Journal of Medicine and Medical Sciences Vol. 10(2) pp 122-129, November 2019
DOI: http:/dx.doi.org/10.14303/jmms.2019.11
Available online http://www.interesjournals.org/JMMS

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.

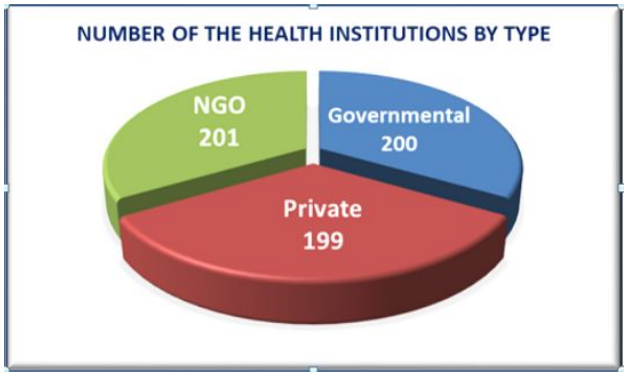

Figure 1. Number of Health institutions in the study by type

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.

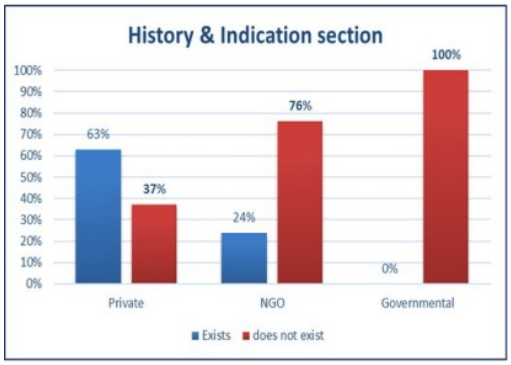

Figure 2. The existence of History and Indication section in the ultrasound reports by type of health institution

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.

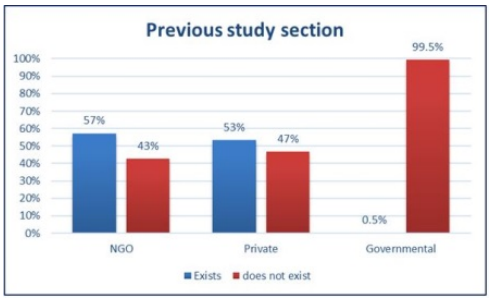

Figure 3. The existence of previous study section in the ultrasound reports by type of health institution

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.

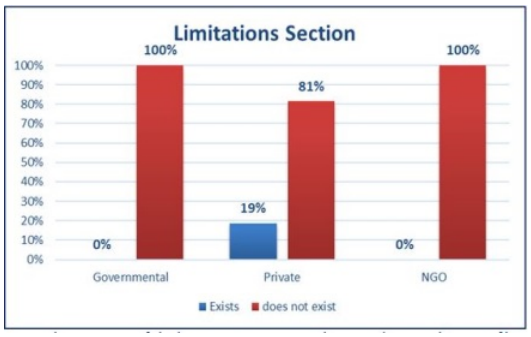

Figure 4. The existence of the limitations section in ultrasound reports by type of health institution

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.

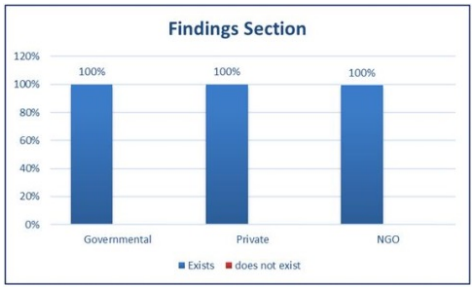

Figure 5. The existence of the findings section in ultrasound reports by type of health institution

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.

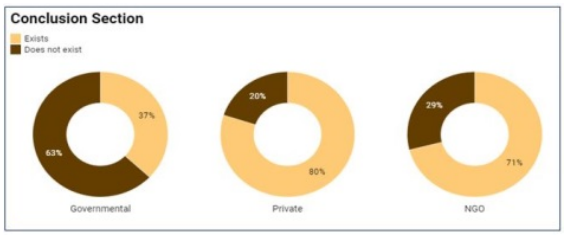

Figure 6. The existence of the conclusion section in ultrasound reports by type of health institution

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.

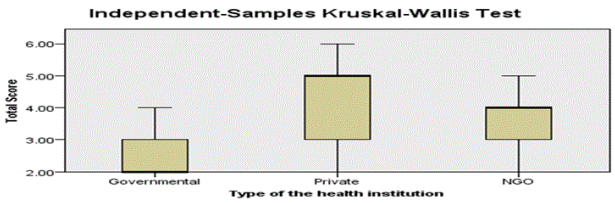

Figure 7. Independent Kruskal-Wallis Test Type of health sector

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.					

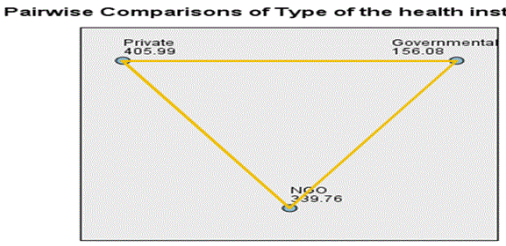

Figure 8. Pairwise comparison for type of health sector

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: χ 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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