



# Perception of Clinicians about Diagnostic Radiological Errors in the University of Science and Technology Hospital, Sana'a - Yemen

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## ABSTRACT

**Objective:** To identify the magnitude and causes of radiological errors as perceived by resident and consultant clinicians in the University of Science and Technology (UST) Hospital, Sana'a -Yemen.

**Methods:** A questionnaire-based survey was used to assess the magnitude and causes of radiological errors. It was distributed among all clinicians in UST Hospital.

**Results:** Of 40 residents and consultants from the UST Hospital invited to participate in the present study, 52.5% agreed to join the study. Of them, 81.0% reported the notice of diagnostic radiological errors during their daily practice, where the majority of daily noticed errors (64.7%) were in the range of 1–10 diagnostic errors. More than half of radiological errors were reported in the interpretation of ultrasound, and abdomen was described as being the most frequent body part with diagnostic radiological errors (65.0%). The respondent clinicians thought that poor communication between radiologists and clinicians was the most frequent cause of diagnostic errors, being reported by 29.0% of clinicians. However, 24.0% and 19.0% of clinicians attributed errors to the lack of experience and knowledge of radiologists, respectively.

**Conclusions:** Errors in radiological diagnosis are still common in Yemen. Establishing a good healthcare system with a proper communication between the radiologists and clinicians is critical to identify and minimize these errors. Peer review and hands-on training are important for newly joined radiologists.

**Keywords:** Radiological error, Perception, Ultrasound, CT scan, X-ray, Resident, Consultant, Sana'a

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## 1. Introduction

Errors in medical practice are common and have an impact on the patients' care. In radiology, these errors are common. Therefore, radiologists should be able to identify all abnormalities in radiological images and come up with proper diagnosis. Good clinical background is important to tailor the radiological diagnosis (1). It has been reported that 4.0% of the radiological interpretations have errors. Although some of them have minor outcomes, others can result in legal issues (2).

Errors in radiology may come from both improper reading (observation) and interpretation, which depend on knowledge, skills and experience of radiologists. These errors may also result from failure to manage the case and suggest the next step in management, or failure to communicate with the clinician (1). In problem case conferences between 1986 and 1990, various sources of radiological errors were reported, including poor perception, interpretation and communication in radiology (3).

Identification of the problem and its causes is crucial to improving healthcare systems. Hence, the present study aimed to investigate the perception of residents and consultants about diagnostic radiological errors in University of Science and Technology (UST) Hospital in Sana'a, Yemen. It also aimed to identify the magnitudes of the problem and its causes and to suggest suitable solutions for improving healthcare in the UST Hospital.

## 2. Methods

### 2.1 Study setting, subjects and ethical considerations

The study was conducted in the UST Hospital in the period from January to February 2015 as

part of a previous study (5), which focused on the diagnostic radiological errors in major hospitals in Sana'a, Yemen. However, the present study was limited to the UST Hospital for the purpose of quality improvement in Radiology Department.

All clinical residents and consultants in the UST Hospital were asked to voluntarily participate in this study. Informed consent was obtained from those who agreed to participate after a clear explanation of the study objectives. The protocol of the study was approved by the Ethics Committee of the Faculty of Medicine and Health Sciences, UST, Sana'a - Yemen.

### 2.2. Data collection and analysis

A hospital-based survey was used to collect data about the perception of residents and consultants about diagnostic radiological errors that are encountered during daily practice in UST Hospital using a pre-designed questionnaire. The questionnaire was composed of three sections: participants' demographic characteristics, description of encountered errors and the possible causes of such errors as perceived by the study participants.

Data analysis was performed using the IBM SPSS Statistics, version 20.0 (IBM Corp., Armonk, NY, USA). Frequencies of errors were calculated and data were presented in tables and graphs.

## 3. Results

Of 40 residents and consultants in the UST H invited to participate, 21 agreed to join the study (a response rate of 52.5%). Of them, 85.7% were males and 66.7% were consultants from different disciplines. Most of the participating clinicians had experience of more than five years (85.7%) and had been working in the UST Hos-



pital since more than five years (57.1%) (Table 1).

**Table 1.** Characteristics of study participants (N= 21)

Variable	n (%)
<b>Gender</b>	
Male	18 (85.7)
Female	3 (14.3)
<b>Clinician role</b>	
Consultant	14 (66.7)
Resident	7 (33.3)
<b>Specialty</b>	
Internal Medicine	8 (38.1)
Surgery	6 (28.7)
Pediatrics	4 (19.0)
Obstetrics & Gynecology	1 (4.7)
Others	2 (9.5)
<b>Experience (years)</b>	
< 2	0 (0.0)
2–5	3 (14.3)
> 5	18 (85.7)
<b>Work in the UST Hospital (years)</b>	
< 2	2 (9.5)
2–5	7 (33.3)
> 5	12 (57.2)

The majority of participants (81.0%) reported the notice of diagnostic radiological errors during their daily practice, where the majority of daily noticed errors (64.7%) were in the range of 1–10 diagnostic errors. More than half of radiological errors were reported in the interpretation of ultrasound, and abdomen was described as being the most frequent body part with diagnostic radiological errors (65.0%) (Table 2).

Regarding the possible cause of diagnostic radiological errors, poor communication between radiologist and clinician was the most frequent cause, being reported by 29.0% of participants; followed by lack of experience or knowledge of radiologists, 24.0% and 19.0%, respectively (Figure 1).

**Table 2.** Description of diagnostic radiological errors encountered by residents and consultants in the UST Hospital, Sana'a (2015)

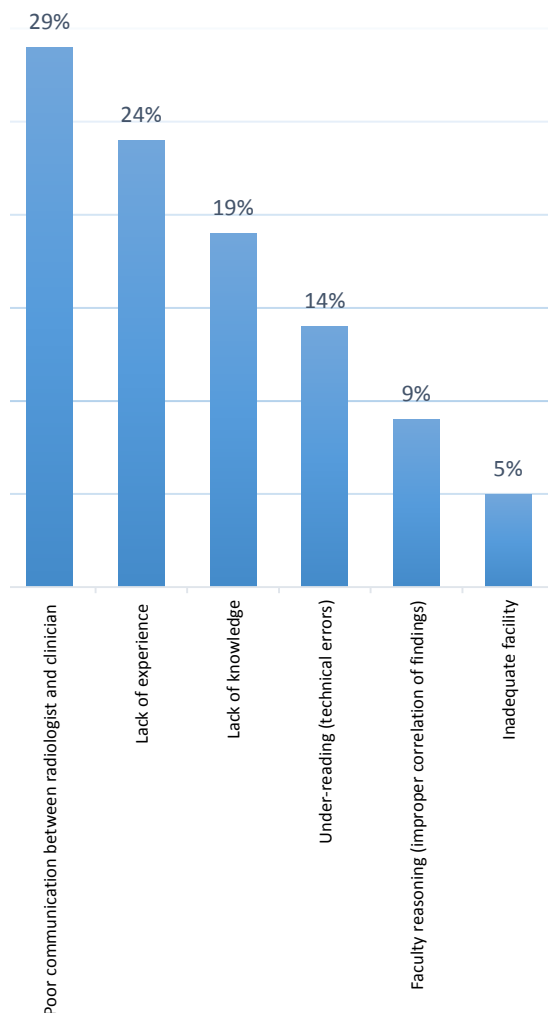
Variable	Frequency (%)
<b>Daily notice of diagnostic radiological errors (n= 21)</b>	
Yes	17 (81.0)
No	4 (19.0)
<b>Daily count of diagnostic radiological errors (n= 17)</b>	
1–10	11 (64.7)
11–20	4 (23.5)
> 20	2 (11.8)
<b>Radiological modalities noticed with errors (n= 23)</b>	
Ultrasound	13 (56.5)
CT scan	8 (34.8)
X-ray	2 (8.7)
<b>Body parts noticed with errors (n=20)</b>	
Abdomen	13 (65.0)
Pelvis	4 (20.0)
Skull	2 (10.0)
Chest	1 (5.0)

#### 4. Discussion

The present study was conducted in the UST Hospital to evaluate the quality of practice in the Radiology Department of the UST Hospital in an attempt to identify the areas in need for further improvement and to build a system for good-quality practice. The UST Hospital is one of the tertiary hospitals in Sana'a, the capital of Yemen, which was established in 2005 and equipped with the most recent and sophisticated technological equipment.

The high frequency of diagnostic radiological errors noticed by the residents and consultants of the UST Hospital during their daily practice in the present study is consistent with the finding of a previous studying Karachi, Pakistan (4), where 64.5% of radiologists reported 1–5 errors per year. Such a high frequency of diagnostic radiological errors is also supported by the findings of a previous study among Yemeni radiologists (5) and another one among multinational radiologists attending the Radiological Society of North America annual meeting in 2007 (6).





**Figure 1.** Causes of diagnostic radiological errors as perceived by the residents and consultants of the UST Hospital, Sana'a (2015)

The higher frequency of errors in ultrasound reports is expected, and this could be attributed to the fact that errors in ultrasounds are multi-factorial in nature (7). In ultrasound, the transducer releases ultrasonic waves that go and return to the transducer. The returning waves undergo refraction, interference, scattering and absorption. Therefore, the knowledge and experience of the operator play an important role in accurate diagnosis. In a similar fashion, the multi-factorial nature of errors in computed tomography (CT) scan might explain

its being the second imaging modality with frequent errors, where the type of tissue and experience of the interpreter are the main sources of errors (8).

In the present study, the most radiological errors were associated with abdomen radiological evaluation (65.0%) followed by those for the pelvis (20%). This could, in turn, be attributed to several factors that affect the radiological evaluation of such body parts, particularly during the performance of ultrasound. These include gases in the gut, empty bladder, abdominal pain and tenderness, wounds and anatomical variation (7).

Regarding the causes of errors in radiology as perceived by participants, poor communication between the clinician and radiologist was most frequently reported reason in the present study. This supports the finding of a previous study, which reported that poor communication between clinicians and radiologists can lead to errors in radiological diagnosis (5). As per the gold statement by the American College of Radiology (ACR) Council "Communication is a critical component of the art and science of medicine and is especially important in diagnostic radiology" (9). This reflects the importance of effective communication of radiological findings between radiologists and clinicians. Regardless of the type of communication, written or by calling, a system should be there to minimize the bad outcome on the patient (10). Other reasons for radiological errors were the lack of experience and knowledge, under-reading and faulty reasoning, which are mainly related to the operators or interpreters. For instance, because ultrasound is an operator-dependent imaging modality, making diagnostic errors is inevitable. Such errors could be due to the lack of operator's knowledge during history taking, physical examination or final reporting of the patient's



condition. On the other hand, lack of operator's experience can lead to errors, including wrong selection of transducer or improper setup of organ-specific mode (11). Other non-human causes of errors include room light, either due to excessive light or to placing the ultrasound monitor opposite to a window, and noise. In addition, other nearby devices can affect the performance of ultrasound such as electromagnetic devices. Errors due to the patient's condition can be either the presence of gases in the abdomen that may cause difficulty in reading and diagnosis, or lack of patient's cooperation such as the inability to take and hold breath, site tenderness, pain and wound that may affect the reading and diagnosis during ultrasound (11). It should be noted this study is limited by the small sample size, the low response rate of the study subjects and being conducted in one tertiary hospital. However, it reports preliminary data crucial for improving the quality of healthcare in tertiary hospitals in Sana'a city, Yemen.

## 5. Conclusions

Errors in radiological diagnosis are still common. Establishing a good system to identify and minimize these errors will improve the healthcare system. Peer review and hands-on training are important for newly joined radiologists. Establishing a good system of communication between clinicians and radiologists is critical to the daily practice in radiological diagnosis.

## Competing interests

The author declares that he has no competing interests associated with this article.

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