference levels for ultrasound reporting.

MATERIALS AND METHODS

The primary motivation behind this study was to appraisal u/s abdomen and pelvis imaging reports in three Palestinian health sectors. The researcher obtained the permission from the Palestinian Ministry of Health to examine the u/s reports in the abdomen and pelvis regions in the radiology and medical imaging departments, so the researcher collected ultrasound reports for the abdomen and pelvis regions from the three different health sectors.

The sample size consisted of 600 medical u/s reports of abdominal and pelvis regions. The sample was divided into 200 reports from each sector selected randomly. All abdominal ultrasound reports were gathered and scanned, assessed, annualized and stored safely. Reports scanned to include ID, name, age, gender, history, indication, previous study,

limitation, measurement, characteristic (Texture, vascularity), abdominal finding and conclusion. Over more, the abdomen and pelvis ultrasound reports were examined with the worldwide report from the American society of radiology (ACR). The inclusion criteria consist of all abdomen or pelvis u/s reports from the three Palestinian health sectors. The exclusion criteria was any u/s report doesn't include u/s abdomen and pelvis.

STATISTICAL ANALYSIS

SPSS 24.0 software was used to study the difference in groups and within groups. Descriptive and frequency statistics was used to study the main characteristic of the sample. This includes: Means, standard deviation, and percentages. Continuous variables were given as mean ± standard deviation while categorical variables were given as number and percentage. To study the difference in the quality of ultrasound report among the 3 different health institutions was used Kruskal-Wallis test. The Kruskal-Wallis test by ranks or one-way ANOVA on ranks is a non-parametric method was used to compare the median of several groups (more than two) to test whether they are different or not. The Mann-Whitney U test, which was used for comparing only two groups. The parametric equivalent of the Kruskal-Wallis test is the one-way analysis of variance (ANOVA). Kruskal-Wallis test collects sample from each group under experiment and rank all the combined data from smallest to largest, and then look for pattern in how these ranks are distributed among the various samples.

RESULTS

In this study the researcher collected a total of 600 u/s report. 200 reports were collected from governmental health sectors. Also, 199 out of the total reports were collected from private health sectors. Finally, 201 of the reports were extracted from NGOs. Figure 1 depicts all the descriptive statistics.

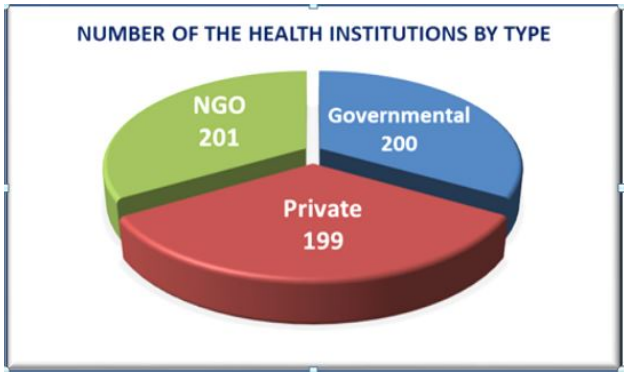

Figure 1. Number of Health institutions in the study by type

While the governmental sectors were covering only 2 sections of the ARC standard reports, private sectors were covering on average 4 sections of the standards ACR report. As well, the averages of NGO sectors were also 4 sections. It was also noted that the maximum of governmental reports' sections that match the ACR requirements was only 4 sections. In contrast, the maximum in NGO was 5 sections. Most notably, in the private sectors the maximum was six sections. This means that parts of private sectors were following the ACR standards. Table 1 depicts all the descriptive statistics. Figure 2 shows these results.

Table 1. Descriptive statistics

Total Score (Number of filled sections in the report)						
Type of the health institution	**Mean**	**Maximum**	**Minimum**	**Median**	**Standard Deviation**	**Mode**
Governmental	2	4	2	2		2
NGO	4	5	2	4	1	4
Private	4	6	2	5	1	5

With respect to section per section analysis, the data analysis found that all health sectors were reporting the patient information section. The patient information section should include patient's name and other identifying information such as sex and age. All this information was found in the 600 reports under this study. Regardless of the health sector the patient information section was exist in all reports.

History and indication section, data analysis found that this section is always missing from governmental sectors reports. Though, 24% of the reports from the NGO sectors included history and indication section. The highest rate was among private health sectors as 63% of their reports were encompassing history and indication section. Figure 2 shows these results.

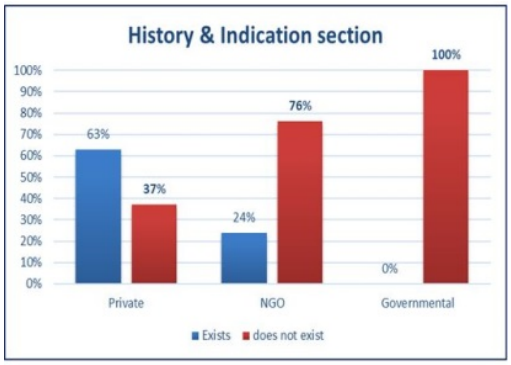

Figure 2. The existence of History and Indication section in the ultrasound reports by type of health institution

With regard to previous study section, our results disclosed that this section is missing in 99.5% of governmental u/s reports. On the other side, it does exist in 53% of NGO u/s reports. Aging, the highest percentage was in private health sectors as 57% of their u/s reports include a section on previous study. Figure 3 depicts these results.

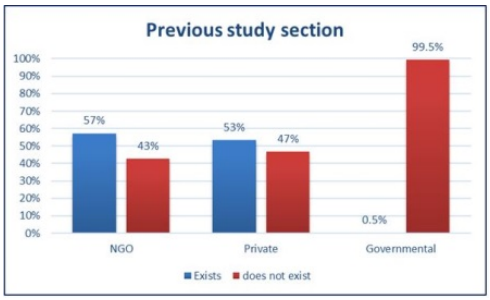

Figure 3. The existence of previous study section in the ultrasound reports by type of health institution

For the limitations section, the data analysis disclosed that this section was missing from all governmental and NGO u/s reports. Whereas, it was existing in only 19% of ultra sound reports extracted from private health sectors. The limitation section found to be the least reported section in our sample of 600 u/s reports. The data can be seen in figure 4. However, all u/s guidelines and manuals emphases on the importance of this sections and stated that " Any limitations should be stated and, if a relevant organ has not been fully examined, the reason(s) should be indicated ". Moreover, professor Hazel Edwards (Professor of radiology from Lister Hospital, UK), affirmed that If technical limitations prevented areas or organs from being examined properly, then specific comments to that effect should be made in the report.

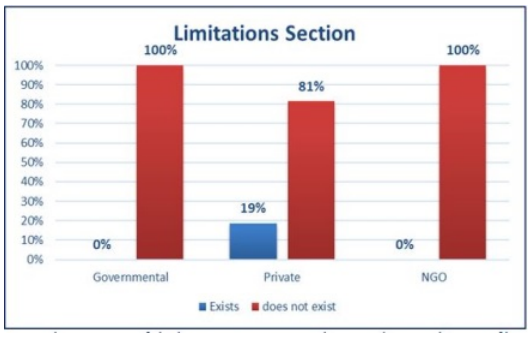

Figure 4. The existence of the limitations section in ultrasound reports by type of health institution

With respect to the findings section, all the 600 repots in the sample were having this section. This means that all governmental, private, and NGO health sectors do include this section in their u/s reports. Figure 5 shows these findings.

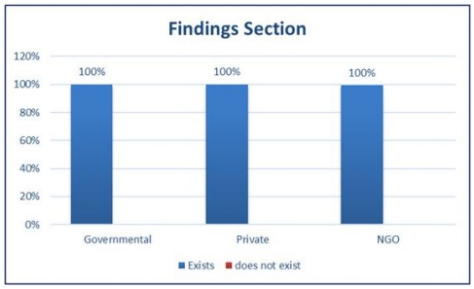

Figure 5. The existence of the findings section in ultrasound reports by type of health institution

Finally, regarding the conclusion section, the data analysis revealed that this section was existed in only 37% of governmental reports. On the contrary, this section was missing in 63% of governmental reports. In the NGOs reports, the conclusion section was existed in 71% of reports. The highest rate was again in the private health sectors as 80% of their u/s reports were including the conclusion section. Figure 6 presents these findings.

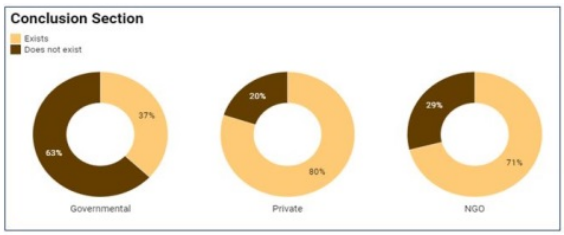

Figure 6. The existence of the conclusion section in ultrasound reports by type of health institution

To test the relationship between the quality of the u/s report (total score of the report) and the type of health sector that issued the reports, the researcher used Kruskal-Wallis test. Kruskal-Wallis test is a non-

parametric test equivalent to one-way ANOVA. Kruskal-Wallis test relies on scores being ranked from lowest to highest; therefore, the group with the lowest mean rank is the group with the greatest number of lower scores in it. Similarly, the group with the highest mean rank contains greater number of high scores within it.

The result of the Kruskal-Wallis test revealed a P value that is less than 0, 001. Therefore; we concluded that there is a genuine positive relationship between the quality of the u/s report and the type of health sector that issued the reports. This means, the type of health sector has significant impact on the quality of the u/s report. These results can be found in the Table 2.

Table 2. Hypothesis Test Summary Kruskal-Wallis Test using the new procedure in SPSS

Hypothesis test summary				
	Null hypothesis	**Test**	**Sig.**	**Decision**
	The distribution of Total Score is the same across categories of Type of the health institution.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.
Asymptotic significances are displayed. The significance level is .05.				

The box and whisker chart below shows the distribution of ranks. The mean ranks distribution suggests that the mean rank of private sectors is the highest with 405, 99, compared with 339.76 and 156.08 for NGOs and governmental sectors respectively. This means that private sectors contain greater number of high scores. This also means that in most cases, the private sectors produce quality u/s reports that excel other health sectors reports. This is because private health sectors covering more sections in their u/s reports. Figure 7 presents these findings.

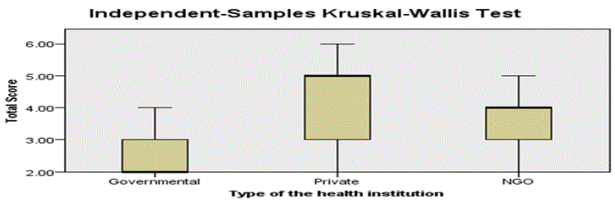

Figure 7. Independent Kruskal-Wallis Test Type of health sector

Post hoc test was used to determine where any differences lie between the type of the sectors (Pairwise comparison). The result of the post hoc analysis found that there are significant differences between the mean rank of governmental sectors and NGOs sectors with p value less than 0.001. Also, the pairwise comparison found that there are significant differences between the mean rank of governmental sectors and private sectors with p value less than 0.001. Likewise, the result of the post hoc analysis found that there are significant differences between the mean rank of private sectors and NGOs with p value less than 0.001. The Table 3 below depicts these findings. Figure 8 presents these findings.

Table 3. Each node shows the sample average rank of type the health institution

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Governmental-NGO	-183.681	16.695	-11.002	.000	.000
Governmental-Private	-249.91	16.737	-14.931	.000	.000
NGO-Private	66.229	16.716	3.962	.000	.000
Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.					
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.					

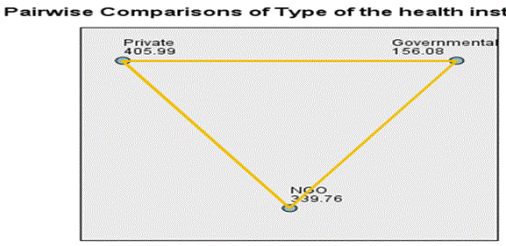

Figure 8. Pairwise comparison for type of health sector

To conclude, a Kruskal-Wallis test was conducted to test the relationship between the quality of u/s report and the type of the health sector that issued the reports. The Kruskal-Wallis H test showed that there was a statistically significant difference in u/s reports quality between the three health sectors: $\chi 2(2)=239.622$, p=0.000, with a mean rank total score of 156.08 for governmental sectors, 405.99 for private sectors, and 339.76 for NGOs sectors. Moreover, a post hoc test was conducted to test the pairwise comparison. The results suggest that private health sectors u/s reports are the most reports that

match ACR reports. Second in rank came NGOs (u/s) reports but with significant (huge) difference behind private sectors. The last in order was governmental sectors, and again with significant difference behind NGOs reports.

DISCUSSION

The current study was conducted to provide national diagnostic reference levels for u/s reporting.

U/S assessment is a fast, non-invasive technique, and radiation free examination with a wide assortment of clinical applications. It is a medical test utilized for diagnosis, because of its properties of great resistance, elements and minimal effort [13]. Generally, u/s assessments have been a piece of the Radiology clinic [14].

Radiologist documentation is an important prerequisite for exact Current Procedural Terminology® (CPT®) coding [15,16]. Deficient documentation can bring about generally avoidable under coding, with related loss of real income. Alternately, wrong documentation can bring about over coding [17]. Consequently, radiologists have been urged to precisely and totally report the administrations they give, with the goal that coders can effectively apply procedural codes [17,18].

The radiology report is the essential technique for correspondence among radiologist and referrer. In spite of this, radiologists get next to no proper preparing with respect to the structure of the radiology report and furthermore its significance as a medical legal document. In present an audit of radiology detailing, featuring the significance of report structure and language to assist radiologists with improving the clearness, quickness, congruity, and intelligibility of reports [19].

Six hundred u/s reports conducted in this study and have been partitioned into three distinctive health sectors. Each report was thought about against the ACR standard report. 200 out of reports were gathered from governmental health sectors; the governmental sectors were covering just two sections of the ACR standard reports. Likewise, 199 reports were gathered from Private health sectors. The private sectors were covering four section of the ACR standards report. In addition to, 201 reports were extricated from (NGOs), the limit of diagnostic reports' sections noticed that match the ACR standards was just four sections.

Interestingly, the most extreme in NGO associations was five sections. Most quite, in the private sectors the greatest was six sections. That is implies private health sectors was applying the ACR standards.

In our study the relationship between the quality of the u/s report and the health sector that gave the reports was examined, accordingly there is a real positive relation between the quality of the u/s report and the sort of the health sectors that gave the reports. This implies, the sort of health sectors has noteworthy effect on the quality of the u/s report, and furthermore the private sectors produce the best quality of u/s report.

Richard Duszak et al reported that radiologist documentation insufficiency in abdomen u/s reports recurrence, attributes, and income related effect. As a diagnosis, (75.1%) abdominal u/s reports archived each of the 8 components for Current Procedural Terminology (CPT) coding as complete assessments, (7.7%) recorded 7 components, (5.6%) reported 6 components, (4.8%) recorded 5 components, and (13.5%) recorded 4 components. Inadequate radiologist documentation in abdomen u/s reports is normal (9.3%-20.2%of cases) and results in 2.5% to 5.5% in lost proficient pay. Organized report may improve documentation and moderate lost income [20].

The results indicated that private health sectors u/s reports are the most reports that match ACR reports. Second in rank came NGOs (u/s) reports yet with distinction behind private sectors. Third in rank were governmental sectors, and again with distinction behind NGOs reports. So in this study the insufficient match criteria for ACR in abdomen and pelvis u/s report were assessed for all sectors, unequivocally in governmental sectors. For this, In the Duszak previous study agreed with our results.

The ACR standards for occupants divides the radiology report into six regions: Patient information, history and indication, previous study, limitation, finding, and conclusion [21]. Not these will be relevant to all reports yet it is an important structure.

In history section, when accessible the clinical inquiry ought to be distinguished and recorded, to encourage the responding to of the inquiry. The clinician will recognize that the radiologist has noticed the inquiry and maybe acquire from the report than one where they are left. The clinical history is frequently fused consequently into the report on Current Procedural Terminology (CPT). If chance that no appropriate history is given, at that point expressing this in the report may help pass on any indicative vulnerability [3,22,23].

History and indication section in current results found that this section is continually absent from the governmental sectors reports. However, 24% of the reports from the NGO sectors incorporated a section on history and indication. The most noteworthy rate was among private health sectors as 63% of their reports were applying a section on history and indication. The previous study section, the results unveiled that this section is absent in 99.5% of governmental sectors u/s reports. On the opposite side, it exists in 53% of NGO

u/s reports. Also, the most noteworthy rate was in private health sectors as 57% of their u/s reports incorporate a section on previous study. So the not recording history section in u/s report influence of diagnosis, this something was showed in our results, particularly in the governmental sectors, our study demonstrated that the quality of u/s report for abdomen and pelvis regions it isn't great. Interestingly for different sectors like private health sectors and NGOs, the quality of u/s report for abdomen and pelvis regions, it is great.

Shelley Nan Weiner detailed that Radiology by non-radiologists, is report documentation adequate, thus they found a limitation for radiologist reports evaluated to 8% [24]. On other hands, as our result was found in the limitation section, the outcome uncovered that this section was absent from all governmental and NGO ultrasound reports. Though, it was existing in just 19% of u/s reports extricated from private health sectors. For this, in the previous study agreed with our results.

When explaining the finding, attempt to utilize wording that is clear and in like manner use. Shortly, even the terms proximal and distal can cause some wrong [25]. Therefore, it is of highest significance to guarantee the importance of the report is right and maintain a strategic distance from the utilization of uncertain terms that could prompt mistake and patient mischief [23].

The finding sections in our study, all the 600 repots in the sample were having this section. This implies that all Palestinian health sectors do incorporate this section in their u/s reports. The quality of the u/s report and the sort of the health sectors that gave the reports. This implies, the kind of health sectors has noteworthy effect on the quality of the ultrasound report. The private sectors produce quality u/s reports that exceed expectations other health sectors reports. This is on the grounds that private health sectors covering more sections in their u/s reports.

The conclusion is the most significant part of the radiology report. It ought to contain outline proclamations that incorporate decisions about the radiological findings and recommendations for further management. The accurate section of the conclusion is probably not going to have any critical effect on the clearness of the report, and it might be named impression. Whatever the case, a compact conclusion is imperative in empowering the report to be conveyed adequately to the referrer [23,26-29]. A review of the demeanors of clinicians have demonstrated that it might be the main part of the report that is read [27].

The conclusion section in our study uncovered that this section was existed in just 37% of governmental reports. In actuality, this section was absent in 63% of governmental reports. In the NGOs reports, the conclusion section was existed in 71% of reports. The most elevated rate was again in the private health sectors as 80% of their u/s reports were including the conclusion section. The consequence of the post hoc study found that there are critical contrasts between the mean position of private sectors and NGOs and they found that there are noteworthy contrasts between the mean position of governmental sectors and private sectors. Results showed that private health sectors are the best health part for composing u/s report. The previous study demonstrated that the conclusion is significant recorded in the report as per the outcomes. In our study demonstrated that private health sectors were increasingly interested to compose a conclusion in the report comparatively for other health sections. This implies that the Palestinian private health sectors matching with ACR standards.

At last, the results propose that the health sectors type has a positive effect on the quality of the u/s report. That implies the private health sectors produce perfect quality u/s reports more than other health sectors.

The quality point in our study, the current study will be the first line to establish national diagnostic reference levels in u/s report model. On other hand, the weakness point loss of precision for composing reports.

CONCLUSION

The sort of health sectors has a good effect on the quality of the u/s report. The private sectors produce quality u/s reports that better than other health sectors.

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