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**AN AUDIT OF COMPLETENESS OF CT SCAN REQUEST FORMS**

**A RETROSPECTIVE HOSPITAL BASED DESCRIPTIVE CROSS-SECTIONAL STUDY**

**AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA**

A research to be submitted to Addis Ababa University College of Health Science, Department of Radiology for partial fulfillment of the requirement for the specialty program in radiology.

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## **Abbreviation**

- **A.A.U** = Addis Ababa University
- **T.A.S.H**= TikurAnbesa Specialized Hospital
- **IRB**= Institutional review board
- **CT scan**= Computed tomography scan
- **S. No.**= Serial number
- **MRN**= Medical record number
- **US**= Ultrasound scan
- **CME**= Continuous medical education

## **ABSTRACT**

### **Background:**

Radiologic request forms are the most important, may be the only formal, means of communication tool between the clinicians and the radiologists/radiographers. Many research evidences showed that incompletely filled radiology forms resulted in deteriorating the quality of patient care given by the specific health institution. It is a worldwide practice to do clinical audit in order to improve patient care in a medical institution, hence; including auditing of completeness of radiologic request forms is one approach to improve patient care.

The aim of this study was to audit the completeness of CT request forms sent from different units and departments of our institution, TASH.

**METHODS AND MATERIALS:** I scrutinized the CT scan request forms received at Radiology Department, radiology reporting unit, TASH, from 15<sup>th</sup> July to 15<sup>th</sup> August 2017. Descriptive study design was applied to assess for the frequency of completeness of the request forms indicated by referring physicians.

A nonprobability Quota sampling method was used to select 300 request forms over a period of one month. The patient name, age, address, MRN, ward, clinical background (diagnosis), anatomic location to be imaged and the name and signature of referring clinician were considered as the minimum contents of the request form which were compiled in a structured blind ended questionnaires and analyzed via SPSS version 20 and frequency and percentages were obtained.

**RESULTS:** The study generally demonstrated many of the data on the request form were incompletely filled. The patient name, fathers' name, age, gender, anatomic location to be imaged and MRN were the highest filled data in all the requests with a frequency of 100%, 100%, 100%, 100%, 100% and 296/300 (98.7%) respectively. In contrary, the least filled data were relevant laboratory data, patients' address, physicians address and previous imaging history which revealed 1/300 (0.3%), 13/300 (4.3%), 15/300 (3.0%) and 52/300 (17.3%) filling rate, respectively. The referring unit was filled in 117 (39%) while the clinical diagnosis was mentioned in 138 (46%) of the cases. Of 300 request analyzed 279 (93%) had referring physicians name and 295 (98.3%) had their signature.

**CONCLUSION:** The completeness of the CT scan request forms was substandard and it should be improved.

**Key words:** Request forms, CT scan, Communication tools, Completeness, Assess.

**General objective:**

To audit the completeness of CT scan request forms that are referred to the radiology department from different departments and units in TASH.

**Specific objective:**

To assess whether the forms were properly filled or not

To compare the results obtained from the study against the reviewed studies done in another hospital and with the expected 100%.

## **1. Introduction:**

Clinical audit, including assessment of completeness of radiologic request forms, is a systematic review and analysis of current practice against standards in order to improve the quality of care by implementing a change if relevant [3]. Radiologic request forms are the most important, may be the only formal, means of communication between the clinicians and the radiologists/radiographers. These request forms contain the patients' biodata and clinical background, among other informations included, which are very helpful in the wholistic interpretation of radiologic images and give optimal and relevant reports. Accordingly, their complete, proper and adequate filling of the columns of information on the request form with legible hand writing are; hence, of paramount importance for providing optimal and appropriate radiologic investigation, to give appropriate diagnosis/differential diagnosis and avoid unnecessary radiologic procedures and radiation exposure. These in turn facilitate timely, cost effective and appropriate provision of patients' medical care. In contrary, inadequate information can reduce the value of the report and can also lead to mistakes in patient identification and delay in returning reports to the correct destination. Of course, it has been documented that there is a correlation between the quality of radiology requisition and the clinical outcome of patients in the intensive care unit [4]. Therefore; it is one among the pillars of improving patients' care and management.

Although there is no universal template for radiology request forms, it is expected that a standard form should conform to the guidelines by the Royal College of Radiologist and Ionizing Radiation [5, 6].

Even though its significance is obvious and cannot be denied, there is no unique standardized format for radiology request forms available. Therefore, each organization usually develops individualized versions. However, it is mandatory that all request forms prescribed should contain the patient's name, age, address, MRN, telephone number, ward, clinical background, imaging modality requested, the specific question to be answered, the name and signature of referring clinician and the name of the consultant responsible for patient's care [7]. The Royal College of Radiologists has periodically issued guidelines regarding completion of radiology request forms, one of which states: Requests should be completed accurately and legibly to avoid any misinterpretation [8].

According to the relevant articles of the Radiation Protection Regulations of European Union Nations, the referring doctor has the responsibility for the collection of all diagnostic information that justifies the requested radiological examinations as well as information about previous exposures.

## **2. Literature Review**

In a research done at our hospital, TASH on the completeness of US requests forms on a total of 218 requests. It revealed that 100% of the request had patients' name, 97.7% had father' name, 77.7 had patients' age and 75.2% had patient's gender specifications. The patients, MRN were specified only in 86.7%; detail clinical data were given in 84.4% of the cases. Requesting physician name was mentioned in 83.3% of the requests while only 3.7% and 2.8% had filled the column for the relevant laboratory data and previous exposure history, respectively [9].

There was also a study done in Khartoum Sudan at five government hospitals and one private centers which evaluates the completeness of radiologic requests forms. Among the five institution the study done at the Khartoum military hospital on 50 x-ray request forms showed that 74% had patients' full name, patients' age in 80%, gender in almost 90%, indication for the procedure in 75%, clinical data in 8%, date of request in about 95%, previous exposure in nearly 8% and requesting physicians name in 90% of the cases [10].

In a study conducted in a teaching hospital in Makurdi, North Central Nigeria, on the assessment of the adequacy of filling of radiologic request cards. This assessment involved 163 consecutive x-ray request forms and demonstrated that complete/adequate frequency on age, sex, unit number, ward and address were 155(95.1%), 137(84.0%), 131(80.4%), 118(72.4%), 70(42.9%) respectively. While incomplete/inadequate frequency were 8(4.9%), 26(16%), 32(19.6%), 45(27.6%), 93(57.1%) in the same sequence. One hundred and sixty-three (100%) mentioned the specific part of the body to be investigated on the request card. Clinical information and clinical assessment were 99.4% complete/adequate and had 0.6%

incomplete/inadequate for both respectively. On filling of the space allotted to past surgical and radiological history on the request card, only 4(2.5%) had complete and adequate information on history of previous X-rays of the request card [11].

Similar another Nigerian research conducted on the compliance rate of adequate filling of radiologic request forms in Lagos university teaching hospital, Nigeria which studied 300

request forms prescribed for x-rays, US and CT. The result indicated that surname, other names and examination requested were the highest filled while relevant previous operation was the least filled data. Provisional diagnosis, referring doctor's name/signature and date of referral were provided in 90%, 98.7%/97.7% and 92%, respectively [12].

In a study undertaken at the department of radiology, Khyber teaching hospital, Peshawar, KPK, Pakistan on the adequate filling of CT scan request forms on a total of 444 requests, it was revealed that name of the patients was mentioned in all, sex in 67% but address in 13% only. Clinical history was provided in 79.5%, probable clinical diagnosis was mentioned in 30%, and specific question was asked in 35%. The writing was illegible in 8.6% and non-standardized abbreviations were used in 6.5%. Renal functions were mentioned in only 1.5% of those scans requiring intravenous contrast. Referring clinician name was mentioned in 18% only, however signature was done in 89% of the request forms. History of allergy was missing in all requests [13].

Again similar investigation done in James Cook university hospital, UK which included 50 x-ray, 50 US and 50 CT scan, a total of 150 requests demonstrated that there was relatively low interest in providing contact detail on the cards. However, identifier of the person requesting the study achievement was 100%. Clinical information in terms of brief history and relevant clinical examination were deficient generally in all request forms which were 82.7% and 90.7%, respectively. A more detailed analysis of the results showed that clinicians making requests tend to provide less information on X-ray request forms than ultrasound scans and CT scans. 22% of X-ray cards didn't contain request maker contacts. This was fairly similar to 20% in CT scan request forms. However, providing provisional diagnosis and/or the question to be answered by the study was deficient in 22% in X-ray request forms as compared to only 2% in CT scan forms. And they concluded that doctors' practice in providing the needed information varies with different radiological studies [14].

### **3. Significance of the Study**

The importance of complete and accurate request forms cannot be overemphasized as it reduces the number of unhelpful radiographic examinations performed, avoid unnecessary delay and aids concise radiological diagnosis. In our practice, we have noticed that most of the radiologic request forms referred to our department are incompletely filled and some have illegible handwriting and nonstandardized abbreviations. Incomplete, inaccurate and illegible handwriting requests was found to have low diagnostic yield, a high radiation dose and are mostly unjustified [15,16]. This may also lead to misdiagnosis, delay of patient's diagnosis, increase in the medical cost and mismanagement and all these in turn significantly reduces the quality of medical care given. All studies reviewed also showed that this is a global problem. IAEA reported high global number (up to 77%) of unjustified radiological examination which is most of the time occurred due to incomplete request forms. There is no such a research done, as to my knowledge, with the recent introduction of the CT scan, we regularly encounter incompletely filled forms in our everyday practice. Therefore; undertaking such a study is of paramount importance to know our status and compare against the internationally observed values and establish a representative data for future auditing. It is on the basis of this that we attempted to audit the adequacy of completion of request forms received at radiology department of TASH, AAU-Ethiopia.

### **4. Methodology and Materials**

Retrospective hospital based descriptive cross sectional study was conducted to audit completeness of radiologic request forms at the radiology department in T.A.S.H. The study will include all request forms presented to the radiology department, image reporting unit, requested from different departments and units in TASH.

#### **4.1. Study area**

The study was conducted in Addis Ababa, the capital of Ethiopia in Tikur Anbesa Specialized Hospital at the department of radiology. The hospital is administered by A.A.U and it is the oldest teaching hospital. The hospital has 800 beds, 130 specialists, and 150 nonteaching staff and provides medical service for approximately 370,000-400,000 patient every year. It is estimated that about 40-50 CT scan is done each day at the department. It also provides teaching for over 300 medical students and 350 residents every year.

#### **4.2. Study period**

The study was conducted from July 15, 2017 to August 15, 2017.

#### **4.3. Study design**

Retrospective hospital based descriptive cross sectional study.

#### **4.4. Source population**

All CT scan request forms referred to the radiology department of T.A.S.H during the study period.

#### **4.5. Study population**

All CT scan request forms available during the study period and fulfill the inclusion and exclusion criteria.

#### **4.6. Sampling technique and sample size**

All CT scan request forms that came to the radiology department between July 15, 2017 and August 15, 2017 were assessed and the sample size was determined by the nonprobability convenient sampling method. The findings were filled on a standardized questionnaire prepared by the principal investigator.

#### **4.7. Data Collection procedure**

Data was collected through standard questionnaires, prepared by the principal investigator, by the radiologic technologist working at the imaging unit. This was done during working hours and the principal investigator supervised and aided the activity.

#### **4.8. Methods of data analysis**

The collected data was checked for clarity and completeness and then organized and recorded. Finally, it was analyzed using SPSS version 20 and the result was presented in figures and tables.

#### **4.9. Inclusion criteria**

All CT scan request forms from different departments and units of TASH.

#### **4.10. Exclusion criteria**

All CT scan request forms referred from other institution (which is not from TASH).

#### 4.11. Ethical Consideration

- Ethical permission was sought from the department of Radiology, college of health sciences, AAU and ethical clearance request from the IRB was granted.
- Patient's and referring physician's names was omitted from the checklist.

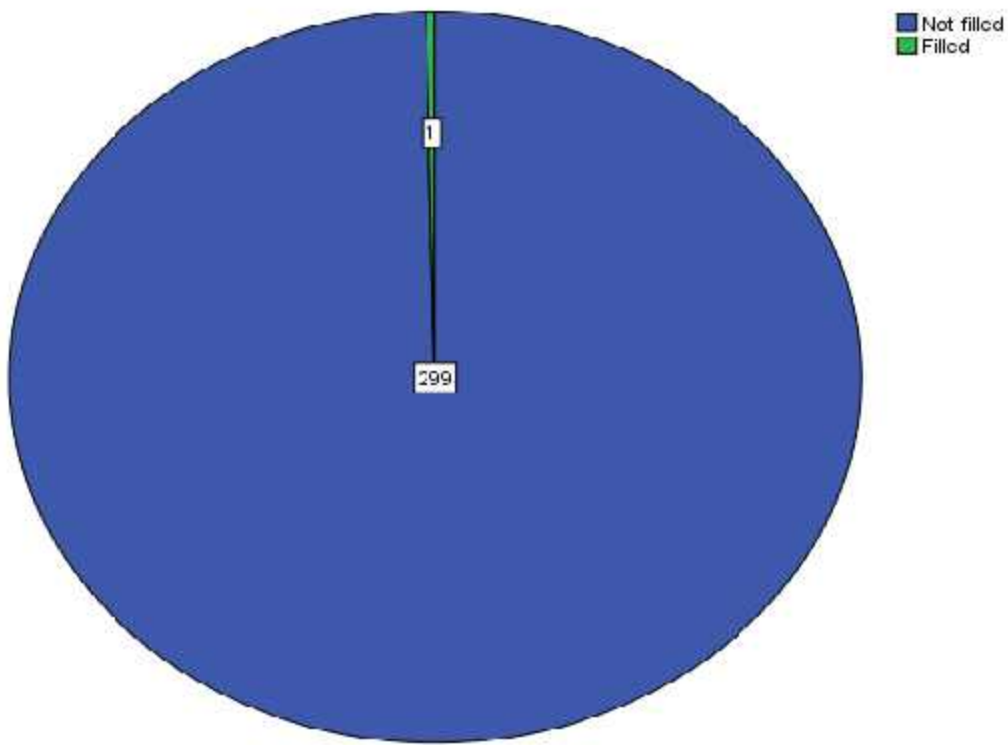
#### 5. Results

Hundred percent achievement of complete filling of the request form was demonstrated by the columns for the patient name, father name, gender and age of the patient and anatomic part to be imaged. The next highest frequencies were achieved by the date the examination requested, the MRN of the patient and the physician signature requesting the study which had the filling rate of 299/300 (99.7%), 296/300 (98.7%) and 295 (98.3%), respectively. The next high filling rate was accomplished by the column for the requesting physicians name where 279/300 (93%) the request form had completed the filling. The patient's address was given in only 13/300 (4.3%) of the requests and 287 of them never mentioned it (Table 1).

**Table 1: Biodata information**

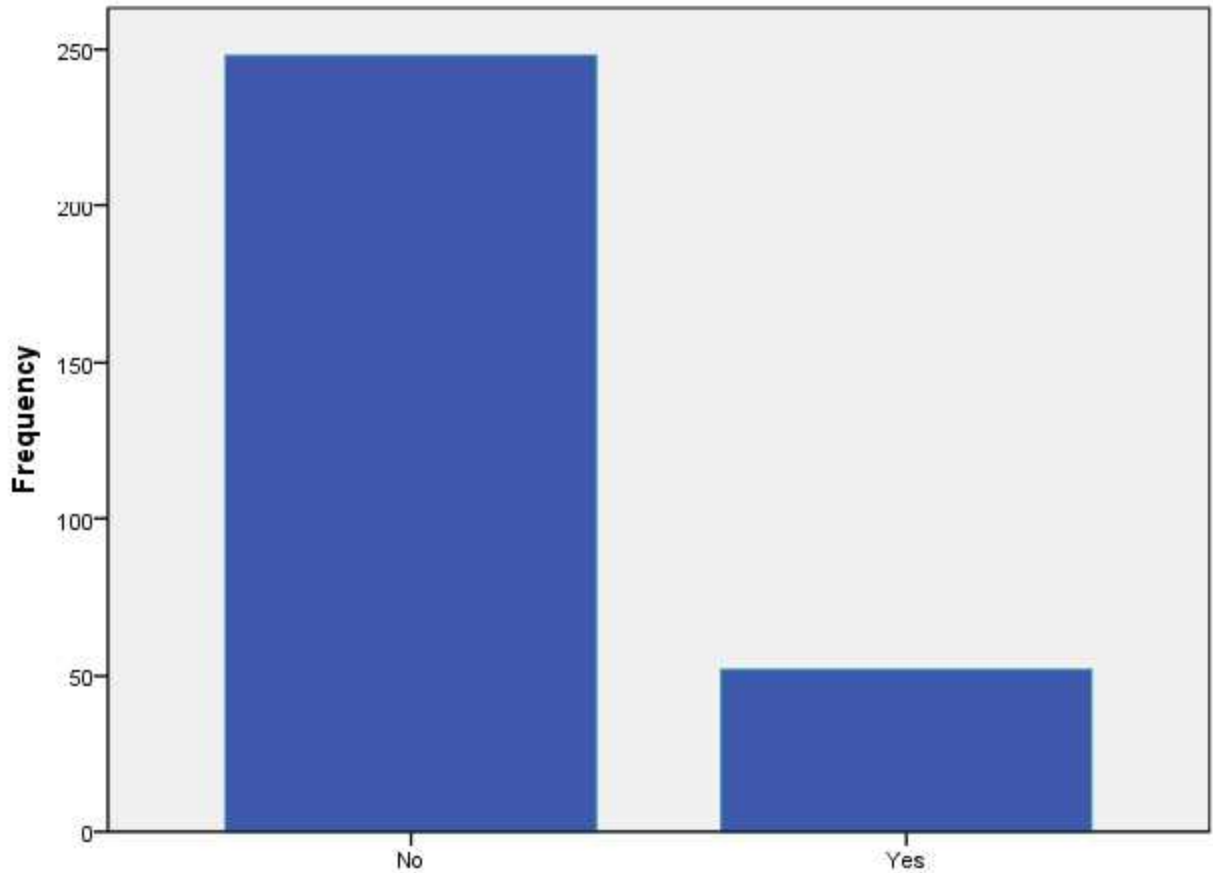
Biodata	Completely filled frequency	Incompletely filled frequency	No information frequency
Patient name	300 (100%)	Nil	Nil
Patient father's name	300 (100%)	Nil	Nil
Patient age	300 (100%)	Nil	Nil
Patient gender	300 (100%)	Nil	Nil
MRN	296 (98.7%)	4 (1.3%)	Nil
Department/unit	117 (39%)	183 (61%)	Nil
Patient address	13 (4.3%)	287 (95.7%)	Nil

The least filled one is the relevant laboratory information demonstrating only one (0.3%) out of the three hundred requests of the request had its column completed for this data (Fig. 1).



**Fig 1. Relevant laboratory information**

One hundred and thirty-eight (46%), one hundred and twenty-one (40.3%) and one hundred and seventeen (39%) of the request had given the clinical diagnosis, patients status (whether ambulatory, on wheelchair or stretcher) and the unit/department requested the scan, respectively while 15/300 (5%) wrote the requesting physicians address. Of the 300 requests 90 (30%) of them mentioned history of allergy and 95 (31.7%) of them indicated previous contrast reaction. However, only 52/300 (17.3%) mentioned previous imaging history (Fig 2).



**Fig 2. Previous maging history completed**

On the filling of the space allotted to the name and signature of the radiographer/radiologic technologists who underwent the procedure 62/300 (20.7%) had their name and 103/300 (34.3%) had their signature (Table 2).

**Table 2: Rate of filling of radiographers'/technologists name & signature**

Variables	Completely filled	Incompletely filled
Radiographers/technologists name	62 (20.7%)	238 (79.3%)
Radiographers/technologists signature	103 (34.3%)	197(65.7%)

The study also revealed that 21/300 (7%) of the final report of the request were normal indicating the potentially avoidable exposure risk if proper clinical procedures and complete filling of the

requests were followed. Table 3 shows the filling rates the minimum content of a CT scan request form should contain and compares it against the standards.

**Table 3: Completion rates of the minimum contents of a CT scan request forms.**

S. No.	Variables	Completely filled	Expected standards
1.	Patient name	300 (100%)	100%
2.	Age	300 (100%)	100%
3.	Patient address	13 (4.3%)	100%
4.	MRN	296 (98.7%)	100%
5.	Department/unit	117 (39%)	100%
6.	Clinical information	138 (46%)	100%
7.	Anatomy to be imaged	300 (100%)	100%
8.	Name of requesting physician	279 (93%)	100%
9.	Requesting physician's signature	295 (98.3%)	100%

## 6. Discussion

In this era of ever advancing technology, medical care is becoming more dependent on different type of imaging modalities which are by themselves rapidly growing and being more influenced by the computer technology. Physicians often need the help of radiological investigations and radiologists to settle patients' diagnosis and contemplate proper, targeted, efficient and cost effective patient management. As it is always said optimal patient care can be achieved if team approach between different departments is established in the health care centers. Unfortunately, this is not usually the case as there is little opportunity to discuss cases among the concerned departments. And radiological request forms are usually the only means of communication between a radiologist and a clinician. Hence, complete and proper filling of radiological request forms should be given due emphasis in order to get best results in terms of accurate radiologic diagnosis or differential diagnosis and to avoid un-necessary medical care delay &/or management, cost and radiation exposure. This audit has revealed that the CT scan request forms are inadequately filled. Some of the CT scans could have also possibly been avoided.

The importance of biodata details cannot be over emphasized as it is well documented that radiologic image interpretation and list of image based diagnosis/differential diagnosis usually

influenced by these data and it also important to trace the patient. This study demonstrated 100% filling rate of Patient's name and father's name which is similar to results reported by other studies (9, 11, and 13). The age and gender of the patient was also best filled data (100%) and it demonstrated a higher filling rate of 77.7% & 75.2%, 80% & 90% and 67% & 67%, respectively as compared to other studies reported (9,10,13). Patient's MRN was also complete in 98.7% which again revealed better outcome compared to 86.7% and 80.4% reported by other studies (9,11). The department/unit referring the patient was mentioned in 39% of the cases which is less than 72.4% that is reported by the study done in a teaching hospital in Makurdi, North Central Nigeria (11). The address of the patient is the least completed column (4.3%) demonstrating lesser rate to 13% and 42.9% (13,11). Evidence suggests that provision of relevant clinical information is associated with more accurate radiological report which in turn aid the referring physicians in establishing the clinical diagnosis and recruiting appropriate, on time and cost effective management of the patient (18). Adequate clinical information was provided in 46%. Royal college of radiologist has recommended that all radiology request forms should address questions posed by referring clinician to justify radiation exposure and help the radiologist narrow the differential diagnoses (5). Literatures show a highly variable percentage of asking specific question in radiology request forms i.e. 8%, 84.4%, 90%, 99.4%, 79.5% and 82.7% (9, 10, 11, 12, 13, and 14). The relevant laboratory results demonstrated worst filling rate of 0.3% which is far less than reported 3.7% by a research done at our hospital, TASH on the completeness of US request forms (9).

The specific anatomic site to be imaged had a filling rate 100% which is also similarly reported as 100% in another study (11).

The significance of knowing the name of the referring doctors lies on when further clinical information is required, to discuss with and inform alternative and better imaging modalities or if there is a finding revealing emergency/life threatening condition requiring to intervene urgently. The name of the physician was indicated in 93% of the forms which is fairly similar to most of the reviewed literature (9, 10, 12, 13, and 14).

The signature that makes the requesting physician more accountable and further authenticates the request was provided in 98.3% which is near to 97.7%, 89% and 100% in other studies (12,13,14).

Seven percent of the CT scan reports revealed normal reports which are potentially avoidable prescription indicating poor clinical judgment on part of the physicians. However; it is also important to remember that some subtle lesions like hyper acute stroke and white matter lesions can be missed on CT scan. Literature demonstrated that up to 20% - 26.5% of the radiological exposures are unhelpful (13, 19).

### **7. Conclusion:**

The practice of filling of the CT scan request forms by the physicians was incomplete which may root from the lack of its importance and emphasis and encouragement should be given to improve.

### **8. Recommendations:**

Patient centered multidisciplinary approach should be promoted and physicians need to be given feedback by radiologist to improve clinical judgment and avoid unnecessary radiological investigations.

Conduct meetings with different departments/units in TASH to disseminate and discuss the findings of this audit and create awareness on the importance of completing the request forms.

In specific & more serious situations send back the request forms and communicate & discuss with the requesting physician.

The undergraduate clinical radiology training program should be emphasized and strengthened and the importance of the radiologic request forms should be elaborated and discussed.

Raising awareness of this and the need for compliance with filling of request cards can also be achieved during CME.

Discuss with the IT experts in order to create and use electronic request forms which can prevent sending incomplete prescriptions.

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## 8. Annexes

### 8.1. Questionnaires

1. Patient's name: Yes:  No:
2. Father's name Yes:  No:
3. Age: Yes:  No:
4. Gender: Yes:  No:
5. Address: Yes:  No:
6. Requested anatomic body part: Yes:  No:
7. Referring unit/department: Yes:  No:
8. MRN: Yes:  No:
9. Status of the patient: Ambulatory:  Bed:  Not mentioned:
10. Date of examination requested: Yes:  No:
11. Relevant Clinical data: Yes:  No:
12. Relevant lab information: Yes:  No:
13. Requesting physician: Yes:  No:
14. Requesting physician's signature: Yes:  No:
15. Referring physicians address: Yes:  No:
16. History of allergy: Yes:  No:
17. History of previous IV contrast reaction: Yes:  No:
18. Previous imaging history: Yes:  No:
19. Radiologic technologist's/Radiographer's name: Yes:  No:
20. Radiologic technologist's/Radiographer's signature: Yes:  No: