Original Article

Audit of Completion of Computed Tomography (CT) Request Forms at the Cancer Diseases Hospital (CDH) of Zambia

Ernest Chanda[1], Osward Bwanga[2], Ncheebe Sindaza[1], Nachalwe Chipampe Mercy[1], Mike Chisha[3]

[1]Cancer Diseases Hospital, Radiotherapy Department, Lusaka, Zambia
[2]Midland Regional Hospital at Tullamore, Radiology Department, Co. Offaly, Ireland
[3]University Teaching Hospital (UTH), Radiology Department, Lusaka, Zambia and University of Cape Town, Divisions of Radiology and Nuclear Medicine, Cape Town, South Africa.

ABSTRACT

Background: Computed tomography (CT) is a common imaging examination requested for the diagnosis and effective management of diseases and injuries. The effectiveness of an imaging examination is greatly increased if the request form is adequately completed by the referring medical practitioner.

Objective: This study aimed at auditing the adequacy of completion of CT request forms filled in at the Cancer Diseases Hospital (CDH) of Zambia.

Methods: This was a retrospective audit conducted at CDH in Zambia using a quantitative approach. A structured proforma (checklist) was used to collect data from randomly selected filled out request forms (N=80) between April and July 2020. Data were presented using tables, graphs and analysed using descriptive statistics.

Results: Of all the variables (N=14) audited, only the name and gender of the patients were provided in all the CT request forms. Other demographic information of patients was provided: age in N=78 (97.5%) and phone number in N=15(18.75%). Information about the examination was provided: requesting date in N=75 (93.75%), clinical details in N=77 (96.25%), examination in N=78 (97.5%), creatinine results in in N=4 (4.5%) and allergies in N=2 (2.25%). None of the request forms had diabetes information. Information related to the referring medical practitioners was provided: requesting department in N=35 (43.75%), name in N=14 (17.5%), signature in N=73 (91.25%) and phone number in N=8 (10%). Lastly, N=78 (97.5%) of the request forms were legible.

Conclusion: The CT request forms are incompletely and inadequately filled at CDH. An awareness programme for medical practitioners is recommended as well as re-auditing after 12 months to assess any improvement.

INTRODUCTION

Computed Tomography (CT) is an imaging technique which uses X-rays to produce cross-sectional images of the body.[1] The availability of CT in Zambia has greatly contributed to the delivery of quality healthcare services. At the Cancer Diseases Hospital (CDH) of Zambia, CT is used for diagnosis, staging of cancer, performing guided biopsies and follow up of treatment outcomes. However, CT is the largest contributor to radiation doses patients

Corresponding author:
Ernest Chanda,
Cancer Diseases Hospital, Radiotherapy Department,
Lusaka, Zambia.
E-mail: e.chanda75@gmail.com

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receive from imaging examinations.[2,3] According to the International Atomic Energy Agency (IAEA), CT imparts doses that are 100 times higher than doses imparted by other lower dose modalities, such as plain film radiography.[4] Thus, only justified examinations should be requested and performed. The justification means that the exposure of the patient to ionising radiation should be judged to do more good than harm.[5] Under the Ionising Radiation Protection Act of 2011 of Zambia, referring medical practitioners have a responsibility to justify each imaging medical exposure.[6] This includes providing all necessary information on the radiology request form.

Clinical auditing is one of the strategies used in radiology to monitor the justification of medical exposures, including completion of request forms.[7-9] A clinical audit means examining a part of clinical practice, comparing it against a standard, and acting to make changes in practice to reach the chosen standard if necessary.[8] The radiology request form is an essential communication tool between the referring medical practitioners and imaging professionals: radiographers and radiologists. It assists imaging professionals in determining the justification of the imaging examination. To radiographers, it aids in performing the imaging examination using appropriate techniques.[10] Performing a wrong technique may result in repeating the examination and additional exposure of patients to radiation. To a radiologist, it helps to answer the question being asked by the referring medical practitioner through a diagnostic report.[10] Correctly and adequately completed request forms have been shown to be beneficial in leading to more accurate reporting and in making the correct diagnosis.[11] Follow up for clarification due to incomplete request forms results in delayed examinations and increases the workload. Under the justification principle, imaging professionals can reject an incomplete request form. Inadequately completed request forms lower the standards of healthcare delivery.

The World Health Organisation (WHO) estimate that between 30% to 50% of radiological examinations may not be justified due to inappropriate or wrong requests.[12] Several clinical audits have been conducted globally on how completely radiology request forms for plain film (general) radiography and CT imaging examinations are filled out.[9,13,14,15,16,17] These audits have revealed that radiology request forms are incompletely and inadequately filled in by medical practitioners.

The authors have observed increasing numbers of inadequately completed radiology request forms at CDH. Since CT is a high dose imaging examination; it was prudent to conduct an audit of completeness of radiology request forms related to this modality. This study, therefore, aimed at auditing the adequacy of completion of CT request forms filled in at CDH of Lusaka, Zambia.

METHODOLOGY

This was a retrospective audit conducted using a quantitative approach at CDH of Lusaka, Zambia. CDH is a 252 bed-capacity that was opened in 2007 and offers oncology services. Apart from radiotherapy equipment, the hospital is also equipped with imaging modalities such as general radiography, CT, magnetic resonance imaging (MRI), ultrasonography (US) and mammography. The permission to conduct this audit was sought and obtained from the Senior Medical Superintendent of CDH. An ethical waiver was also obtained from the National Health Research Authority (reference number: NHRA00001/03/11/2020). The audit did not seek patients' or healthcare professionals' personal information.

The data collection tool (checklist) was developed based on the information from the CT request form used at CDH (Appendix 1). The checklist contained 14 dichotomous closed-ended questions: “Yes” was ticked if the information was provided on the request form or “No” if not provided. The filled-in request forms were assessed for completeness looking at the following details: requesting date, name, age,

gender, phone number, clinical details, examination, referring department, creatinine results, allergies, diabetes, and doctor's name and signature. The legibility of the forms was also assessed. The standard of good practice was 100% which is based on the Royal College of Radiologist (RCR) guidelines [10] and literature. [15-17] This means that all details must be filled in by the referring medical practitioners.

During the audited period, there were a total of 498 request forms received from CDH. Request forms from other medical facilities such as University Teaching Hospitals (UTH) were excluded as per objective of the audit. An online calculator from Clincal.com [18] was used to determine the sample size and the statistical power and this revealed a sample size of 80 powered at 80%. In keeping with a prior study, the authors chose the parameters to factor into the sample size and statistical power calculations. The beta was set at 20% and the incidence of unjustified examinations was set at 50% as reported by the World Health Organisation (WHO).[12] A beta of 20% is consistent with a prior study on calculating statistical power and sample size in medical literature.[19] Using this sample size of 80, a stratified random sampling across the four months (April to July 2020) was applied so that 20 request forms were randomly retrospectively selected in each month. All used CT request forms are kept for two years as per record-keeping policy at CDH. Data was extracted manually on the proforma (checklist) by three internal clinical auditors in August 2020.

The analysis of data was conducted on the completion of the data collection process. Data entry and analysis were done using Microsoft Excel for Windows 2016 and descriptive statistics with appropriate tables and graphs. The international guidelines on clinical auditing in radiology recommends the use of simple descriptive statistics which all stakeholders can understand to improve practice if required. [7,8]

RESULTS

A total of 80 CT request forms were audited. Of the 80 audited CT request forms, N=15 (18.75%) were inappropriate forms: N=14 (17.5%) were on general X-ray forms and N=1 (1.25%) on a drug prescription form.

Demographic information

Name of the patient and gender were provided in all the forms N=80 (100%), age in N=78 (97.5%), and phone number in N=15(18.75%). Figure 1 shows the frequency of providing the demographic information of patients on the CT request forms.

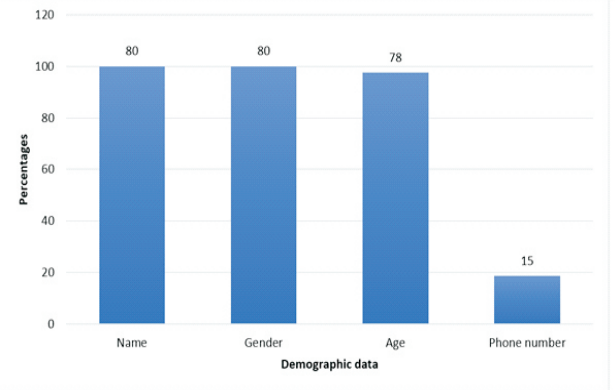

Figure 1: demographic information provided on the CT request forms

Information related to CT examinations

The requesting dates were provided in N=75 (93.75%) of the request forms. There was one incomplete request form which had only the date and month provided without the year. Clinical details were provided in N=77 (96.25%). There were N=3 (3.75%) incomplete forms where only provisional diagnosis was provided without supporting clinical information. For example, one request form had "ca vulva" only. The imaging examination requested was provided in N=78 (97.5%) of the request forms. On the examination component, there were N=2 (2.5%) incomplete forms because of non-specification of the examination required. For example, one form had the examination written as "head" instead of

"the brain". There was an absence of creatinine results and allergies in N=76 (95%) and N=78 (97.5%) of the request forms, respectively. Lastly, no request form had diabetes information. Table 1 shows the frequency of providing information related to CT examinations.

Table 1: frequency of providing information related to CT examinations

	Variable	Filled	Not filled	Incomplete	Standard
1	Requesting date	75 (93.75%)	4(5%)	1 (1.25%)	100%
2	Clinical details	77(96.25%)	0 (0.00%)	3 (3.75%)	100%
3	Examination	78 (97.5%)	0 (0.00%)	2 (2.5%)	100%
4	Creatinine results	4 (5%)	76 (95%)	0(0.00%)	100%
5	Allergies	2 (2.5%)	78 (97.5%)	0(0.00%)	100%
6	Diabetes	0 (00.00%)	80 (100%)	0(0.00%)	100%

Information related to referring medical practitioners

The requesting department was provided in N=35 (43.75%) of the request forms. The name of the referring medical practitioner was absent in N=23 (28.75%) of the request forms. There was a total of N=43 (53.75%) incomplete forms because only the last names were provided on the request forms. The referring medical practitioners' signatures and phone numbers were present on N=73 (91.25%) and N=8 (10%) of the request forms, respectively. Table 2 shows the frequency of providing information related to the referring medical practitioners.

Table 2: frequency of providing information related to the medical practitioners

	Variable	Filled	Not filled	Incomplete	Standard
1	Requesting department	35 (43.75%)	45 (56.25%)	0(0.00%)	100%
2	Doctors name	14(17.5%)	23 (28.75%)	43 (53.75%)	100%
3	Doctors signature	73 (91.25%)	7(8.75%)	0(0.00%)	100%
4	Doctors phone number	8(10%)	72(90%)	0(0.00%)	100%

The last variable is related to the legibility of the request forms. N=78 (97.5%) of the request forms were clear enough to read, whilst N=2 (2.5%) had illegible handwriting. Figure 2 presents the legibility result.

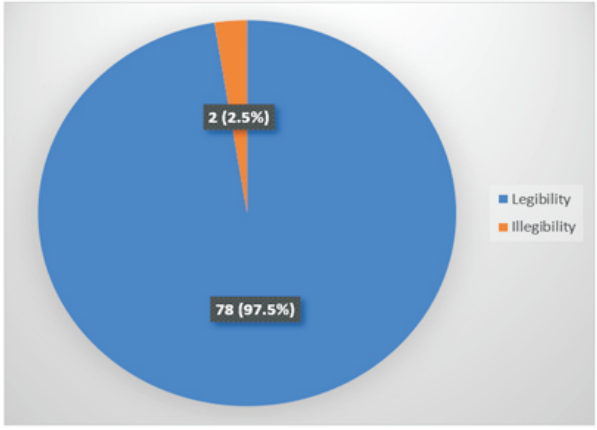

Figure 2: legibility of the CT request forms

DISCUSSION

Inadequate completion of CT request forms is a global problem.[15,16,17] The standard is that all information (100%) on the request form should be provided by the referring medical practitioner.[10] However, only the name of the patients and their gender were provided in all the CT request forms. Our audit found that less than a fifth [N=15 (18.75%)] of CT examinations were requested on general X-ray forms and drug prescription form, instead of the approved CT request form. This is a lower percentage than the findings in a similar audit, where 28.3% were requested on inappropriate forms.[14] The substitution of the approved CT request form with a general X-ray form, laboratory form, drug prescription form, or plain paper can result in the omission of important information required for CT examinations.

The demographic information of patients audited includes name, gender, age, and phone number. This information is important for the correct identification of the patient. A lack of demographic information can lead to performing an imaging

examination on the wrong patient and unnecessary medical exposures. It can also lead to the mixing of diagnostic imaging reports and mismanagement.[17] In our audit, all the forms had the names of the patients. This is similar to audits conducted from other countries.[15,17] The gender and age are important because some diseases are more common to particular age groups and genders.[17] The radiologist requires these details of the patients on the request form to make a correct diagnosis. Our audit found that gender was provided on all request forms and only N=2 (2.5%) had no patients' age. The phone number of the patient is also used to contact the patient for booking and any other related issues. However, most [N=65 (81.25%)] of the request forms in our audit had no patients' phone numbers. If the patient has no phone, the phone number of the next of kin should be provided.

To effectively identify the patient before imaging, the age component on the current CDH request form should be changed to the date of birth (DOB). This is because age cannot be used to accurately identify the patient. The address is an important component missing on the current CDH request form for CT imaging. The address is also used to identify the patient, for postage of CT booking information and tracing the patient for any infectious diseases, such as COVID-19 contact tracing.

The clinical details and examination are used to determine the justification of any medical exposure. In our audit, the majority [N=77 (96.25%) and N=78 (97.5%)] of the request forms had clinical details and type of examination, respectively. Our finding of clinical details is higher than what was found in an audit conducted in the UK by Rawoo (92%).[16] The Royal College of Radiologists (RCR) states that adequate clinical information is associated with an increased level of accurate diagnostic reports and good patient management.[10] The radiologist combines the radiological findings with the clinical information in reaching the final diagnosis.[9] Our audit also found N=4 (5%) request forms with no requesting date. This is lower (8.34%) than another audit on CT examinations.[17] This looks irrelevant, but most CT imaging examinations are conducted on an appointment basis (booked), and in the case of a complaint about delays in performing the examination, the date of the requesting becomes important. It is also useful for internal audits on waiting time and advocating for the expansion of imaging services.[19]

To minimise the risk of contrast-induced nephropathy (CIN) for patients undergoing contrast-enhanced CT studies, creatinine results should be provided on the request form. Creatinine is a laboratory test used to calculate the glomerular filtration rate (eGFR) which is the recommended method to estimate renal function before intravenous (IV) contrast media administration.[20] In cases of very low eGFR and if the patient is not on renal dialysis, IV contrast media is not given to avoid CIN. In our audit, creatinine was provided in N=4 (4.5%) request forms. This is better than 1.5% in another audit.[15]

The diabetes information about the patient, when provided on the CT radiology form, assists radiographers and radiologists in advising the patient about eating and taking diabetic medication (metformin) before and after the imaging examination.[1,20,21] Metformin discontinuation for 48 hours post iodinated contrast injection in diabetic patients helps to prevent severe lactic acidosis which could potentially happen if the renal excretion of metformin is compromised.[20] Lactic acidosis occurs when the body produces too much lactic acid and cannot metabolise it quickly.[1,20] The condition is life-threatening. No request form had diabetes information in our audit despite being on the approved CT request form. Another medical condition which is useful to know before administration of IV contrast media is any allergies. Ehrlich and Coakes state that reactions occur most frequently following IV administration of the large doses of ionic iodinated contrast medium used during such examination as CTs.[1] To ensure the safety of the patients, radiographers and radiologists should know the history of allergy to some drugs or

IV contrast media before imaging.[20] In cases where there is a previously reported moderately severe or severe reaction to IV contrast media, caution should be exercised and the need for the use of contrast media should be re-evaluated with respect to an unenhanced study.[1,20,21] Our audit found only N=2 (2.5%) of the request forms included patients' allergy information. Where a patient has no diabetes or allergies, it should be clearly stated on the request form. This avoids imaging professionals seeking information from the referring medical practitioner, laboratory department, or patient.

The other important information missing on the CDH request form are previous imaging examination(s) and last menstrual period (LMP). Information about previous imaging examination helps radiographers and radiologists in the justification process, in deciding whether a new examination is necessary. It can also be used to compare the current imaging examination with the old ones to determine the progress of a disease or injury.[14] Before medical exposures of the pelvic area, radiographers or radiologists are required to ask females of childbearing age about pregnancy status and LMP. This is because a foetus is more vulnerable to the biological effects of ionising radiation.[22,23,24] There are two pregnancy checks rules used in imaging: the 10 and 28-day rules. The rules state that whenever possible, radiological examinations of the pelvis may only be performed in the first 10 days of the menstrual cycle for higher dose examinations, such as CT and in the first 28 days for lower dose examinations, such as pelvic X-ray.[22]

The requesting department is important in case of any needed clarifications about the requested information and when sending the diagnostic report for the patient. It also serves as a guide to the radiologist in the provision of a diagnosis.[14] For example, if the request form is from the oncology department, it will guide the radiologist to look for cancer-related evidence on the images. In our audit, only N=35 (43.75%) request forms had the name of the requesting department.

It is important to know the referring medical practitioner and contact details in case of a need for any clarification or if requesting more information to avoid patient management delays. In our audit, the name and phone numbers of the referring medical practitioners were missing in N=23 (28.75%) and N=72 (90%) respectively, which is better than in other audits: 82% and 100%, respectively.[15,17] The phone number also includes the referring departmental extension or doctor's bleep number. On the request form, the signature of the referring medical practitioner authenticates the request.[14] However, the signature of the referring medical practitioner was absent in N=7 (8.75%) in our audit, which is lower than in another audit where it was 11%.[15] A request form is a communication medical-imaging tool. Thus, illegible handwriting of the referring medical practitioner can lead to misunderstandings. This may result in delays because of the need for clarification.[14] Our audit found that N=2 (2.5%) of the request forms had illegible handwriting, which is better than the findings of the previous two audits: 6% [17] and 8.6%.[15] One of the strategies used to overcome illegible handwriting is changing from hardcopy to electronic request form.

CONCLUSION

The audit found that CT request forms had inadequate information at CDH. Except for the name and gender of the patient, all other components were not adequately provided by the referring medical practitioners. The address, LMP, and previous imaging examination are not included on the approved CT request form for CDH. It is recommended that these components be included. Also, an awareness programme for medical practitioners should be developed and delivered by radiographers and radiologists. This should be followed by re-auditing after 12 months following the implementation of an awareness programme to assess any improvement in the completion of request

forms for CT examinations towards achieving the 100% standard of good practice.

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Appendix 1: Data collection tool (checklist)

	Variable	Yes	No
1	Requesting date: Is the requesting date on the request form?		
2	Name: Is the full name of the patient provided?		
3	Gender: Is the gender of the patient indicated?		
4	Age: Is the age of the patient indicated?		
5	Patient phone number: Is the patient's phone number provided?		
6	Clinical details: Are the indication (s) and clinical details provided?		
7	Examination: Is the type of CT examination stated?		
8	Referring department: Is the referring department provided?		
9	Creatinine results: Is the creatinine of the patient provided?		
10	Allergies: Is the allergies portion completed?		
11	Diabetes: Is the diabetes portion completed?		
12	Doctors name: Is the full name of the referring medical doctor provided?		
13	Doctors signature: Is the form signed?		
14	Doctor's phone number: Is the phone number, bleep, or requesting department of the referring medical doctor provided?		
15	Legibility: Is the request form legible?		