

Factors influence on ultrasound scan imaging quality and point of care in the clinical context

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Abstract

Objectives: Patient preparation before abdominal ultrasound plays a major role to ensure improved visualization of internal organs and pathologies by minimizing artifacts. The aim of this study was to assess the effectiveness on abdominal ultrasound scan imaging quality by patient preparation and evaluate its associated factors.

Method and Materials: This was a descriptive cross-sectional study on consenting medical patients who had undergone elective abdominal ultrasound scan examinations at the radiology department of tertiary care center, in Sri Lanka for a three months period. Blinded examiners examined the patient preparation and optimization of the scan image findings in related to the abdominal ultrasound scan. The univariate, bivariate analysis and the chi-squared test were used to check the relationship between two categorical variables as this study dataset comprises more than 50 observations, where 5% was used as the significance level.

Results: The total 320 randomized patients were included in the primary analyses. The majority of this study participant (29.7%) age was above 60 years while considering gender prevalence both male and female had relatively an equal contribution 52.2% and 47.8% respectively. The greater number of study participants represented urban living places (53.1%) while there was 46.9% from rural places. The occupational category accounted for skilled workers 16.9%, menial jobs 27.8% and a larger proportion was jobless (55.3%).

Conclusion: There are lack of research study on patient preparation and optimization of abdominal ultrasound imaging quality. However, our study contends that patient's preparation improves the abdominal ultrasound scan imaging quality to some extent.

Keywords: Optimal ultrasound scan finding; Point of care; Image quality; Patient preparation

1. Introduction

The ultrasound is a fundamental diagnostic tool for imaging technique used for visualizing internal body structures to investigate the possible pathology because it provides a non-invasive diagnostic examination nature for clinicians to identify a number of clinical conditions. However, the ultrasonic examination requires optimum patient's preparation in order to examine the abdominal organs more appropriately to have precise interpretation [1]. The majority of ultrasound department instruct their patients to come fasting for such examinations, sometimes for longer than 12 hours, assuming that the gall bladder would otherwise be contracted and difficult to assess on the other hand that fasting patients will have less gas in the duodenum and colon [2]. Inadequate patient preparation will give the substandard

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results and that will require repeat scanning procedure. This gives additional workload to radiologists, inconvenient and needs further cost to the patients due to re-visit for scan as well as it leads to delay the treatment procedures [3]. Even though the preparation techniques are very simple, roughly one third of our patients are inadequately prepared and requested to visit again to undergo scan [4]. It is a mandatory to provide all sufficient information to patient, who seeks any medical procedures because patient consent prior to undertaking an examination or treatment is an ethical and legal requirement. Moreover, they become part of the decision-making process about their treatments and medical care [5]. Therefore, it ought to be considered that with clear information to enable their participation and being involved in the actual investigation procedure. This prospective study was to establish the relationship between the patient preparation influencing factors and the ultrasound scan image finding accuracy.

2. Material and methods

This study was conducted as an institutional based cross-sectional descriptive study to assess the effectiveness of abdominal ultrasound scan patient preparation in a tertiary care center, in Sri Lanka for a three month period. This study was obtaining Institutional Review Board approval, and the patient informed written consent was received. This study aim was to assess the effectiveness between patient preparation, its associated factors and the accuracy of scan findings when they were referred to abdominal ultrasound scan. This study had been approved by the institutional ethics review board. All the patients visited to radiology department of the study setting for abdominal ultrasound scan were selected during the study period excluding emergency scan, unconscious patients repeat abdominal scan and follow up scan patients were excluded. The systematic random sampling technique was used to identify a sample that represents the ultrasound scan unit.

3. Results

A total 320 randomized patients were included in the primary analyses. The majority of this study participant (29.7%) age was above 60 years while considering gender prevalence both male and female had relatively an equal contribution 52.2% and 47.8% respectively. Patient age clusters by decade were 10-19 (n=16); 20-29 (n=34); 30-39 (n=33); 40-49 (n=66); 50-59 (n=76) and > 60 (n=96). While just over half of study participants represented from urban living places (53.1%), remaining was from rural residential area. The occupational category accounted for skilled workers 2.1%, menial jobs 42.5% and a larger proportion was jobless (55.3%). Considering the educational level of this study participants, a larger proportion had high school education (42.5%) while primary and secondary education were nearly equal contribution about 27% and only 2.8% had tertiary education.

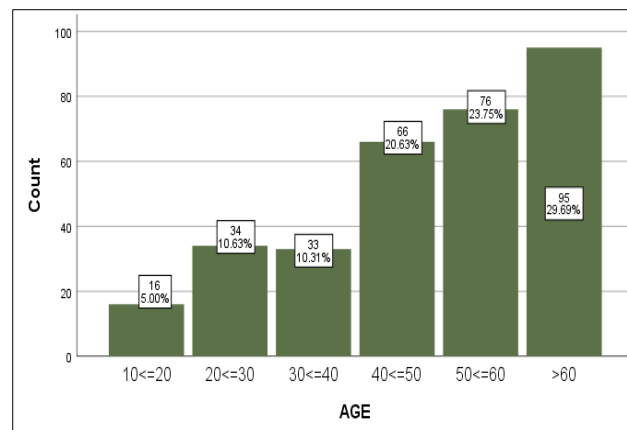


Figure 1 Abdominal USS requirement with patient age clusters

Almost two fold of the study participants (63.4%) referred from inward settings and remaining was from outpatient's referral. The figure of only 30.6% had adequate fasting while 46.6% and 22.8% had inadequate and over fasting respectively. Although adequate water intake was 63.8%, the full bladder amounted to 56.6% and 44.4% inappropriate bladder filling. Among this study participant nearly half of the figure 48.8% received advice from doctors while 23.4% and 11.9% from nurses and 15.9% respectively, however, there was 15.9% hadn't received any advice at all.

The chi-squared test was applied to check the relationship between rescan procedure and its influencing factors. There was enough evidence to conclude that the variables such as fasting ($P=0.000$), full bladder ($P=0.000$), water intake ($P=$

0.000), the patient got advice ($P= 0.000$), and preparation ($P=0.000$) have a statistically significant relationship with rescanning at 5% level of significance. The significant results were obtained when the appropriate clustered bar charts were fitted to summarize the two categorical variables in this study.

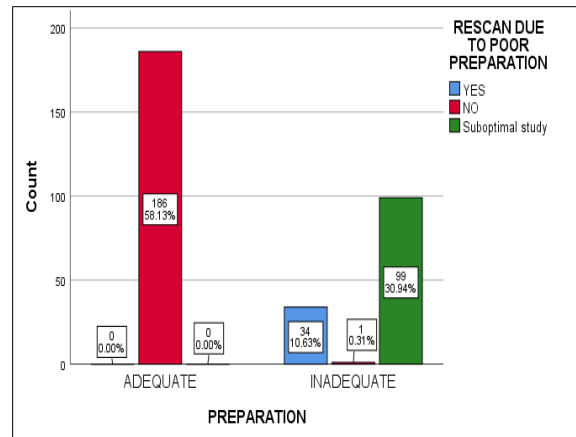


Figure 2 Level of fasting during the abdominal USS

4. Discussion

The optimal abdominal ultrasound scan finding to be central to have accurate diagnostic and clinical decision-making when a patient presents with a disease because the ultrasound scan investigation is performed to find the underlying etiology in regard to the ongoing disease. However, patient preparation before abdominal ultrasound plays a major role to ensure better visualization of internal organs and pathologies by minimizing artifacts. In our study found that when the subject age less than 60 years repeat scanning process was not required. The similar finding was observed in a study [6] that revealed abdominal ultrasound results were optimal with younger age (<40 years) but the findings accuracy was low with their aging even though there was no relationship with gender factors in regard to rescan procedure [8]. The greater number of study participants represented from urban living places while a larger proportion of study participants had no job. However, the majority of this study recruit mentees were over 60 years this is the age for retirement in Sri Lanka [9] as it might increase the jobless figure contribution. The figure of rescan relatively equal when considering the participants living areas while the necessity for repeat scan was high with primary and secondary educational background.

The significant difference was found between the results from prepared and un-prepared patients. Thus, it is assumed that the necessity of a repeat scan is increasing with aging while adequate ultrasound scan preparation doesn't require rescan procedure. There was no significant relationship between gender and rescan while study participants from urban areas are unlikely to need rescan requirement [10]. There were no observations for rescanning among people, who are professionals and have tertiary education while the necessity to follow rescan procedure seems to be higher on people who had only primary and secondary education. A high percentage of cases don't require rescanning when they had over fasting, while a few cases only don't require rescanning when they had inadequate fasting. The necessity of non-rescanning seems to be high for the cases with full bladder compared to the cases with empty bladder. If the patients adequately intake water, there is a high chance of non-rescanning. It's seen from the fitted graph that; the percentage of non-rescanning is higher when patients got advice from doctors but its low when patients didn't receive any advice.

5. Conclusion

Thus, the accuracy of the finding leads to make a precise clinical decision making and its management procedures. To ensure maximum accuracy of results proper patient preparation and handling are necessary. The values of the patient preparation before proceeding abdominal ultrasound scan must be central to achieve a high quality of clinical imaging and accurate underlying root cause relevant to any ailments.

Compliance with ethical standards

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Disclosure of conflict of interest

There is absolutely no conflict of interest between the authors as everybody is aware of the work and participated adequately.

Statement of informed consent

This study obtained informed consent from all individual participants included in the study.

References

- [1] Bor R, Fábíán A, Szepes Z. Role of ultrasound in colorectal diseases. *World journal of gastroenterology*, 2016; 22(43): 9477–9487.
- [2] Walas MK, Skoczylas K, Gierbliński I. Errors and mistakes in the ultrasound diagnostics of the liver, gallbladder and bile ducts. *Journal of ultrasonography*, 2012; 12(51): 446–462.
- [3] Dissaneevate K. Results of Lower Abdominal Ultrasound as Part of Whole Abdominal Ultrasound in Patients with and without Indications Related to Lower Abdomen. *Journal of the Medical Association of Thailand* 2017; 100(1): 177-182.
- [4] Sinan T, Leven H, Sheikh M. Is fasting a necessary preparation for abdominal ultrasound?. *BMC Medical Imaging*. 2003;3(1).
- [5] Merritt CRB, Foreman M, Bluth E, Sulli I. Abdominal ultrasound. clinical application of realtime. *Appl Radiol*, 1981; 10(1): pp. 83-94.
- [6] Anon O. Guidelines for Professional Working Standards: Ultrasound Practice.. United Ultrasound Practice. Kingdom Association of Radiologists. 2008.
- [7] Anon. Catheter drainage of a large pyogenic abscess of the liver. *Manual of diagnostic ultrasound* , 2006;1: pp. 34-68.
- [8] Bates J. *Abdominal Ultrasound : How, Why and When..* 2nd ed. ed. London.: Churchill Livingstone, Elsevier, 2008.
- [9] Bluth E. et al. *Ultrasound: A Practical Approach to Clinical Problems*. New York: Thieme, 2000; 3(1): pp. 122-128.
- [10] Bluth EI, Katz MM, Merritt CR. Jeanfreaux. Ultrasonic findings in pelvic lipomatosis.. *south medical journal*, 1979; 72(9): pp. 1215-1216.