



An Audit of Ultrasonography Performed and Reported by Trainee Radiologists

Une vérification de l'échographie effectués et déclarés par les radiologues Stagiaire

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ABSTRACT

BACKGROUND: Proforma information, instructions and procedures of training in radiology are lacking in Nigeria.

OBJECTIVE: To describe the errors in ultrasonography performed by unsupervised trainee radiologists.

METHODS: The radiology records of all ultrasound scans (USS) carried out and all reports that came back to the unit of the authors on account of misdiagnosis, doubtful diagnosis, misinformation or error in the reports were studied. The patients with the returned reports were rescanned where available by consultants and the collected data analysed.

RESULTS: A total of 4680 patients had ultrasound studies without supervision resulting in 605 (12.93%) queried reports. The USS scans of 235 (5.02%) patients were repeated with consultants in attendance resulting in significant change in reports of 95 (2.03%) patients. Analysis of the request cards of 605 queried reports showed omission of relevant clinical information 463 (76.53%), outright wrong information 65 (10.73%), and unconventional abbreviations 139 (22.98%), while 493 (81.49%) were completed by a nurse, medical student or junior resident. Typographical errors comprised 174 (28.76%) of the 605 queried reports. False negative error was the highest type of error seen in 55 (57.89%) of the 95 patients with significant change in their report after repeat scan as lesions not detected were not documented.

CONCLUSION: Trainee radiologists make significant errors in carrying out and reporting ultrasonography without adequate direct supervision of the study by their training consultants. Majority of the errors originate from lack of accurate filling of the patients request cards by the requesting physicians, lack of adequate preparation for the intended study, and typographical errors in writing reports. False negative reports are by far the greatest cause of errors recorded as lesions not detected were not documented. *WAJM* 2009; 28(4): 257–261.

Keywords: Audit, Ultrasonography, Trainee, Residents, Radiologist, Errors, Reports.

RÉSUMÉ

CONTEXTE: Contexte: informations pro forma, des instructions et des procédures de formation en radiologie font défaut au Nigeria.

OBJECTIF: Décrire les erreurs de l'échographie effectuée par des radiologues stagiaire sans surveillance.

MÉTHODES: Les dossiers de radiologie de tous les examens échographiques (USS) a effectué et tous les rapports qui revenait à l'unité de compte sur les auteurs de mauvais diagnostics, le diagnostic douteux, la désinformation ou d'erreurs dans les rapports ont été étudiés. Les patients avec les déclarations qu'elles ont été scanné à nouveau le cas échéant par des consultants et les données recueillies analysées.

RÉSULTATS: Un total de 4680 patients ont eu l'échographie sans surveillance résultant en 605 (12,93%) s'interroge sur les rapports. L'USS scans de 235 (5,02%) patients ont été répétées avec des consultants de la fréquentation entraînant une modification importante dans les rapports de 95 (2,03%) patients. Analyse des cartes de demande de 605 rapports ont montré interrogé omission de l'information clinique pertinente 463 (76,53%), pure et simple des informations erronées 65 (10,73%), et les abréviations non conventionnelles 139 (22,98%), tandis que 493 (81,49%) ont été complétées par une infirmière, étudiant en médecine ou résident junior. Les erreurs typographiques comptait 174 (28,76%) des 605 rapports interrogée. Erreur de faux négatifs est le plus grand type d'erreur vu en 55 (57,89%) des 95 patients atteints de changement significatif dans son rapport après le répète scan comme des lésions non détectées ne sont pas documentés.

CONCLUSION: les radiologues de stagiaires font des erreurs importantes dans l'exécution et le compte rendu échographie sans supervision directe adéquate de l'étude par leurs conseillers en formation. Plupart des erreurs proviennent d'un manque de remplissage précise des cartes de la demande du patient par le médecin du requérant, le manque de préparation adéquate pour l'étude prévue, et les erreurs typographiques dans la rédaction de rapports. Faux rapports négatifs sont de loin la plus grande cause d'erreurs enregistrées comme des lésions non détectées n'ont pas été documentées. *WAJM* 2009; 28(4): 257–261.

Mots clés: Audit, échographie, de stagiaires, résidents, radiologue, erreurs, rapports.

INTRODUCTION

In many institutions, teaching hospitals, and radiology institutes that train radiologists, the learning method is basically by apprenticeship. The residents are taught on each case as it comes while carrying out the study. Proforma information, instructions and procedures are basically unavailable or poorly developed in Nigeria, where the system has been structured after the British system. Residents agreed in a study that learning the skill can be gained eventually through apprenticeship model. However, it did not give them the confidence or competence a more structured programme could provide.² The usual practice in most radiology departments in Nigeria (ours inclusive) is that, a resident who has had appreciable training performs a study, that is cross-checked by a more senior resident and eventually by the consultant. The patient is entrusted to the consultant who takes all the responsibilities and credit. All reports from the radiology departments are expected to be vetted and cross-checked by the consultants. However, in a busy work schedule with low radiologists to a patient ratio, especially, during emergency periods late in the night, residents' performed radiological studies are reported and sent out without passing through the consultants. In a study by Hillier *et al*³ it was noted that registrars make a significant number of errors, which affect patients' management while reporting computed tomography. Clinical audit and reporting on proformas have been adjudged to increase the standard of practice and information content of reports.^{4,5} Errors emanating from the referring physicians regarding omission of patient's age, clinical information, inclusion of unconventional abbreviations and illegal entries in the radiological request forms may lead to confusion and inadequate guide to the radiologists and trainee radiologists.⁶ All these affect patients' reports. This study was undertaken to analyse some mistakes that came to the knowledge of the radiology department in our centre brought back by referring physicians, patients, nurses or patients' relations due to the discovery and sometimes adverse comments and effects of such mistakes.

MATERIALS AND METHODS

The authors collected reports that came back to the radiology departments between March 1st 2002 to April 29th 2004 on account of misdiagnosis, doubtful diagnosis, misinformation or error in the reports. These were not all the reports that came back to the department, but these came back to the authors' unit. The reports were collected on a prospective basis, Patient's case notes, request forms and initial reports were studied and cross checked with the information from the referring physician or surgeon, and the information recorded. The patients were rescanned on individual basis to ascertain whether correct diagnosis was made or whether there was wrong diagnosis.

The department performs obstetric and gynaecologic ultrasonography, abdominal ultrasonography, renal, pelvic, prostatic, scrotal, breast, ophthalmic, thyroid, pleural, transfontanelle and soft tissue ultrasonography. However, specialised areas like breast, scrotal, and ophthalmic, thyroid, transfontanelle and pleural ultrasonography as a policy in the department are constantly supervised by the consultants before reports are issued out. The residents can send out reports of the other studies without vetting by the consultant. Therefore, these specialised studies were not included in this study. The patients with returned reports were rescanned where available and the consultants were called to carry out the repeat studies. Senior registrars with consultant duties are those who have passed the Fellowship examinations and hold qualifications as consultant but are yet to exit the programme or be appointed as consultants. These were classified as consultants and occasion-

ally carried out the repeat scans. Data analysis was done using the software, SPSS (SPSS Inc, USA 2003).

RESULTS

A total of 4680 patients were examined with ultrasonography by residents without vetting by the consultants in the study period both on routine and emergency bases involving obstetric, gynaecological, abdominal and prostatic ultrasonography. Six hundred and five (12.9%) of the reports were returned or queried, 235 (5.0%) had repeat scan, while 370 (7.9%) patients were not available for repeat study. Of the total number of 4680 patients seen by the team, 804 (17.2%) were referred from other clinics outside the hospital. Four hundred and nine (8.74%) patients were seen on emergency, while 4271 (91.23%) were seen during the regular hours. The number of patients seen in the different types of studies are summarised in Table 1. Obstetric and gynaecological scans comprised 3187 (68.1%) of all the studies performed by the residents. The referring clinicians, patients' relations, nurses or residents sent back 605 (12.93%) reports with some queries requiring clarification or outright doubtful diagnosis. Prostatic ultrasonography topped the list with 124 (22.8%) cases, while abdominal and gynaecological ultrasonographies were the least queried reports (Tables 1 and 2.)

Among the repeat scans, the number of patients with significant change in reports or occasionally completely false reports was recorded. , Obstetric scans had 348 (13.0%) reports that were returned for rescan with 97 (41.23%) rescanned, and 48 (13.78%) having significant change in report.

Table 2: Reports Returned, Rescanned and/or with Significant Change on Review

Type of Study	Number (%)			
	Total	Returned With Complaints	Re-scanned	Significant in Report after Re-scan
Obstetrics	2679 (57.2)	348 (57.5)	97 (41.3)	48 (50.5)
Gynaecology	508 (10.9)	62 (10.3)	64 (27.2)	16 (16.8)
Abdominal	949 (20.3)	71 (11.7)	41 (17.5)	17 (17.9)
Prostate	544 (11.6)	124 (20.5)	33 (14.0)	14 (14.7)
Total	4680 (100.0)	605 (100.0)	235 (100.0)	95 (100.0)

Table 3: Reasons for the Non-availability of 370 Patients for Repeat Study

Reason	Number(%)
Typographical errors, corrected by doctor that performed the study	174(47.02)
Other investigations clarified the diagnosis / problem	43(11.62)
Problem became clinically obvious with time	33(8.92)
Fault discovered after delivery	22(5.95)
Fault discovered after surgery	7(1.89)
Patient declined study or unavailable	55(14.87)
Other logistic reasons*	30(8.11)
Fault discovered after death of patient	6(1.62)
Total	370(100.0)

*Lack of power supply, patients' seriously illness prevented repeat study.

Prostatic scans had 124 (22.78%) returned with 33 (14.04%) rescanned and 14 (11.29%) significant change in report. Abdominal ultrasonography had 71 (7.48%) returned with 41(58.45%) rescanned and 17 (23.94%) having significant change in report. The percentage of the total patients in each group with significant change in report

Table 4: Indices of Request Cards of 605 Queried Reports

Types of errors in filling request cards	Number(%)
Omission of relevant clinical information	463(76.53)
Wrong information	65(10.73)
Unconventional abbreviations	139(22.98)
Wrong anatomical site of lesion indicated	43(7.11)
Lesion not diagnosable by ultrasound requested for study	31(5.12)
Request card information completed by nurse, medical student or junior resident	493(81.49)

is shown in Table 2. From 605 queried reports, only 12 (1.98%) came from clinics outside the hospital; this brought the number of total patients sent by outside clinics to 2.93%.

Attempts were made to find out why 370 (61.2%) out of 605 patients with their reports returned were not rescanned. The result showed that typographical errors were the highest causes of returned reports comprising 174 (28.8%) from the 605 queried reports and 174 (47.0%) of 370 patients that could not be rescanned since these errors were promptly corrected. Other reasons why the patients could not be rescanned are shown in Table 3.

The request cards of the 605 queried reports were studied (Table 4). Four hundred and sixty three (76.5%) had omission of adequate or relevant clinical information which was provided during the request for the repeat scan. Sixty five (10.7%) of the 605 queried reports had outright wrong information on the request card. One hundred and thirty nine (23.0%) from the request cards in the queried results had unintelligible or unconventional abbreviations. It was discovered, that 493 (81.5%) were completed by a nurse, medical student or a junior resident. Only 112 (18.51%) request cards were completed by either the consultants or senior registrars.

The types of errors recorded after the repeat scans (Table 5) showed that false negative error was the dominant type of error seen in 55(57.9%) among the 95 persons with significant changes in their report after repeat scan. Errors in writing report were seen in 13(13.68%) cases, while, false positive, outright wrong diagnoses, and poor conclusion of already correctly elicited features were nine (9.47%) each.

DISCUSSION

Some studies have attempted to estimate the burden of resident performed ultrasound scans, and the corresponding reports that were not adequately supervised or vetted by the consultants.^{3,5,7} In all these, evidence abounds that trainee radiologists make significant errors, in which if the patients, relations, nurses or referring physicians are not observant, the patient may be exposed to a high risk.

In Nigeria and other developing countries, many consultants leave for Europe and America in pursuit of greener pasture leaving fewer consultants to train large numbers of medical students and residents. These result in giving residents greater level of responsibilities often, without adequate previous training or supervision to meet the challenges ahead. A total of 235 (5.0%) errors were recorded often requiring change in management or leading to severe deterioration in patients' conditions when not recognised. It can be seen that majority of outside referral clinics did not send their patients back probably because of time constraints or unfamiliarity with the teaching hospital as only 12 (1.5%) of the 804 patients from outside clinics were queried compared to 593 (15.3%) of the 3876 patients from the hospital.

This results of agree with the study by Hillier et al³ which noted that 69% of the errors were false negatives which compared well with the 57.89% in the present study (Table 5). The findings by Williamson et al⁵ of the linear relationship of increasing performance with increasing experience is self-evident although this study is limited in that aspect in that these errors were not separated according to the duration of training of the residents. Regular clinician-radiologist meetings or interdepartmental meetings with the radiology department as advocated by Jumah et al⁶ are obviously a way of emphasizing the importance of accurate filling of request cards by experienced members of the requesting clinician's team. Erroneous reports are too

Table 5: Types of errors recorded in the 95 repeated studies with significant change in the reports

Type of errors recorded	Number(%)
Error in writing reports*	13(13.7)
False positive	9(9.5)
False negative	55(57.9)
Outright wrong diagnosis	9(9.5)
Poor conclusion of already correctly elicited features	9(9.5)
Total	95(100.0)

*Unintelligible reports, misleading meaning, bad writing, poor grammar

dangerous, therefore it is necessary to establish feedback and control units including departmental self-audits.⁸

When repeat scans were requested, care was usually taken to meet the normal optimal conditions in terms of patient preparation before such scans were done, therefore leading to a wide variation with the initial inappropriately prepared study. Lack of full bladder due to urinary incontinence often necessitates hurried studies with wrong diagnosis and reports especially during busy schedule and call periods for prostate study. In the obstetrics and gynaecology scans differentiation of pelvic inflammatory disease from ectopic pregnancy and diagnosis of placenta praevia comprised 86 (54.4%) of the 158 patients in the group with significant change of diagnosis after rescan. In summary, lack of adequate patient preparation accounted for over 142 (60.4%) of the causes of wrong diagnosis. Departmental self audit is necessary for improved performance.⁹ Feedback from other departments with reassessment of that department can improve the professional practice of clinicians and radiologists.¹⁰ Some authors have mentioned on grammar and incompleteness of existing lexicons for generating and representing radiology reports. Ridley¹¹ rightly suggests that using correct English, concise reporting and being aware of unintended readers among other suggestions proffered, a good radiology report that conveys the exact information can be generated.

Most doctors are eager to improve quality. However objective audit or self assessment and acknowledgement that the patient may not have received the best care possible are viewed with suspicion as criticism of their performance and competence and sometimes outright attack. This makes doctors to be silent, not willing to discuss their faults and when they do often this is not whole heartedly. Malpractice threats from patients and relations also hinder not only objective assessment of individual performance but the care system itself.¹² The basic aim of audit is to improve the quality of patients care. This encompasses the desire of patients, public or its representative and the health

care provider. Audit also includes effectiveness, efficiency, acceptability, equity and relevance of the healthcare system. Therefore, owing to these reasons errors and mistakes must be kept minimal by collaborative efforts and departmental self-audit.¹³

Although, litigations are presently low in Nigeria and other developing countries, there are signals that they increase as the society becomes more enlightened. Adequate documentation including filling request cards by referring physicians and recording the findings by the sonologists are essential to escape cases of litigation. Also, reasons noted for having inadequate preparation for examination, include, incontinence of urine, and patient on *nil per oral* who may require full bladder.¹⁴

It is always rewarding to request for patient to come back for re-scan whenever the clinician raises a query no matter how irrational it may sound. Pedunculated fibroid reaching the liver area with a narrow thin stalk was found in one of the repeat scan which previously reported normal uterus. Defensive practice by being very receptive to criticisms, requests for repeats, and documentation of any limitation is always desirable as it puts the doctor in a safer place. Adequate communication with patients, colleagues and effective administration with respect to record keeping are necessary to avoid not only losing professional respect, faith in reports and licence but staying out of unnecessary litigations and police cases.¹⁵

Majority of patients want to know their results after each examination. Many referring physicians, patients and radiologists have favoured direct disclosure of information by radiologist to the patients.¹⁶ Ultrasonography is completely different from other imaging studies because a lesion that is not detected is not documented. This is one of the reasons that false negative findings are the most common fault in ultrasound reports. However, it has been shown that when standard practice and adequate preparation are applied, there are high inter-examination and inter-observer agreement.¹⁷ For this to be achieved, and radiologist to find themselves more visibly involved in patient

care, rather than backdoor suppliers of information, there is the need for examination and reports to be accurate at all times. A situation where a referring physician will prefer to scrutinize the report before disclosing it to the patient will only further increase the loss of confidence by the the patients in the radiologist. Radiologists should communicate more with the patients to further extract any information not available on the request forms. Closer interaction with the patients will lead to their willingness and cooperation in achieving the best preparation for the study.¹⁶

In conclusion, trainee radiologists make significant errors in carrying out and reporting ultrasonography on patients in the absence of adequate direct supervision of the study and vetting of reports by their training consultants. Majority of the errors originate from lack of accurate filling of the patients request cards by the requesting physicians, typographical errors in writing reports and lack of adequate preparation for the intended study. False negative reports are the greatest number of errors recorded as lesions not detected are not documented.

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