Original Article

Evaluation of inadequately filled radiology request forms with its impact on patient radiation exposure and waiting time in a tertiary care hospital: A preliminary report from Northwest Nigeria

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Abstract

Background: Adequate and accurate clinical history on a properly filled request form is indispensable if a clinically relevant radiological diagnosis is to be made. Moreover, clinicians need to clearly justify their requests for radiological procedures on a request form to prevent unnecessary radiation exposures and examinations with attendant prolonged waiting time.

Objective: The study audited inadequately filled radiology request forms to determine their impacts on diagnosis, patient radiation exposure, and waiting time.

Materials and Methods: Following an institutional review board approval, a total of 158 inadequately filled request forms for conventional X-ray examinations were sequentially enlisted and evaluated. Scorings as filled, inadequately filled, and unfilled were used to score each item based on the following: patient biodata/demographic information and patient referral details and referring physician details. Request forms for repeat examinations were further analyzed for remote factors tied to inadequate filling or lack of filling of the details on the repeat forms. Data were analyzed based on descriptive statistics using SPSS statistical software.

Results: Patient names including first and surname were adequately filled on all the request cards (100%). Information related to patient referral details such as previous X-ray examination, blood pressure, and last menstrual period were inadequately filled with 4.4%, 2.5%, and 19.7% completion, respectively. Of the 158 request forms assessed, 33 (20.9%) examinations were repeated due to partial or complete cutoff of anatomic region of interest analysis showing inadequate clinical history and requested examination accounting for 45.5% and 24.2% of the remote factors tied to the repeats.

Conclusion: The practice of adequate, correct, and consistent filling of radiology request forms was suboptimal with resultant prolonged waiting time and possibly increased exposure among repeat cases. A continued reminder of all referring clinicians needs to be improved to protect patients from prolonged waiting times and unnecessary radiation exposure, for the overall improvement of quality of services.

Implications for Practice: Adequate information on the request forms improves diagnostic acuracy, reduced waiting time, and increased overall quality of service delivery.

Keywords: Patient exposure, radiology request forms, waiting time, X-ray

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INTRODUCTION

A radiology request form is an essential tool for communication between the referring doctor and radiology department. A properly filled radiology request form provides the radiologist and radiographer with adequate information that could aid accurate diagnosis, reduced patient waiting times, reduction in patient expenses, and most importantly, justification in radiation exposure.[1] Inadequately filled forms on the one hand may mislead the radiographer to perform a wrong investigation or the radiologist into making a wrong diagnosis.[1,2]

Although there is no universally known standard format of how radiology request forms should be designed, precedents have established the specific information; it should contain date, name, age, gender, ward/clinic, patient's address, hospital number (patient's hospital reference number), patient's radiological imaging reference number, clinical information, provisional diagnosis, specific radiological investigation requested, and referring doctor's name, and signature.[1-3]

The Royal College of Radiologists clearly states in its guidelines that all radiology request forms should be filled adequately and legibly to avoid any misinterpretation of the request.[4] Similarly, the Ionizing Radiation (Medical Exposure) Regulations (IRMER) 2000 of the United Kingdom's department of health requires the referrer to supply the practitioner with sufficient medical data, relevant to the medical exposure requested, to enable the practitioner to decide whether the exposure is justified.[4,5]

The responsibility for justification of exposure lies with the radiologist and/or a radiographer who rely on the adequacy of information provided on request forms to arrive at a decision.[6] Thus, filling of radiology request forms directly affects the concept of justification of medical radiation exposure.

Although literature available on the adequate filling of the request cards focused on how well radiology request forms are filled in terms of patient information and investigations requested, very few studies discussed the impact of inadequate filling of the request card on patient radiation exposure.[6,7] Thus, the current study audited the inadequately filled radiology request forms in our hospital to determine its impacts on patient radiation exposure and patient waiting time. The assessment of impact of prolonged waiting time and radiation exposure among patients in this study will help galvanize referring clinicians on the need to clearly justify their requests for radiological procedures on a request form to prevent unnecessary radiation exposures and examinations.

MATERIALS AND METHODS

The study was carried out prospectively at a Tertiary Care Hospital located in the Northwest region of Nigeria. Approval for this study was obtained from the institutional research ethics committee. Within a period of 3 months (January–March, 2020), a total of 158 request forms of conventional X-ray examination(s) carried out at the Radiology Department (new extension) of Aminu Kano Teaching Hospital, Kano, who had inadequately filled request forms were sequentially enlisted into the study and data obtained analyzed. The study only considered request forms from our studied institution as the request forms were uniform in terms of design and format with exclusion of properly filled forms and foreign forms (request forms from other hospitals).

All request forms analyzed in this study were from radiographic examinations carried out using only conventional screen-film system obtained from a static X-ray machine (Silhouette VR; 090-0011model; General Electric company, Wisconsin USA, 2007) and films that were processed through the automatic processing machine available at the department. All sorting protocols for this study were done under the supervisions of both radiologists and radiographers of more than 5-year postqualification experience working in the department.

The information provided on each request form was assessed and classified into three groups as follows: patient demographic information (name, age, gender, ward/clinic, hospital identification [ID] number, blood pressure), patient referral details (patient clinical history, requested investigation, last menstrual period (LMP), previous X-ray, and patient condition), and referring physician's details (name and date). Information provided on each request form and in each of the three groups was scored using the following criteria: filled when all the information was provided; inadequately filled when one of the items was not provided, and unfilled when none of the items was provided.

From the radiology request forms assessed, all repeated cases were further evaluated to establish the possible causes of repeat. There was a further scrutiny of the request forms to determine whether the reason(s) for the repeat was related to the inadequate filling of the request forms. Descriptive statistics were performed to analyze

the data using IBM SPSS statistical software version 23, New York, USA.

RESULTS

A total of 158 inadequately filled request forms were obtained with the patient's name detail adequately filled in all (100%) requests within the study period. Patient's biodata/demographic and clinical details that were extracted showed that inadequate filling occurred largely in the LMP parameter of the request form (80.7%), previous X-ray (95.6%), and patient's ambulatory status (98.1%). Meanwhile, information relating to the clinical history and requested examination was adequately filled in 76.6% and 88.6% of the time, respectively. Information relating to the name of referring physician (90.5%) and date of request (97.5%) were adequately filled in appreciable proportion of the request forms. These details are as shown in Table 1. Out of the 158 request forms analyzed, 33 of the forms (20.9%) were repeat examination cases due to partial or complete cutoff of anatomical region of interest (ROI) on the radiographs as noticed during radiologist reviews. Some remote factors tied to the repeat include poor information related to the clinical history (47%), followed by inadequate information related to the requested examination (24%). This is summarized in Table 2.

DISCUSSION

Justification and optimization in the medical use of ionizing radiation are part of the cardinal principles of radiation protection.[8] Medical exposures contribute the highest proportion of population dose from man-made radiation sources, with repeat examinations escalating absorbed doses among affected patients.[9] Incomplete filling of radiology request forms remain a global challenge within many hospitals especially in resource poor countries were manual or paper-based radiological investigation requests are still ubiquitous.[1] This study evaluated inadequately filled radiology request cards to determine their impacts on diagnosis, patient radiation exposure, and waiting time. It is hoped that the audit will have positive impact on the overall quality of services rendered by the radiology department.[10]

The findings of this study show that 158 radiological examination forms were inadequately filled which is a sizable number in a modest time frame of 3 months. Furthermore, 33 (21%) out of the 158 request forms assessed led to a repeat of the procedure. The Repeats were on account of partial or complete cutoff of anatomical ROI on patients radiographs as noticed during radiologist reviews/reportage in addition to inadequate filling of their request forms as shown in Table 2. Repeat examination prolongs patient waiting time, in addition, it may contribute to the cause of stochastic effects, such as cancer development either in the exposed individual or the patient's future offspring.[11] Furthermore, cumulative additional exposures due to repeat could have medicolegal implication and possible liabilities as reported by Oswal *et al*.[12] It is therefore recommended to further create awareness among referring physicians in conjunction with the radiologists and radiographers about the importance of providing adequate clinical information on all radiology request forms if repeated cases due to partial or complete ROI cutoff following inadequate filling of radiology request forms are to be reduced or eliminated.

Although all the request forms evaluated in this study were inadequately filled, information related to the patient's first name and the surname was adequately provided at all times. This was similar to the findings in most of the literature reviewed.[1,10,13,14]

Patient age was provided in 58.2% of the request forms assessed. A previous local[1] and foreign[14] study reported findings of 29% and 44.1%, respectively, and both of these are lower than our values. Two similar local studies, however, reported that age was an information often adequately filled with ranges between 83.45% and 98%.[2,10] This is at variance with our study which reported much lower values (58.2%) for adequate filling of age details. These differences may be attributed to the much lower doctor-patient ratio in northwest regional health facilities accounting for high patient loads and fewer doctors which may lead to relegation of filling of some request forms to lower cadre staff and nondoctors who may not appreciate the value of age details column in a radiology request form. The implication of not providing patient age on the request form is that misleading diagnosis and complications in clinical decision-making is likely. This is due to the fact that some of the pathologies are age specific. Furthermore, age influences the selection of exposure parameters by the radiographer to ensure the patient are not being overexposed.[15,16] This calls for the need to continue to encourage the referring physicians to ensure all the necessary information on the patient request form are provided, this can be achieved through regular joint clinical reviews between radiology department and referring clinics.

Patient demographics such as hospital ID number and gender were filled in 93.7% (148) and 94.9% (150) of the request forms assessed in this study. A similar finding was

Table 1: Request card information and their filling detail scores

Variables	Number of filled information, *n* (%)	Number of inadequately filled information, *n* (%)	Number of unfilled information, *n* (%)
Patient demographic details			
Surname	158 (100)	Nil	Nil
Name	158 (100)	Nil	Nil
Hospital ID	148 (93.7)	Nil	10 (6.3)
Age	92 (58.2)	Nil	66 (41.8)
Gender	150 (94.9)	Nil	8 (5.1)
Ward	102 (64.6)	Nil	56 (35.4)
BP	4 (2.5)	Nil	154 (97.5)
Patient referral details			
Clinical history	121 (76.6)	12 (7.5)	25 (15.9)
Requested examination	140 (88.6)	7 (4.4)	11 (7)
LMP	11 (19.3)	Nil	46 (80.7)
Previous X-ray	7 (4.4)	Nil	151 (95.6)
Patient physical status	3 (1.9)	Nil	155 (98.1)
Referring to physician details			
Name	143 (90.5)	Nil	15 (9.5)
Date	154 (97.5)	Nil	4 (2.5)

LMP – Last menstrual period; BP – Blood pressure; ID – Identification

Table 2: Remote factors tied to repeat following partial or complete region of interest cutoff

Factors	*n* (%)
Inadequate filling of patient demographic information	5 (15)
Inadequate information related to clinical history	15 (47)
Inadequate information related to the requested examination	8 (24)
Illegibility of the referring physician handwriting	5 (15)
Total	33 (100)

reported by Irurhe *et al*.[17] who reported 92.3% and 99.7% filled for the hospital ID and gender, respectively. Although most of the fields related to the hospital ID and gender were adequately filled, the remaining request forms where the information was not provided could potentially lead to difficulties in retrieval of previous examinations of the same patient. Furthermore, comparison of pathological processes from follow-up studies could be potentially daunting. It was also noted that there were 10 (6.3%) of inadequately filled request forms in this study on account of missing hospital ID number, with about (5) of them having a repeat examination, which could be due to failure of retrieval of previous imaging records that could help inform the radiographer to narrow down to ROI as captured in earlier images thereby aiding to avoid cutoffs and off centering on radiographs [Table 2].

In this work, patient's ward/clinic detail was inadequately provided on request forms in 35.4% ($n = 56$) of the time. It is important to have this information provided on the request forms because the ward or clinic where the patient is referred from can also serve as a guide for radiologists in proper patient ID, reports interpretation, differential diagnosis, and appropriate radiological exposure or dosing.[14,18] Lack of above important information could lead to misidentification and mix up of examination results were patients from same ward/clinic have similar names, if proper attention is not paid to patients hospital ID which is often the case due to lengthy and cumbersome nature of arithmetic numbers associated with hospital ID of the patients. Moreover, this information may be needed for a patient's recall in case of an unexpected medical emergency and may also be needed when the referring clinician or medical/surgical team of specialists has to be contacted with ease for further discussions about the patient.

Patient's general mobility status and physical fitness information are also important in preprocedure planning by the radiographer to adequately chose the right film/cassette and X-ray machine most suitable and appropriate for the patient to guarantee optimum images and ensure no further injuries are sustained as a result of the improper handling during radiographic examinations, especially in trauma cases. In our study, patient physical status was only filled in 1.9% of all the request forms assessed which is lower than the 20.7% reported by Irurhe *et al*.[17] The very low completion rate for patient physical status reported in this study is quite disturbing and could impact negatively on patient waiting time and prolong general turnaround time for the procedure with its spillover effect on all subsequent patients to be attended by the radiographer.

Out of the 158 request forms assessed, 57 (36.1%) were for females of childbearing age with only 19.3% of them having LMP details filled. Our figures are slightly higher than those obtained by Irurhe *et al*.[17] who reported a completion rate of 11.5% for LMP details. Failure to provide LMP details may not provide enough justification for radiation use on affected cases based on the standard of practice, since this information is required to avoid unnecessary

exposures that increase the collective radiation dose to the population.[19] The request form of every female patient of reproductive age should have LMP details filled to enable the radiographer apply the necessary precautionary measures to prevent an unintended exposure of the fetus.

As reported by Akintomide *et al*.,[2] a previous X-ray indicates that the patient has had an X-ray examination in the past which could be a repeated case or a follow-up investigation. Availability of previous radiographs and reports enables the radiologist to compare and determine progression of a clinical condition which also helps influence radiologic decision where necessary.[1] In this study, the previous X-ray detail was filled only in 4.4% of the time. Our finding is slightly higher than the 2.5% reported by Mohammad *et al*.[3] and possibly indicates that filling up this detail is not a popular practice.

Inadequate and unfilled information related to the requested examination was noticed in 24.2% of all the repeated cases in the present study, in which they had details on their request forms that were either not related to the requested examination or the information was inadequate. This omission has the tendency to add to the cumulative and prolonged patient waiting time in those cases since clarification has to be sought from the referring physician before further actions can be taken on the initial examination request. Although results of this study have shown a 88.6% completion rate of the requested investigations details, it is still lower than the values reported by Mohammad *et al*.[3] who reported a 99.66% completion rate of requested examination detail. Therefore, not providing adequate information related to appropriate examination required on the request form still remains a problem in our environment as it contributes a substantial proportion of repeat cases in this study suggesting a potential relationship between them.

In the present study, illegible handwriting was noticed 15.1% of the time. This was much higher than values reported by Akintomide *et al*.[2] (7.37%) and Badu[20] (2.6%) in southwest Nigeria and Nepal, respectively. Illegible handwriting leads to lack of understanding of the request or wrong interpretation in which the former leads to prolonged waiting time due to delays in carrying out the examination because the clinician needs to be contacted for clarification, while the latter can lead to a wrong examination being done, repeat examinations, and ultimately, unnecessary radiation exposure.[2]

The name and signature of the referring clinician on request forms help to authenticate the request and in reaching out to the referrer when the need arises, like interpreting illegible handwriting.[3] Finding from our study shows that date and name of the referring physicians were filled in 97.5% and 90.5% of the time, respectively. This is similar to the findings of Irurhe *et al*.[17] who reported 92% and 99.7% completion rate. Similarly, Afolabi *et al*.[1] also reported a 97% and 96.5% completion rate. However, the values of Akintomede *et al*.[2] are a bit lower (83.1%) than ours. The referring physician is responsible for patient management including requesting for the procedure and its consequences. Furthermore, the name of the referring physician is required in case of complaint and auditing of the referral forms.[2,18] Further, the date of the requested examination plays an important role in case of complaints about delays in reporting or auditing of waiting/turnaround time.[18] Although the date and name of the referring physician were provided in most request forms assessed in this study, there is a need for continuous awareness among the referring physicians on the need to provide such details to avoid prolonged waiting time and avoidable delays.

The IRMERs 2000 of the Department of health, UK, issued that all referrals of any radiological investigation involving the use of ionizing radiation must provide adequate clinical information to the radiographer and radiologist to enable them ensure patients are not overexposed to an unnecessary dose of radiation.[5] Lack of clinical information not only jeopardizes the quality and usefulness of the radiology report but also impairs the effort of radiology department in ensuring justification and optimization of practice.[21] There is evidence that inadequate clinical information is associated with an increased level of inaccurate reports.[21] The present study showed that clinical history was inadequately provided 12 (7.5%) and was completely unfilled 25 (15.9%). The findings are not surprising as previous studies have reported clinical history to be inadequately provided by the referring doctors.[9,18,21] Furthermore, inadequate information related to clinical history had the largest proportion (47%) out of the 33 cases of repeated examinations in this study. This underscores the necessity of having an adequate clinical history on the request forms as no meaningful radiographic examination and radiologist report is likely to be obtained without this.

CONCLUSION

This study showed that significant number of referring clinicians is still not adequately, correctly, and consistently filling the request forms which remains an essential means of communication with radiologist and radiographers. These omissions tend to have considerable stress on

radiologists and radiographers and perhaps on the quality of diagnosis. There is a need to continuously sensitize referring clinicians on the importance of adequately completing request forms for investigations. We recommend regular workshops in that regard.

Limitations

The sample size in this study was rather modest which might make the results less generalizable. However, the authors are of the opinion that a larger number of requests forms may not substantially alter the findings of the study. The assessment of the impact of radiation dose on the patient in this study was only based on the repeat examinations' record reviewed, though it ultimately added to patient exposure dose.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Afolabi OA, Fadare JO, Essien EM. Audit of completion of radiology request form in a Nigerian specialist hospital. Ann Ib Postgrad Med 2012;10:48-52.
2. Akintomide AO, Ikpeme AA, Ngaji AI, Ani NE, Udofia AT. An audit of the completion of radiology request forms and the request practice. J Family Med Prim Care 2015;4:328-30.
3. Mohammad H, Jt I, Ogbeifun OJ, Je I, Eo E, Adekwu A. An assessment of the adequacy of filling of radiology request cards in a teaching hospital in Makurdi, North Central Nigeria. IOSR J Dent Med Sci 2016;15:71-4.
4. Nedumaran PA. Do the reports address the questions? Br J Radiol 2002;75:565-6.
5. Department of Health (UK). The Ionizing Radiation (Medical Exposure) Regulations 2000, Statutory Instrument No. 1059. London: HMSO; 2000. Available from: https://www.legislation.gov.uk/uksi/2000/1059/made. [Last accessed on 2020 Oct 22].
6. Dhingsa R, Finlay DB, Robinson GD, Liddicoat AJ. Assessment of agreement between general practitioners and radiologists as to whether a radiation exposure is justified. Br J Radiol 2002;75:136-9.
7. Cook PG, Birchall IW, Jeans WD. Audit of quality in a radiological department--a pilot study. Clin Radiol 1991;44:345-9.
8. ICRP. The Optimisation of Radiological Protection-Broadening the Process; 2006 Available from: http://www.icrp.org/publication.asp?id=ICRP%20Publication%20101b. [Last accessed on 2019 Oct 23].
9. Triantopoulou CH, Tsalafoutas I, Maniatis P, Papavdis D, Raios G, Siafas I, *et al*. Analysis of radiological examination request forms in conjunction with justification of X-ray exposures. Eur J Radiol 2005;53:306-11.
10. Danfulani M, Ma M. Radiology request forms (RRF) inadequately completed: The case of a tertiary health center in northwest Nigeria materials and methods. Int J Clin Biomed Res 2015;1:1-4.
11. Sobechukwu WI, Onwuzu SW, Ugwuja MC, Adejoh T. Assessment of patient's waiting time in the radiology department of a teaching hospital. ARPN J Sci Technol 2014;4:183-6. Available from: http://www.ejournalofscience.org. [Last accessed on 2020 Nov. 19].
12. Oswal D, Sapherson D, Rehman A. A study of adequacy of completion of radiology request forms. Radiography 2009;15:209-13.
13. Abbas M, Omer A, Hamad M. Adequacy of cinical information on radiology request cards from medical assessment unit. Clinical audit. Nucl Med Biomed Imaging 2016;1:5-6.
14. Depasquale R, Crockford MP. Are radiology request forms adequately filled in ? An audit assessing local practice. Malta Med J 2005;17:36-8.
15. Adejoh T, Elugwu CH, Ezugwu EE, Sidi M, Aronu ME. A single-centre experience of radiation dose mitigation in computed radiography using dose charts. Pak J Radiol 2020;30:25-33.
16. Adejoh T, Ewuzie OC, Ogbonna JK, Nwefuru SO, Onuegbu NC. A derived exposure chart for computed radiography in a Negroid population. Health 2016;8:953-8.
17. Irurhe NK, Sulaymon FA, Olowoyeye OA, Adeyomoye AA. Compliance rate of adequate filling of radiology request forms in a Lagos University Teaching Hospital. World J Med Sci 2012;7:10-2.
18. Oyedeji OA, Ogbenna AA, Iwuala SO. An audit of request forms submitted in a multidisciplinary diagnostic center in Lagos. Pan Afr Med J 2015;20:423.
19. Teunen D. The European directive on health protection of individuals against the dangers of ionising radiation in relation to medical exposures (97/43/EURATOM). J Radiol Prot 1998;18:133-7.
20. Badu M. Study of missing clinical details in computed tomography radiology request forms: A descriptive cross-sectional study. JNMA J Nepal Med Assoc 2020;58:94-7.
21. Leslie A, Jones AJ, Goddard PR. The influence of clinical information on the reporting of CT by radiologists. Br J Radiol 2000;73:1052-5.