ABSTRACT

Background: Radiology reporting in today's era has a very important role in diagnosis and management of patient so it is very important to rule out the causes and ways to improve reporting time and its quality. Delays in performing radiology scans or interpreting them can prolong the time until a proper treatment decision can be made, leading to increased costs and potential compromises in patient care.

Objective: To find out reasons for delay in radiological reporting and to find out how to reduce them and improve reporting standards.

Materials and Methods: This study was an observational descriptive study and it involved data collected from all patients whose CT scan or MRI was performed for random problems in Hayatabad Medical Complex. Duration of this study was 6 months starting from 1st July 2018 to 31st December 2018. There scans were followed till they were reported and handed over to patients or patient's attendants. Questionnaires were given to five consultants of radiology department to know about causes of delay.

Results: In this observational study we found that delay in reporting was multifactorial. Approximately 11,600 CT scans and MRI scans were performed in the period between 1st July to 31st December 2018. Approximately 2070 (17.8%) reports were delayed more than 72 hours while 82.1% scan were reported in time within 72 hours. In our study the most important cause of delayed reporting was incomplete history (34.8%), while other causes were inappropriate technique (21.5%), radiologist overburden (29.7%) while in 14% patients the cause of delayed reporting was lack of communication between radiologist and clinician.

Conclusion: We found that the commonest cause of delay was incomplete history of the patient conveyed by the clinicians followed by overburden of the radiologist for reporting. Increasing communication between referring clinician and radiologist will improve reporting standards and timings of reporting. Maintaining a proper waiting list for scanning and prioritizing urgent cases will improve reporting time and quality. Increasing the number of Consultant Radiologists in each shift will also improve reporting time.

Key Words: Computed tomography, Magnetic resonance imaging, Reporting.
advanced imaging details and cost details for the last 5 years. The purpose of the study was to examine the extent to which the time to completion of CT, MRI, and ultrasound imaging could be shown to influence the length of hospital stay and total episode costs, while accounting for patient acuity.

Delay in reporting is due to many causes but some of the top causes in our study are incomplete record provided by a patient or clinician, inappropriate technique of scan and radiologist overburden. Fatigue in radiologists may be responsible for a large number of medical errors. Many studies have done regarding the fatigue in radiology. That includes measurement methods, and evidence on how fatigue affects accuracy and causes delay in reporting. Nowadays in medical practice clinical diagnosis is greatly dependent on radiological scans which also increases importance of its reporting. Radiologists are overburdened and visual fatigue is the cause of decrease in quality and increase in timings of reporting images.

Lack of communication between clinician and radiologist also leads to delay in reporting. As clinicians are overburdened and they do not consider importance of communication for proper reporting. Clinicians advise radiological scans for proper diagnosis and management of these patients and they want to rule out their closest differentials. So prompt diagnosis of radiological scans is mandatory for diagnosis and management of patients. Delay in reporting can affect patient care. It can psychologically as well as physically affect the patients and their attendants.

The present study was done to find out the main causes contributing in delay of reporting the cases sent to radiology department by clinicians and how to reduce this delay. By finding the causes in delay and ways of improving the system we can improve the quality and time for reporting. It will affect clinician’s timely and proper management of patients as well.

**MATERIALS AND METHODS**

This was descriptive prospective observational study performed in Radiology Department, Hayatabad Medical Complex, Peshawar. Duration of this study was 6 months starting from 1st July 2018 to 31st December 2018. Ethical approval was obtained from the ethical approval committee of Hayatabad Medical Complex.

Total 11,600 MRI and CT scans cases were included in the study which were referred by clinicians of various departments and emergency department to Radiology department. The cases were selected by consecutive sampling. There were 8000 CT scans and 3600 MRI scans performed during this period. The scans were followed till they were reported and handed over.

Questionnaire were given to five consultants in Radiology department of HMC to know the reason of the delay in reporting. These case were reported by five consultants having level III qualification in Radiology and having at least one year experience in reporting. Those CT and MRI reports which were delayed for more than 72 hours were included in category of delayed reporting.

**RESULTS**

There were 8000 CT scans and 3600 MRI scans performed during this period. Out of which 3856 (48.2%) of the CT scans were reported on the same day of scanning while 3210 (40.1%) of the patients waited for 72 hours for their reporting. There were 934 CT scans (11.7%) during this period who waited more than 3 days for their reporting. Out of these 14 cases (1.4%) waited more than 2 weeks for their final report (Table 1).

In MRI section out of 3600 scans, 923 scans (25.6%) were reported on the same day while 1541 patients (42.8%) waited for more than 3 days and 1136 (31.5%) patients waited for 1 week for their reporting. There were about 100 (2.7%) patients who waited for more than 3 weeks for their reporting (Table 2).

Total reports of CT and MRI which were delayed for more than 72 hours was 2070 (17.8%) out of 11,600 patients (Figure 1).

In our study the most important cause of delayed reporting was incomplete history (34.8%), while other causes were radiologist overburden (29.7%), inappropriate technique (21.5%), while in 14% patients the cause of delayed reporting was lack of communication between radiologist and clinician (Table 3).

Delay in reporting has many causes related to lack in the standard frame work for reporting, patient’s illiteracy, not providing history and records, lack of...
professional staff, over burden of work, no communication with referring clinicians etc. Some of the scans which were delayed more than weeks for reporting had problems like deficient images taken by technician, patients living in far flung areas and they came late for re scanning. Also, delays were done in complicated cases where histories were inadequate.

Table 1. Time Period Of CT Scan Reporting

<table>
<thead>
<tr>
<th>Reporting Time Period</th>
<th>Number of Patients (n=8000)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 24 hours</td>
<td>3856</td>
<td>48.2</td>
</tr>
<tr>
<td>Within 72 hours</td>
<td>3210</td>
<td>40.1</td>
</tr>
<tr>
<td>More than 72 hours</td>
<td>934</td>
<td>11.7</td>
</tr>
</tbody>
</table>

Table 2. Time Period of MRI Reporting

<table>
<thead>
<tr>
<th>Reporting Time Period</th>
<th>Number of Patients (n=3600)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 24 hours</td>
<td>923</td>
<td>25.6</td>
</tr>
<tr>
<td>Within 72 hours</td>
<td>1541</td>
<td>42.8</td>
</tr>
<tr>
<td>More than 72 hours</td>
<td>1136</td>
<td>31.5</td>
</tr>
</tbody>
</table>

Table 3. Causes of Delayed Reporting

<table>
<thead>
<tr>
<th>S. No</th>
<th>Causes</th>
<th>Delayed reports n=2070</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inappropriate technique</td>
<td>446</td>
<td>21.5</td>
</tr>
<tr>
<td>2</td>
<td>Incomplete history</td>
<td>721</td>
<td>34.8</td>
</tr>
<tr>
<td>3</td>
<td>Radiologist overburden</td>
<td>614</td>
<td>29.7</td>
</tr>
<tr>
<td>4</td>
<td>Lack of communication</td>
<td>289</td>
<td>14</td>
</tr>
</tbody>
</table>

DISCUSSION

Radiological examinations like CT scanning, MRI, fluoroscopy etc. are extremely sophisticated but they are dependent on simple written report on a paper. There is not a standardized method for radiological reporting so they are subjected to error. Also they cannot fulfill clinician's expectations. Clinicians require timely, accurate and clear-cut report for their diagnosis and management. Ideal situations are hard to achieve but improving standards of reporting, timing of reporting and better communication between a radiologist and referring clinician can improve quality of reporting for better and timely management of patients.  

Waiting list in Hayatabad Medical Complex Peshawar MRI is for about 7 days and for CT scan up to 5 days. Reporting time for emergency cases in both is 24 hours and normal cases is up to 72 hours. As compared to any foreign country we found out that waiting lists and reporting time in our setup is quick as studies done in England showed much delays in reporting. According to NHS acute trust data submitted in 2016 showed that many patients wait for more than 31 days for their X-ray. CT scan and MRI reports with a backlog of 186,808 patients. Reasons for delay in our setup are much regarding illiteracy of patients. Patients are mostly unaware to provide proper history and records for reporting. There is not a proper standard frame work for reporting which results in delay as well as mistakes in radiology reports. Lack of communication between referring clinicians and radiologists results in wrong examination being performed. Wrong examination is then cancelled with new examination being planned. It results in radiation exposure to patients and also delays diagnosis of patient.
In our study the most important cause of delayed report was incomplete history provided by the patient (34.8%) which is comparable to the study done by Nagy PG et al 2008 who also found that lack of communication between patient and radiologist is one of the causes of delayed reporting. In our study 29.7% reports were delayed due to shortage of radiologist and burn out. This is also discussed in studies done by Cheri L. Canon et al 2021 and Parikh JR et al 2020 who found that increased working hours, increased volume of scan and excessive call duties cause radiologist burn out and ultimately delayed reporting of scans.

Following are recommendations to improve reporting time and avoid inconvenience to the patients. By forming a standard frame work. By teaching illiterate people about importance of history and records for reporting. Increasing communication between referring clinician and radiologist will improve reporting standards and timings of reporting. Also, by teaching technologists’ staff about proper scanning protocols and sequences re scanning of patients for proper sequences will be reduced. Maintain proper waiting list for scanning and prioritizing urgent cases will improve reporting time and quality.

To avoid Radiologist, burn out there should be increased number of Radiologist, proper evening and night shifts. Excessive call duties should be avoided and extra incentive should be paid for extra duty. Same suggestions were discussed in study done by Ben Wandtke et al 2019.

In our radiology department, there are five consultants working who are supposed to report and sign CT scan reports, MRI reports, Mammography, X-rays and teach more than 40 trainee medical officers so the work load is that about 60 CT scans, 40 MRI scans and approximately 800 X-rays are performed daily and 15 mammography scans done in a month. There is no proper frame work for radiology reporting. It has been reported that standard frame work is important as it will specify the time for reporting. Reporting time among radiologists and reporting specific reports is different. MRI shoulder needs more time to report while MRI brain needs comparatively less time to report. Patients on the other hand have no awareness regarding difference in them which leads to restlessness among them. In our study we found that on average, scans can take up to 72 hours for being reported. Some of the scans are reported urgently but missing of findings in these cases exceeds up to 50% as compared to routinely reported scans. Causes of delay in reporting is limited number of radiological trained staff, not providing proper history and clinical records, wrong radiological investigation performed, incomplete investigation done. Ill literacy among common population is also a factor resulting in delay because they usually don't understand about the scan being done, importance of history and importance of giving time to radiologist for reporting.

The results of this study can be very useful as results of this study can help radiologist to avoid causes of delayed in reporting and if we address these causes then patient can be managed timely and properly. However there are some limitations of this study. First sample size was limited so true causes of delayed reporting could not be evaluated. Secondly the results were analyzed from data collection in one centre, so multicenter study would give better insight and generalizability of results. Thirdly other factors of delayed reporting like transcriptionist error, inappropriate urgent cases will improve reporting time and quality.

Further research studies with large sample size and multicentre data as well as considering the other variable should be done to address these limitations. Secondly further studies should be to assess the improvement in reporting time after implementation of suggested recommendations.

CONCLUSION
Delay in reporting has many causes which are related to patient’s illiteracy, lack of communication and lack of standard frame work, radiologist overburden for reporting. Delay in reporting time and inconvenience to the patients can be avoided by forming a standard frame work., by teaching illiterate people about importance of history and records for reporting, radiologist and clinician communication, increase in faculty number with proper shifts and proper radiological techniques.
AUTHOR’S CONTRIBUTION

Wahid G: Idea conception, drafting the work, final approval, agreed to be accountable for all the work.

Haroon A: Design of the work, data acquisition, critical revision, final approval, agreed to be accountable for all the work.

Samad M: Data analysis, drafting of the work, final approval, agreed to be accountable for all the work.

Tamkeen N: Data interpretation, critical revision, final approval, agreed to be accountable for all the work.

REFERENCES


DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

CONFLICT OF INTEREST: Authors declared no conflict of interest.

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