

# Clinical radiology: Going an extra mile for patient care

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## Abstract

**Context:** Clinical details help radiologists report accurately. However, the clinical aspect has taken a backseat among radiologists, who are overdependent on referral notes. This leads to inaccurate assessment, financial burden, and loss of man hours. **Aims:** To re-emphasize the benefits of detailed clinical evaluation and real-time monitoring of imaging in interpreting images. **Settings and Design:** Prospective study. **Materials and Methods:** A study was done in the Department of Radiodiagnosis for 10 days, including all referred patients above 18 years of age. Detailed history taking and examination was done by radiologists prior to imaging. Any additional significant clinical detail was endorsed on the referral slips. Appropriate imaging modality under given circumstances was carried out. Imaging was studied by the radiologists, near simultaneously with the acquisition. Any additional imaging needed was performed on the same day. Comprehensive reports with specific outputs were provided. Wherever apt, imaging-guided management options were offered to the patients. **Results:** During the study, 1024 patients with mean age of 46.3 years underwent various types of imaging, including radiography, computed tomography, magnetic resonance imaging, ultrasound scans, and fluoroscopic procedures. Additional clinical details were endorsed in referral slips in 32.4% patients, 53% of which helped in interpreting images appropriately. Primary imaging modality was changed in 3% patients. Additional imaging was done in 10.9% patients. 3.6% of patients underwent imaging-guided procedures. **Conclusion:** Detailed history taking and examination help radiologists in deciding appropriate imaging and better interpretation of images. This will also reduce the number of visits to the hospital and expenditure on part of patients.

**Key words:** Clinical evaluation; image interpretation; radiology; outpatient department

## Introduction

Medical imaging provides information on extent of diseases<sup>[1]</sup> and offers wide scope for management through imaging-guided interventions. Though it is universally agreed that elaborate clinical details help radiologists report accurately, few studies have tested the veracity of such beliefs.<sup>[2-7]</sup> Clinical aspect has taken backseat among radiologists, due to race against time.<sup>[8-10]</sup> Radiology has become vulnerable due to overdependence on referral clinical

notes,<sup>[10]</sup> which are often sketchy.<sup>[11]</sup> This leads to inaccurate assessment, repetitive consultations and investigations, financial burden, and loss of man-hours. To re-emphasize the benefits of clinical evaluation and real-time monitoring of imaging, in interpreting images, this study was undertaken.

## Materials and Methods

A prospective study was carried out in the Department of Radiodiagnosis at a tertiary care hospital for a period

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of 10 days during the month of December 2016. Patients above 18 years of age (legal age for consent in India) and referred for imaging (radiography, ultrasonography, computed tomography (CT), magnetic resonance imaging (MRI), fluoroscopic/radiographic procedures) were included in this study. Cases referred on urgent/emergency basis were excluded from the study. Prior to imaging, the patients were subjected to detailed history taking and clinical examination by three in-house radiologists, randomly. Whenever the patient was unable to provide relevant information, the accompanying attenders/relatives were questioned and the information was sought. All relevant medical documents of the patients were sought and studied. Thereafter, the imaging referral sheets were scrutinized. Any additional significant clinical detail found was endorsed in them. Based on the patient's condition and information needed by the referring doctor, appropriate decision on the type of imaging modality was taken, giving due consideration to the referring doctor suggested modality. The radiologists decided upon the type of imaging modality based on the existing norms and protocols in each individual case. Search for recent literature was done, whenever there was ambiguity. The decision on the mode of imaging was explained to the patient concerned. After their approval, the patients were explained in detail about the imaging modality and preparations required for such imaging. Informed consent was taken from the patients. Earliest or convenient appointment was given, whenever preparations were required. As was the norm in the department, the radiologists studied all the imaging, near simultaneously with the acquisition of the images, at the respective consoles. Any additional protocol, plane of acquisition, or any additional area to be imaged were performed at the same time as recommended by the respective radiologist and with due consent of the patient. Any additional imaging modality which is likely to give more information or clear the ambiguities arising was explained to the patient after the primary imaging and was carried out.

Comprehensive reports were prepared, incorporating findings noted on various imaging modalities carried out on the patient and answering the specific questions raised by the referring doctors. Those reports were made available to the patients and to the referring doctors on the same day of imaging.

The radiologists explained the results to the patients/attenders personally and also conveyed them to the referring doctors. Wherever apt and after taking the referring doctor into confidence, imaging-guided management options were offered to the patients.

## Results

One thousand twenty-four people referred for imaging to the Department of Radiology during the study period were included. This comprised 492 ladies (48%) and 532 men (52%). The mean age of the patients was 46.3 years.

The largest number of patients were originally referred for radiography (453), followed by ultrasonography (320), CT (148), MRI (83), and fluoroscopic/radiographic procedures (20). A large number of patients referred for radiography were for chest-related complaints (223) and skeletal trauma (125). Most of the patients referred for ultrasonography were for abdomen and pelvis-related conditions (213). The bulk of cases referred for CT (86) and MRI scans (59) were for neuroimaging. A tabulated form of various advantages of clinical assessment in interpretation of imaging, as found in this study, is depicted in Table 1.

Additional clinical details deemed relevant by the radiologists were endorsed in the referral slips in 332 cases (32.4% of 1024) after detailed clinical evaluation and scrutinizing medical documents; 236 of them were originally referred for radiography and 65 for ultrasonography. The radiologists opined that in 176 cases (53% of 332), this additional clinical information helped in arriving at more appropriate diagnosis. One such patient was a 28-year-old lady, who was referred for ultrasonography of the abdomen with complaints of severe lower abdominal pain. A history of missed periods, which was not mentioned in the requisition, proved to be crucial in diagnosing a ruptured ectopic pregnancy and this helped in prompt management. Another young patient referred for scrotal ultrasonography with complaints of testicular pain, and was suspected epididymo orchitis. On questioning revealed the pain to be radiating and colicky. A prompt search for ureteric calculus was made and found. Scrotal scan was also done and found to be normal.

In 32 cases (3%), the primary modality of imaging was changed after due approval of the patient. All of these were

**Table 1: Benefits of clinical assessment in numbers**

	Radiography	Ultrasonography	CT*	MRI <sup>†</sup>	Fluoroscopy/procedures	Total
Originally referred for	453	320	148	83	20	1024
Additional clinical details endorsed	236	65	15	6	10	332 (32.4%)
Change of primary imaging modality	-	-	32 (changed to MRI <sup>†</sup> )	-	-	32 (3%)
Additional imaging	-	78	10	24	-	112 (10.9%)
Image-guided aspiration/biopsy	-	18	10	8	-	36 (3.6%)

\*CT: Computed tomography, <sup>†</sup>MRI: Magnetic resonance imaging

referred for CT and were changed to MRI. The cases who underwent such change in imaging modality were referred with clinical impressions ranging from stroke, hypertensive and acquired metabolic encephalopathies, seizure disorder to soft tissue tumors in the extremities. For instance, a 2-year-old child with developmental delay and seizures was referred for CT head, which was changed to MRI after due consultation and explaining to the child's parents.

In 112 cases (10.9%), additional imaging in the form of imaging of an additional area, additional imaging modality, plane of acquisition, and imaging protocol was sought by the radiologists after the initial imaging. Such cases included endometrial malignancy, carcinoma cervix, metastatic lesions in the liver, subcutaneous venous malformation, etc., Numerical breakdown of such cases is depicted in Table 2. For instance, a 23-year-old male, who was referred for MRI of lumbosacral spine with complaints of low backache, was found to have hydronephrosis on MRI with a near normal lumbosacral spine. He further underwent ultrasonography and an ureteric calculus was detected. Additional ultrasonography removed ambiguities or provided additional information in 58 out of 78 patients (74.4%).

The comprehensive reports and films of all imaging undergone by the patient were made available to all the patients on the same day of imaging. Thirty six cases (3.6%) were offered and underwent imaging-guided aspirations/biopsies the very next day of their report dispatch. A liver abscess detected on ultrasonography was drained under sonological guidance on the same day. Another patient incidentally found to have an enlarged retrocaval lymph node underwent CT-guided fine needle aspiration, which revealed caseating granulomas.

## Discussion

The widespread view held is knowledge about clinical details of a patient, improves sensitivity and specificity of the image interpretation.<sup>[2-6]</sup> There are studies to show that clinical inputs improve accuracy of reporting radiographs.<sup>[3-7]</sup> With the advent of cross-sectional imaging and multiplanar capabilities, it is even more pertinent to emphasize the importance of clinical evaluation in interpreting these modalities.

Though a broader consensus is for eliciting adequate clinical details before interpreting images,<sup>[3-5]</sup> a study by Griscom *et al.* in 2002, suggested that such details may bias the radiologist who may ignore some findings or patterns to fit into previously held clinical impression. However, the study also mentions that clinical information should be sought after analyzing the images and this helps in arriving at a narrower differential diagnoses.<sup>[6]</sup> Another study by Berbaum *et al.* concluded that clinical details improves the accuracy irrespective of whether provided to the radiologist before or after the image interpretation.<sup>[4]</sup> In the present study elaborate history taking and clinical examination were performed by the radiologists prior to the imaging.

Studies have recommended that the referral doctors should make available relevant and adequate clinical data regarding the patient condition, in their referral slips/digitized form to help radiologists interpret accurately.<sup>[2,3,6,11]</sup> In the present study, in addition to the clinical details endorsed on the referral slips by the referring doctors, radiologists themselves did a detailed clinical examination in an attempt to elicit more details. This is in line with the opinion that qualified radiologists have their own clinical acumen, which is equal to if not better than many other doctors.<sup>[10]</sup> An attempt was made in this study to treasure and preserve the clinical skills and knowledge among the radiologists in the interpretation of imaging.

In the current study, radiologists decided to change the primary imaging modality in 3.1% of cases, after taking informed cognizance of the patient. In addition, in 10.9% of all cases, radiologists recommended additional imaging to clear ambiguities. Radiologists have the expertise to decide on the best-suited imaging modality or its combination, in any given clinical scenario.<sup>[10]</sup> Hence, it is recommended that the referring doctors ask relevant clinical questions to be answered by imaging and leave the choice of imaging modality to the judgment of the radiologists.

In 36 cases, imaging-guided aspirations and biopsies were suggested and performed at the earliest, hence extending the scope of the facilities in the department.

Another advantage perceived in this study was the reduction in the number of consultations and visits to the

**Table 2: Numerical breakup of cases who underwent additional imaging**

	Originally referred for (numbers in parentheses)				Total
	Radiography (453)	Sonography (320)	CT* (148)	MRI† (83)	
Additional imaging					
Sonography	56	-	12	10	78
CT*	4	2	-	4	10
MRI†	-	5	-	Additional sequences‡ 14 Imaging of Additional region§ 5	24

\*CT: Computed tomography, †MRI: Magnetic resonance imaging. ‡Sequences and planes of acquisitions over and above the routine protocol used in the department, §Imaging of another region which the disease process known to involve

health center and radiology department by the patients, thus saving man-hours and personal finances. In this study, revisit by the patients to the Department of Radiodiagnosis and possible re-consultations with the referring doctors and others were reduced in at least 356 patients (34.8%). To substantiate, calling back patients for additional clinical details/examination was avoided (17.2%). Inadequate imaging could have led to repeated visits by patients and unnecessary imaging. This was avoided by changing the primary modality of imaging in 32 patients (3%) and by performing additional imaging in 112 patients (10.9%) on the same day.

In countries where there are no standardized central health registries containing details of all the patients attending to the hospitals, it is often not possible to trace all the patients and follow-up. Many patients end up having multiple consultations and duplication of investigations. Hence, it is suggested that radiology departments be more proactive and utilize that single opportunity, when the patient is referred for imaging, to try and diagnose his/her condition accurately using the right imaging modalities, and help the referring doctors in offering more appropriate treatment options. This is possible if the radiologists interact with each patient at a personal level to elicit the problems and educate patients about the scope of imaging. In this direction, it is recommended that every Department of Radiology establish a radiology outpatient department (OPD), which can be manned by radiologists and can act as first point of contact with patients, prior to actual imaging.

### Limitations

The impact of clinical evaluation on imaging interpretation, in terms of accuracy of diagnosis, was not determined in this study. No comparison of accuracy with and without availability of clinical information was done due to the ethics of not depriving the patients of best possible care.

Due to nonavailability of expertise in vascular and neurointerventions, patients requiring such interventions were referred to appropriate centers in consultation with referring doctors. This adversely influenced the number of patients who underwent imaging-guided procedures in the department, whereas the scope of radiology is even larger.

In certain cases, nonaffordability of a specific imaging modality affected the decision-making in favor of alternatives.

The satisfaction levels among the referring doctors and patients, regarding imaging services provided, were not

objectively assessed in this study. However, no complaints or displeasure notes were received. Further studies may be done to objectively assess the levels of satisfaction with such radiology services.

### Conclusion

Detailed history taking and clinical examination help radiologists in deciding appropriate imaging and better interpretation of images in answering clinical questions. From patient's perspective, this will lead to reduction in the number of visits to the hospital and personal financial savings. Establishing OPDs in radiology departments can go a long way in providing more comprehensive patient care with a personal touch and in strengthening patient–radiologist–referral doctor relationships.

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### Conflicts of interest

There are no conflicts of interest.

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