

Quality of Completion of Computed Tomography Request Forms by Clinicians: A Simple Audit Assessing Local Experience

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ABSTRACT

Computed Tomography (CT) request forms, an underappreciated medical document, are by far the most effective route of communication between referring doctors and radiologists. We aim at assessing the quality of completion of CT request forms by our clinicians, and to compare the completeness rating across hospital departments. From December 2019 to November 2020, we retrospectively reviewed 303 CT requisition forms from various departments at the Benue State University Teaching Hospital, retrieved from the radiology departmental archives. Data generated was analysed using Microsoft Excel 2019 edition and Statistical Analysis Software (SAS) version 15 to determine whether the twenty-two (22) fields on the request form were filled out completely, incompletely, or not at all. Results were displayed in tables and figures. None of the CT request forms reviewed were completely filled, with only 3/22 (13.6%) fields on the request forms being adequately filled. These were patient's name, ward, and type of CT examination. The most common fields with no information consistently were, the clinician's phone number and radiographers' signature. The hospital's accident and emergency department achieved the highest departmental completeness rating of 195/303 (64.4%). Requests for Brain CT had the most completed fields on 252/303 (83.0%) forms, while chest CT, 6/303 (2.0%) had the least. There is generally a poor compliance rate for completing CT referral forms at our hospital, and even though the completeness rating achieved by our accident and emergency department is far from ideal, it is nevertheless commendable, necessitating the promotion of departmental awareness beginning in undergraduate years.

Keywords: Audit, Clinicians, Computed Tomography, Request forms, local experience, Quality of completion



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INTRODUCTION

Computed Tomography (CT) request forms are by far the most simple and effective means for referring clinicians and radiologists to interact and share vital information. However, they are a frequently disregarded and undervalued medical documents.^{1-3.}

The Royal College of Radiologists (RCR) expressly emphasizes that all radiology request forms (RRFs) should be adequately and legibly filled out to avoid any potential misinterpretation.⁴ Therefore, it is necessary for the referring physician seeking answers from the radiologist to offer unambiguously relevant clinical details and questions on these forms for the benefit of the patient.⁵

Several institutions and organizations have adopted customized referral forms due to the lack of a uniform global template.⁶ These forms must, however contain common and basic information that meets the minimal standards defined by the World Health Organization (WHO),⁷ the International Atomic Energy Agency (IAEA),⁸ and the Royal College of Radiologists (RCR).⁹ A typical CT referral form must therefore, contain the patient's name, age, address, clinical background, telephone/institution number, ward, the specific question to be answered, the name and signature of the referring clinician, and the name of the consultant or general practitioner (GP) responsible for the patient's management.¹⁰

Previous research has shown that up to 20% of radiographic examinations are medically unnecessary, primarily unjustified and/or erroneously requested.^{11,12} Inaccurate information about the patient's address and other demographic data can make it difficult to determine for whom the investigation was intended, occasionally necessitating the patient's recall.^{13.} Conversely, satisfactory filling of the request form helps to shorten the examination time, thereby assisting the radiologist to give an accurate and concise radiological diagnosis, thus avoiding unnecessary investigations and radiation exposure.^{14,15}

The increasing rate of inadequately completed CT

request forms is unacceptable. However, the trend has assumed alarming global proportions¹⁶ with a paucity of local data on the subject. This has compelled the European Society of Radiologists (ESR) to call for the institution of both internal and external audits in radiology departments, with the firm belief that regular and quality clinical audits will surely strengthen the standard of the health care system.¹⁷

The aim of this study is to assess the quality of completion of Computed Tomography (CT) request forms by clinicians at Benue State University Teaching Hospital (BSUTH) through a simple audit **and to** compare the completeness rating across hospital departments.

MATERIALS AND METHODS

This was a retrospective study, assessing 303 CT request forms originating from various departments Accident and Emergency (A&E), Emergency Paediatric Unit (EPU), Surgery Outpatient Department (SOPD), General Outpatient Department (GOPD), Paediatric Outpatient Department (POPD), and Medical Outpatient Department (MOPD), which were retrieved from the Radiology Departmental archives at the Benue State University Teaching Hospital (BSUTH), Makurdi, from December 2019 to November 2020. Makurdi, the capital of Benue State, is situated on the south bank of the Benue River, between latitudes 7.3 and 8.32 degrees. In 2016, the city and its environs had an estimated population of 365,000 people.^{18.} The hospital serves a population of over four million people in Nigeria's north-central region and beyond.

The inclusion criteria were CT request forms from all departments at BSUTH, as long as they were legible and contained the ward/clinic of the patient at the hospital.

The exclusion criteria were illegible and badly mutilated CT request forms, use of non-standardized

abbreviations, CT request forms from outside our healthcare institution, or those requests submitted on non-standardized writing materials. All radiological request entries, not for CT but for example, ultrasound scan, MRI, and special radiographic examination, were also excluded.

The CT request forms assessed were shortlisted by the consultant radiologist, sorted, and the data was collected by looking or reading through the request forms to verify the information that was filled out on them.

The fields on the request form were deliberately subdivided into four groups to make data collection and analysis easier. The patient's name, age, gender, date of examination, hospital number, referring ward/clinic, personal telephone number, and address were the fields grouped under the patient's biodata. The fields relating to the patient's clinical information, such as indication for the study, provisional diagnosis, history of allergy, and last menstrual period (LMP), belonged to the second group. The third group included the healthcare provider's details, such as the name of the referring doctor, his/her signature, Dr's phone number, radiographer's signature, Dr's email, and the consultant in charge of the patient's care. The last group contained radiological and surgical history, such as previous x-rays, past surgical operations, type of CT examination requested, and the allotted CT numbers.

Level of completeness scores were computed for each CT examination of several body parts, such as the brain, abdomen, and chest. Completeness ratings across hospital departments were also documented, using information on CT referral forms received from A/E, EPU, SOPD, GOPD, POPD, and MOPD.

Data generated was analyzed using Microsoft Excel 2019 edition and Statistical Analysis Software (SAS) version 15 to determine whether the twenty-two (22) fields on the request form were filled out completely, incompletely, or not at all.

The health ethical committee of BSUTH approved the protocols.

RESULTS

During the study period, 327 CT request forms were reviewed. However, 24 did not meet the inclusion criteria and were excluded since they were not written on our hospital's request form but on other non-standardized writing materials. Only 303 submissions met the inclusion criteria and were analyzed, using CT referral forms of 192 (63.4%) males and 111(36.6%) female patients, with a male to female (M: F) ratio of 1.7:1.

The collated data was subjected to the completeness status of whether all the 22 fields on the CT request forms had been filled out completely, incompletely, or not at all. Table 1 shows the distribution of frequency and percentage scores for each field on the request form. The fields on all the 303 CT forms that are completely filled (100.0%) are the patient's name, ward, and type of CT examination requested, which account for only about 3 (13.36%) of the total 22 (100.0%) fields on the request form. The most incompletely (inadequately) filled fields were the indication for study and patient address on 47(15.5%) and 103 (34.0%) forms, respectively. The fields that were most common for having no entries consistently on all the 303 (100.0%) forms were the clinician's phone number and the radiographers' signature.

Figure 1 shows the distribution of completeness scores for each CT examination at Benue State University Teaching Hospital (BSUTH). Brain CT had the most completely filled fields on 252 (83.0%) forms, followed by abdominal CT scan 46 (15.0%), while chest CT 6 (2.0%) had the least.

Figure 2 depicts the distribution of CT form completeness ratings across hospital departments that referred patients to the radiodiagnosis department of Benue State University Teaching Hospital (BSUTH). The highest departmental completeness rating on CT request forms was 195 (64.4%) from the hospital's accident and emergency unit (A/E), while the CT completeness rating of 47 (15.5%) was achieved by the emergency paediatric unit (EPU), surgery outpatient department (SOPD) was 43 (14.2%), general outpatient

department (GOPD) 14 (4.6%), and MOPD 3 (1.0%). The least 1(0.3%) was by the paediatric outpatient department (POPD).

Table 1: Distribution of frequency and percentage scores for each field on the request form

Request Card Data	Complete (%)	Incomplete (%)	No Information (%)
A) Patient Biodata			
Name	303 (100.0)	0(0.0)	0(0.0)
Age	287 (94.7)	16 (5.3)	0(0.0)
Gender	285 (94.1)	18 (5.9)	0(0.0)
Date	290 (95.7)	9 (3.0)	0(0.0)
Hospital Number	281 (92.7)	21 (6.9)	1 (0.3)
Ward	303 (100.0)	0(0.0)	0(0.0)
Patient Phone	53 (17.5)	0(0.0)	250 (82.5)
Address	198 (65.3)	103 (34.0)	2 (0.7)
B) Clinical Information			
Indication for study	256 (84.5)	47 (15.5%)	0(0.0)
Provisional Diagnosis	203(67.0)	0(0.0)	100 (33)
Known Allergy	18 (5.9)	1 (0.3)	284 (93.7)
LMP	9(8.1)	1 (0.9)	101 (91.0)
C) Health care provider's details			
Name of referring Dr	272 (89.8)	30 (9.9)	1(0.3)
Dr signature	272 (89.8)	30 (9.9)	1(0.3)
Dr Phone number	0(0.0)	0(0.0)	303 (100)
Radiographer sign	0(0.0)	0(0.0)	303(100)
Dr email	13(4.3)	5 (1.7)	285 (94.1)
Consultant I/C	275(90.8)	0(0.0)	28 (9.2)
D)Radiological & Surgical history			
Previous X-ray	8 (2.6)	0(0.0)	295 (97.4)
CT examination type	303 (100.0)	0(0.0)	0(0.0)
CT Number	302 (99.7)	1 (0.3)	0(0.0)

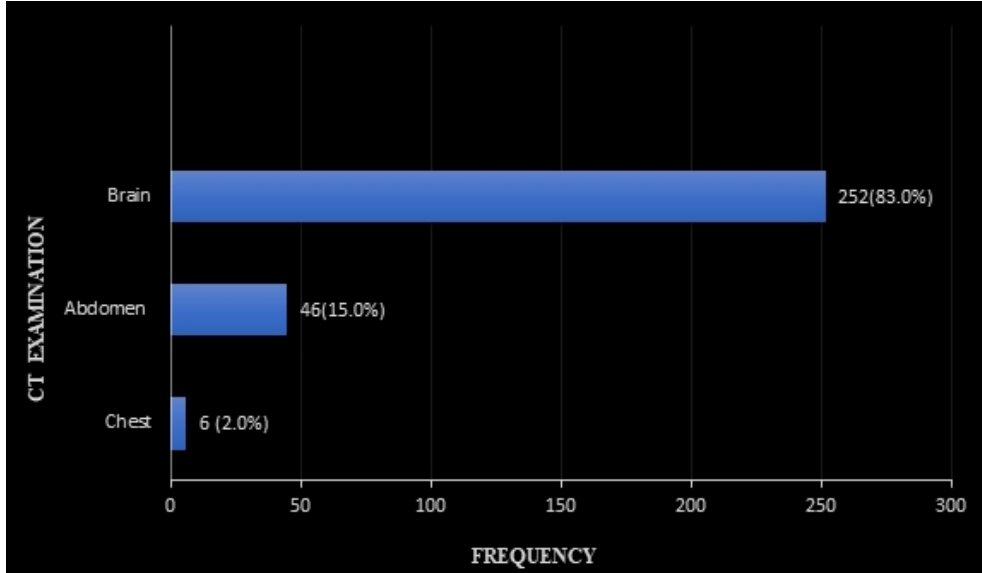


Figure 1: Distribution of completeness score for each CT examination

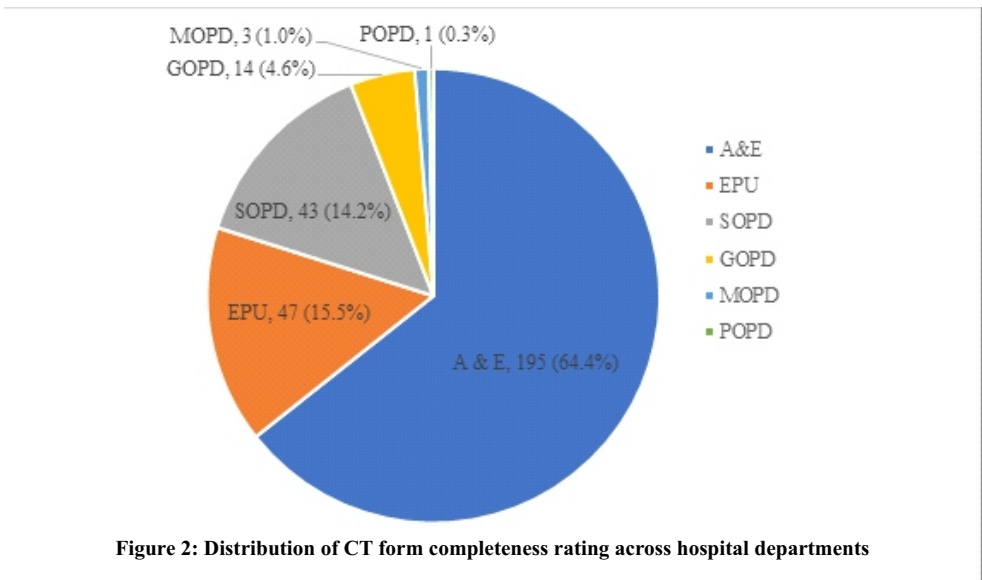


Figure 2: Distribution of CT form completeness rating across hospital departments

DISCUSSION

The analysis of 303 request forms revealed a poor compliance rate for the completion of CT referral forms at our hospital. Patient name, ward, and type of CT examination were the only fields that were completely filled out, accounting for just 3 (13.6%) out of the 22 (100.0%) fields on the CT request forms. In fact, none of the CT request forms reviewed were completely filled out, in line with previous reports by Akinola R *et al.*,¹⁰ Abubakar MG *et al.*,¹³ Irurhe NK *et al.*,¹⁴ Zafar U *et al.*,¹⁷ and Akintomide AO *et al.*¹⁹ This contradicted the findings by Despaquale R *et al.*,²⁰ who found out that 8 (4.0%) of the radiological request forms (RRFs) they examined were completely filled out. The disparity may have been occasioned by the researchers' use of a variety of imaging modalities as well as referrals from general practitioners and primary health care centers.

The eight fields on our CT referral form that comprise the patient's biodata aid in patient verification and tracing. They include the patient's name, age, gender, date of examination, hospital number, referring ward/clinic, personal telephone number, and address. Despite using a smaller sample size, the patient's name received complete filling 303 (100%) on all our CT forms, similar to prior research findings by Chitwiset S *et al.*⁴ The patient's age was filled completely on 287 (94.7%) of our CT request forms, but fell short of the 1000 (100.0%) achieved by Chitwiset S *et al.*⁴ Our percentage was, however, higher than the complete filling for age of between 29.0-92.4% reported by Eze JC *et al.*,⁶ Afolabi OA *et al.*,¹¹ Akintomide AO *et al.*,¹⁹ and Depasquale R *et al.*,²⁰ respectively. The disparity may be explained by the fact that the above researchers^{6,11,19,20} reviewed all RRFs rather than just CT referral forms. Majority of diseases are age-related, therefore, in order to select acceptable exposure factors and establish an accurate diagnosis, both the radiologist and the radiographer need to know the patient's age. On 285 (94.1%) of our CT referral forms, gender was completely filled in. This percentage was lower than what Chitwiset S *et al.*⁴ reported, but greater than that of prior researchers,^{15,17} most likely due to disparities in

sample size. Knowing the patient's gender is crucial because some clinical disease entities are gender-sensitive. 290 (95.7%) of our CT request forms had the date of referral completely filled in. While slightly higher, this percentage is comparable to the complete filling of this field of 91.1-92.0% in studies by Eze JC *et al.*⁶ and Irurhe NK *et al.*¹⁴ who experimented with a variety of imaging techniques. While the date of referral for an investigation may not have direct bearing on the radiological examination or reporting, when examinations are unduly delayed, the patient or the referrer may become unsettled and file a complaint, resulting in avoidable medico-legal disputes.^{14,21} When the information provided on the CT request form is insufficient, the hospital number, with a fill rate of 281 (92.7%) in our study, the patient's case notes, and his/her ward, come in handy. The radiologist can then look up more information in the patient's case notes or locate inpatients on the ward for additional clinical details using the hospital number. Previous researchers⁴ reported lower values of 537 (53.7%) for the patient's ward/clinic complete filling than we did (303, 100.0%). The patient's telephone number and address were the two least completely filled fields in this group on 53 (17.5%) and 198 (65.3%) CT forms, respectively. These two demographic fields allow for direct communication with the patient, and any missing information about them makes it difficult to identify for whom the investigation was intended.¹⁵ Our complete filling of the patient's address is higher than what Afolabi OA *et al.*,¹¹ Irurhe NK *et al.*,¹⁴ and Akintomide AO *et al.*¹⁹ reported in their separate reviews, with complete filling rates of 24 (11.9%), 39 (13%), and 62 (10.8%) respectively.

The four fields in our study that provide clinical information on the patient are: indication for study, provisional diagnosis, history of allergy and last menstrual period (LMP). A CT referral is typically seen as a request for a second opinion on a suspected clinical diagnosis. As such, it is critical that the study's exact indications, with complete filling of 256 (84.5%) in our

index study, be expressed precisely, without ambiguity.⁶ Before ordering a test, the referring doctor must have a question or provisional diagnosis in mind that the test can answer. This assists the radiologist in making an informed decision.^{6,14} The provisional diagnosis field was completely filled in 203 (67.0%) CT referral forms in our review. The least completely filled fields in this group were the history of known allergies and the last menstrual period (LMP) at 18/303 (5.9%) and 9/111 (8.1%), respectively. Both fields also doubled as the most prevalent blank entries. Any previous drug or contrast allergies should be disclosed to the radiologist, because it is his duty to ensure the safety of patients before undertaking radiological procedures.¹⁷ Chitwiset S *et al*¹ reported approximately 46 (45.8%) complete fillings for contrast allergy, a percentage value that is much higher than ours, most likely due to their sample size, which more than tripled that of our index study. Knowledge of the last menstrual period (LMP) in a woman of reproductive age aids in radiation protection of the unborn baby. This field, however, is frequently overlooked, with only 2.118.9% of it completely filled in earlier studies.^{4,6,13,19}

All CT requisitions should, include the healthcare provider's details such as the physician's name, his/her signature, phone number, email, the consultant in charge and the radiographer's authentication, for ease of communication. The name of the referring doctor was completely filled on 272 (89.8%) of our CT forms, which is lower than the 94 (93.7%) reported by Chitwiset S *et al*,⁴ but higher than those of previous researchers.^{15,20,22} The physician's signature which further validates the requests, was found in 272 (89.8%) of our CT forms, which was in line with the percentage value 395 (89.0%) reported by Anjum H *et al*.¹⁵ Researchers who used RRFs^{14,20} rather than CT forms reported higher percentages of 97.7- 100.0% for this field. The doctor's phone number and the radiographer's signature were the most neglected fields in this group, as they were left blank on all our request forms. For the Dr's phone number, our findings were not in agreement with the 31 (31.4%) filling of this field by Chitwiset S *et al*.⁴, while Akinola R *et al*,¹⁰ reported

that less than 1% of radiographers complied with complete filling of the form, which in a way corroborated our finding. Dr's email was the next item that was poorly completely filled in 13(4.3%) of our CT request forms, leaving 285(94.1%) blank spaces without information. The consultant's name has been completely filled on 275(90.8%) request forms in our research. Iruhe NK *et al*¹⁴ reported a higher filling rate of 299(99.7%), utilizing a wide range of imaging modalities. However, our result was higher than the 51.3-73.2% reported by previous researchers.^{4,6,13} The consultant's identity is essential, because the patient is under his care. He must also be easily contactable in the event of an emergency.⁶

To arrive at an informed conclusion, the radiologist should know the patient's medical history, including the history of previous x-rays and surgeries, as well as the type of CT examination requested and its CT number. The two poorly completed fields in this group were the history of previous x-rays and surgeries, which were found on only 8 (2.6%) and 17 (5.6%) of our CT forms, respectively. The pattern of poor compliance rate for completion of the field of previous x-rays was also seen in earlier researches^{10,19}. Afolabi OA *et al*¹¹ reported a much higher complete filling of this field at 72 (35.6%). Instead of looking at just the CT forms, majority of the studies above^{11,19} reviewed all the request forms from departmental archives. The past surgical history, in prior studies, was provided in only 10 (3.3%) and 2 (0.4%) of the forms, respectively.^{14,19} When compared to our research, these values are lower. While previous examination may be required for comparison in order to determine the progression of a clinical condition, previous surgeries remind the radiologist about the best study approach and suitable interpretation of any tissue/anatomical deformation.^{4,17,19} In our study, the type of CT examination and its CT number received the best complete filling of this group on 303 (100.0%) and 302 ((99.7%) request forms, respectively. Zafar U *et al*,¹⁷ reported that the name of the CT examination was present in 299 (99.7%) of the forms, which is consistent with our study.

In our study, brain CT had the highest completeness

score of 252 (83.0%), followed by abdominal and chest CTs with 46 (15.0%) and 6 (2.0%), respectively. This was in contradiction to findings by Rawoo R *et al.*,¹ who reported that completeness scores for brain, abdomen, and chest CT were 10 (67.0%), 13 (83.0%), and 11 (73.0%) correspondingly. This is partly at the discretion of the referring clinician, who filters and simplifies the patient's symptoms, signs, and clinical indications based on the body part to be examined, as well as the type of CT requisition, while seeking answers to the patient's questions or fundamental differential diagnosis from the radiologist.¹ Other studies^{14,16} indicated that the examined body parts received acceptable filling.

The best departmental completeness rating on CT request forms was 195 (64.4%) from A/E, while the least was 1 (0.3%) from the POPD, according to our survey. This was consistent with a study by Iruhe NK *et al.*,¹⁴ but at variance with that of Eze JC *et al.*,⁶ which documented that the majority of completed forms came from the OPD, with the A/E providing the least 34(4.5%). The discrepancies could be due to institutional record-keeping practices, loss, misplacement, or misfiling of case-notes, or as a result of the hospital's variation of types of patients to its specific units such as A/E.⁶

CONCLUSION

We reviewed 303 CT request forms at the radiology department of BSUTH and it was observed that there were major omissions (19;86.4%) and only moderate compliance (3;13.6%) with the complete filling of the 22 (100.0%) fields on the request forms. Clinicians must endeavor to offer all the necessary information to identify the patient, ensure patient safety, provide an accurate diagnosis, and justify the need for a CT scan. There is also a need to employ standardized request forms that contain all the relevant fields because the radiologist's report will be dependent on the clinical information from the referring clinician. This study also found that request forms are by far the most simple and effective means for referring physicians and

radiologists to interact and share vital information. While the departmental completeness rating achieved by our A/E unit at BSUTH is far from ideal, it is nonetheless commendable. However, the POPD fared poorly (0.3%). This calls for the promotion of departmental awareness right from the undergraduate days through clinical radiology lectures, aggressive continuing medical education (CME) and continuing professional development (CPD) sessions. In addition to all these measures, radiology departments should out rightly reject uncompleted or inappropriate request forms in order to enforce standard radiological practice. We believe that the findings of our index study would inspire radiologists to audit CT request forms and possibly all other RRFs on a more regular basis in order to improve the accuracy of CT examinations and diagnoses, allowing for more effective patient management without unnecessary investigations or radiation exposure.

Recommendations

To improve the CT referral process, healthcare stakeholders such as the chief medical director (CMD), chairman medical advisory committee (CMAC), consultants, senior registrars, registrars, and house officers should be made aware of our research findings as well as the risks they pose, while also emphasizing the need to reform our hospital's current referral procedure.

Radiological record staff should be instructed to return any inadequately completed forms prior to their filling into the departmental archives. This must, however be done with utmost caution, to reduce patient suffering while maintaining safe radiological practice.

If clinicians are unsure of the best investigation for their patients, the free awareness material and leaflets promoted by The International Atomic Energy Association (IAEA) called "the 10 pearls promoting safe referral for CT examinations,"²³ are a good educational tool that could be used to raise clinicians' awareness about radiation dose from radiological investigations.

Alternatives to this campaign include orientation

lectures, continuing education workshops, best practice booklets, and the deliberate attachment of educational notes to radiologists' reports, reminding clinicians and clients of the dangers of radiation from unjustifiable CT tests.

Conflict of interests

The authors have no such disclosures.

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