

# AUDIT OF CT PULMONARY ANGIOGRAM TURN-AROUND TIME

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## ABSTRACT

**OBJECTIVE:** To determine whether the international standard recommendations of reporting CTPA are being followed in Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan, to identify areas of weakness and give suggestions for improvement. **MATERIAL AND METHODS:** A retrospective study was performed during a six month period from January 2010 to June 2010 in the radiology department of SKMCH&RC. The study included 20 admitted patients who underwent CTPA during this period. Data was analyzed to evaluate whether the international standard recommendations of CTPA turn-around time were being followed at SKMCH&RC. Areas of improvement were identified and proposals for betterment were given. Re-audit after implementation has been suggested. **RESULT:** Average Request-to-Scan time was 3 hour and 13 min, compared to the recommended standard of 24 hours for non-massive Pulmonary Embolism (PE) and 1 hour for massive PE. (Half of the reported cases were non-massive and rest were un-specified) Average Scan-to-Report time was 34 min, compared to recommended standard of 30 min for CT done in acute emergency situations. There was 1 case which crossed the 24 hour limit of recommended standard for request-to-scan time and 9 cases which exceeded the 30 min limit for reporting. **CONCLUSION:** The audit shows that despite having no documented protocol of CTPA turn-around time at SKMCH&RC, the average time intervals of physician s request to scan and scan to report come very close to the international standard protocol.

**Key Words:** Medical audit, CTPA, Pulmonary Embolism, Shaukat Khanum Memorial Cancer Hospital and Research Centre

## Introduction

CT pulmonary angiogram (CTPA) is a diagnostic test that utilizes computed tomography to visualize the pulmonary arteries. The most common indication for CTPA is for the diagnosis of pulmonary embolism.<sup>1</sup> Pulmonary embolism is a medical emergency and a potentially lethal condition. The overall mortality is reported to be 30% in untreated cases<sup>2</sup> with majority of deaths occurring within the first 1-2 hours in massive PE.<sup>3</sup> Treatment with anticoagulants also has significant

morbidity. Therefore a diagnosis or exclusion of PE is essential as soon as possible.

Pulmonary Embolism (PE) can be divided into massive and non-massive PE. Massive PE is defined by systolic arterial pressure of less than 90 mm Hg, and non-massive PE by systolic arterial pressure of more than 90 mm Hg<sup>4</sup>. 95.5% of patients present with non-massive PE and 4.5% with massive PE.<sup>4</sup>

The standard protocol for the CTPA scan time is that imaging should be performed ideally within 1 hour in massive PE, and ideally within 24 hours in non-massive PE.<sup>5</sup> Any emergency CT should be reported within 30 minutes of the scan.<sup>6</sup>

The Radiology Department of SKMCH&RC has no

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documented protocol for the reporting times of CTPA. This audit was undertaken to determine whether the CTPA turn-around time at SKMCH&RC falls within the guidelines of international standard recommendations.

## Materials and Methods

A retrospective study was performed during a 6 month period from January to June 2010 in the Department of Radiology of Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan. The study was approved by the hospital s research and ethics committee. There were a total of 31 patients who underwent CTPA during this period for suspicion of Pulmonary Embolism. 11 of them were walk-in patients and were excluded from the study because their follow-up data was not available. Only the 20 admitted patients were included.

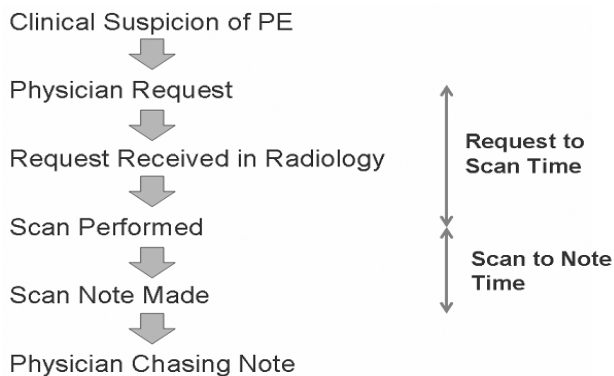


Figure 1: shows the temporal sequence in the requesting, performance and reporting of CTPA scan, and the time intervals involved.

CTPA Audit Performa		
M.R number	.....	
Requesting Physician	.....	
Suspected Pulmonary Embolism	Massive	<input type="checkbox"/>
	Non-Massive	<input type="checkbox"/>
	Not specified	<input type="checkbox"/>
Date of request	.....	
Time of request	.....	
Time of scan	.....	
Time lapse between request and scan	.....	
Interpretation:		
Time of Radiologist's report/note	.....	
Time lapse between scan and note	.....	
Physician's acknowledgement of the report	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Result	Positive <input type="checkbox"/>	Negative <input type="checkbox"/>
Additional Finding	.....	

Figure 2: The case notes of the patients were then reviewed and data extracted. Shows the Performa we used for data collection.

## Results

S. #	Mr. Number	Massive/Non-Massive PE	TIME (mins)	
			Request to Scan	Scan to Report
1	71670	NM	60	16
2	80956	NM	123	17
3	83740	Not specified	129	38
4	72219	Not specified	1643	42
5	60265	Not specified	183	18
6	24238	NM	45	Radiologist Report Missing
7	82417	Not specified	37	20
8	68386	Not specified	52	53
9	86536	NM	70	45
10	77017	NM	303	54
11	74071	Not specified	94	73
12	82450	NM	115	19
13	81241	NM	71	35
14	88418	Not specified	101	17
15	82476	Not specified	56	42
16	78156	Not specified	160	22
17	81036	Not specified	365	49
18	88117	NM	105	Radiologist Report Missing
19	84154	NM	7	Radiologist Report Missing
20	13202	NM	139	15
	<b>Average</b>		<b>192.9</b>	<b>33.8</b>

Table 1: Presents the result of data that was collected during the audit in tabulated form.

Average Request-to-Scan time was 3 hour and 13 min. In comparison, the standard recommendations for Request-to-Scan time are 1 hour for massive PE and 24 hours for non-massive PE. Half of the cases in our study were of non-massive PE and rest were not specified by the physician.

There were 14 cases in which scan was performed more than 1 hour after request. 7 of these were of non-massive PE and 7 were not specified. There was one case in which the 24 hour limit was crossed. (Fig. 3) The minimum time taken was 37 min and maximum was 27 hours and 23 min.

Scan-to-Report average time was 34 minutes. The standard recommendation for the Scan-to-Report time is 30 minutes; the SKMCH&RC average falls very close to it. The minimum time taken was 15 min and the maximum time was 73 min.

There were 9 cases in which the 30 min deadline was crossed, and there were 3 cases in which the radiology resident report was never placed; the requesting physician however was verbally informed about the results of the scan in these 3 cases. (Fig. 4)

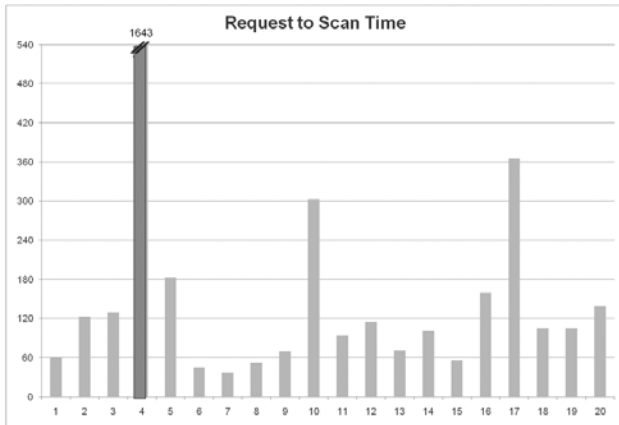


Figure 3:

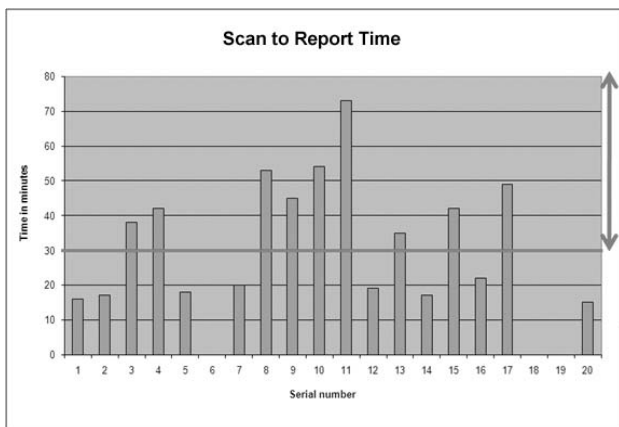


Figure 4:

Six of the cases turned out to be positive for Pulmonary Embolism according to the CT scans. The CTPA interpretation was acknowledged by the requesting physicians in all cases.

## Discussion

The time taken from a physician's request for CTPA to the interpretation of that scan can be divided into Request-to-Scan and Scan-to-Report time as explained above. However, if analyzed further, it can be seen that Request-to-Scan time consists of two intervals:

i) The interval between the request and request being received in Radiology department (acknowledgment time).

ii) The interval between acknowledgment time and the scan being performed.

In determining the delays of Request-to-Scan time, it is important to identify in which of these sub-intervals

the actual delay is taking place. However, this aspect of the study remains unanalyzable because the Radiology department at SKMCH&RC does not keep a record of the acknowledgement time. As long as the record of acknowledgement time is not available, this blind spot will persist in all future similar studies. The determinable causes of delay in the request-to-scan time were:

- The case in which 24 hour limit was crossed, patient had to undergo Echocardiography before CTPA
- In another patient with pleural effusion, pleural tap had to be done before CTPA
- Physician ordered 3 investigations at the same time: Doppler, Echo and CTPA
- Patient was unstable

The causes of the delay of scan-to-report time cannot be determined because no record is kept of the activity in between. The most likely reason is that very few radiology residents are actually aware of the 30 min reporting time for emergency CT.

The three cases in which radiology report was not placed were cases in which radiologist had discussed the interpretation of the scan with the physician through remote access.

Based on the results of this audit, it is suggested that

The Radiology department at SKMCH&RC should have a documented protocol for CTPA reporting based on the international standard protocol, and all residents should be aware of it.

When making a request for CTPA, physician should indicate whether the suspected case of PE is clinically massive or not.

PE is an acute emergency and CTPA performed to exclude it should be prioritized over other investigations.

The investigations of patient (including creatinine) should be complete before sending for CTPA. Acknowledgement Time should be recorded into system by Radiology reception.

Report should be placed by the resident as soon as the scan is interpreted (whether the interpretation of scan is through remote access or not).

These suggestions should be implemented and re-audit done to complete the audit cycle.

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## Conclusion

The audit shows that despite having no documented protocol of CTPA turn-around time at SKMCH&RC, the average time intervals of physician s request to scan and scan to report come very close to the international standard recommendations. The requesting physician should specify the suspected severity of the Pulmonary Embolism. Any reason for delay from request to scan should be better documented. Acknowledgment time of the CTPA request being received in Radiology dept. should be recorded into the system. Re-audit after the necessary changes are implemented is recommended.

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