

# Picture Archiving and Communication Systems (PACS): A Pre-Post Comparative Analysis

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## Abstract

**Background:** A picture archiving and communication systems (PACS) is a computerised means of acquiring, storing, transmitting and displaying images digitally. PACS is a standard component for radiology information systems.

**Method:** A comprehensive descriptive and observational study was undertaken at two tertiary care hospitals from April 2012 to December 2012, the main hospital and an associated hospital. The main hospital had the functional RIS and PACS while PACS was being installed in the associated hospital. So, the main hospital represented Post-PACS scenario and the associated hospital represented Pre-PACS era. The data was collected from the Radiology Information Systems and the PACS Servers. The historical data was obtained from secondary sources. Simple random sampling was used to select cases for the calculation of average waiting time and report TAT for examinations on different modalities.

**Results:** The findings showed improvement in the TAT following PACS implementation at Main Hospital. A noteworthy improvement had been in the case of X-ray unit which had declined considerably from the peak value of 6.8 days in the year 2006 to 2.2 days in the year 2011. In the case of USG, the TAT had reduced and the reports were available on the same day with an average TAT of 0.5 days. In the case of CT, the TAT reduced by more than 50% to 1 day on an average. In the case of MRI, the TAT reduced from 3 days in the year 2004 to 2.4 days in the year 2011. On the other hand, the TAT in case of Associated Hospital was higher in almost all the modalities.

**Discussion and Conclusion:** It may be concluded that the introduction of PACS in Main Hospital had paid the dividends and the decision to install and implement the PACS in Associated Hospital was pragmatic one.

**Keywords:** *Picture Archiving and Communication Systems (PACS), Operational efficiency, RIS.*

## Introduction

A picture archiving and communication systems (PACS) is a computerised means of acquiring, storing, transmitting and displaying images digitally.<sup>1</sup> PACS is a standard component for radiology information systems.<sup>2</sup> It has facilitated the management of images easier

for healthcare organizations<sup>3</sup>. New technologies are sometimes easily accepted in healthcare organizations to improve service quality and efficiency<sup>4</sup>. Though PACS has fundamentally changed healthcare landscape, it proves to be a real challenge for many healthcare organisations<sup>5,6</sup>. The procurement of PACS is a major financial investment and its implementation has a long-term effect on the daily operations of organisation.<sup>7</sup> The evaluation of PACS implementation has been conducted from various perspectives.<sup>8</sup> The impact of PACS on the overall efficiency of imaging services has been calculated to reduce the cost per image.<sup>9</sup> Many studies point out that the user acceptance is an essential tool before implementing PACS as it determines the success rate to a large extent.<sup>2</sup>

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### Method

A comprehensive descriptive and observational study was undertaken at two tertiary care hospitals from April 2012 to December 2012. These tertiary care hospitals (main hospital and an associated hospital) were located at different locations in the same city and were managed by single administrative set up. The main hospital had the functional RIS and PACS while PACS was being installed in the associated hospital. So, the main hospital represented Post-PACS scenario and the associated hospital represented Pre-PACS era. The data was collected from the Radiology Information Systems and the PACS Servers. The historical data was obtained from secondary sources. Simple random sampling was used to select cases for the calculation of average waiting time and report TAT for examinations on different modalities. Data was analysed by using Microsoft Office Suite.

### Results

The radiology departments at both the hospitals were well equipped to provide the full range of diagnostic imaging services including Computerized Radiography, Ultrasonography (USG) & Colour Doppler, Multi slice Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Mammography and Interventional

radiology. Images from these modalities were stored on PACS (Picture Archival and Communication System) in the main hospital.

Though the PACS was installed in the main hospital in the year 1999 but the integration of various modalities with PACS could be achieved by the year 2005. So, the data was perused after the year 2006 onwards for analysis. The PACS was still under the process of installation and implementation in associated hospital. The main hospital represented Post-PACS phase and associated hospital represented Pre-PACS phase.

Before the implementation of PACS in main hospital, the examination was followed by approximately an hour long process of film development which was further followed by the sorting of the previous images before the patient folder could reach the radiologist. Post PACS, this had been replaced by a five minute activity of processing a plate, containing a cassette with patient details, and the screen containing image, in the CR processor and transmitting the image to PACS by a technician.

The operational efficiency of HMIS/RIS and PACS was gauged from the workload handled, the average examination waiting time and the average report turnaround time.

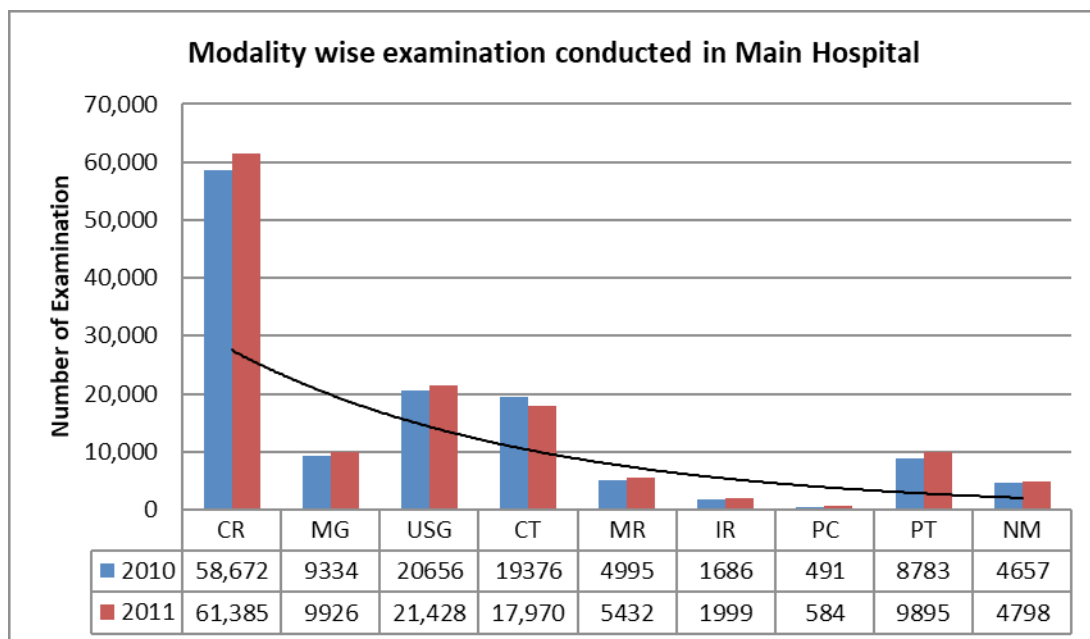
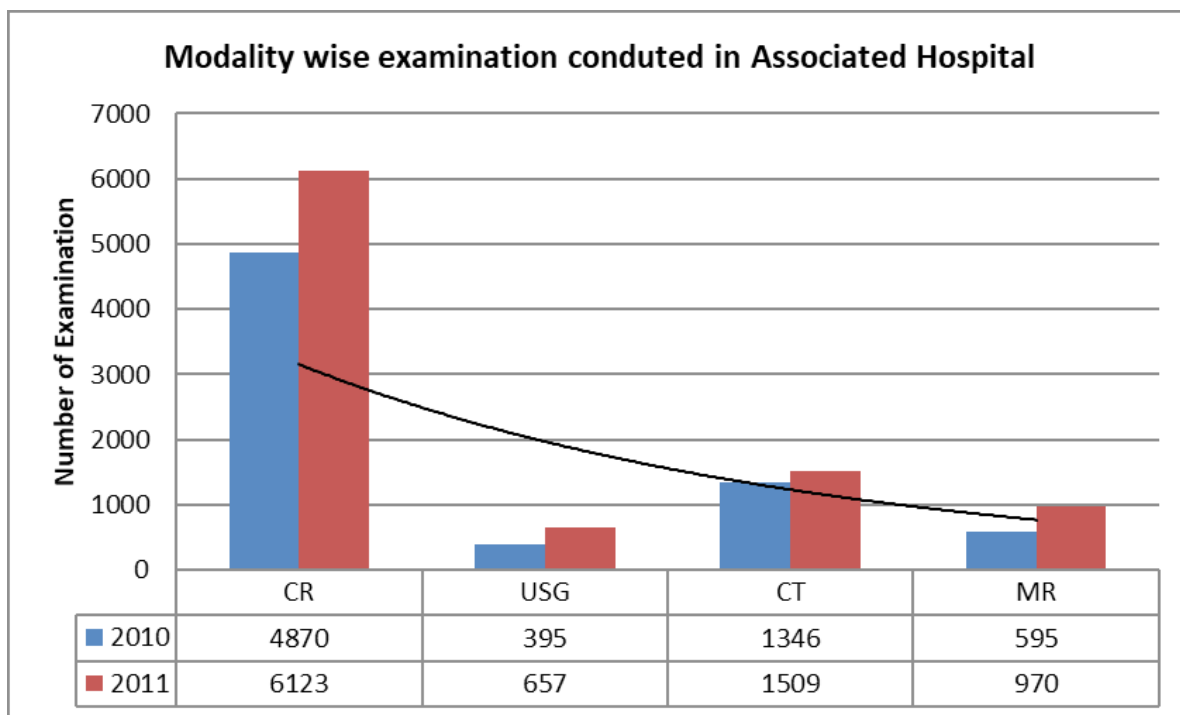
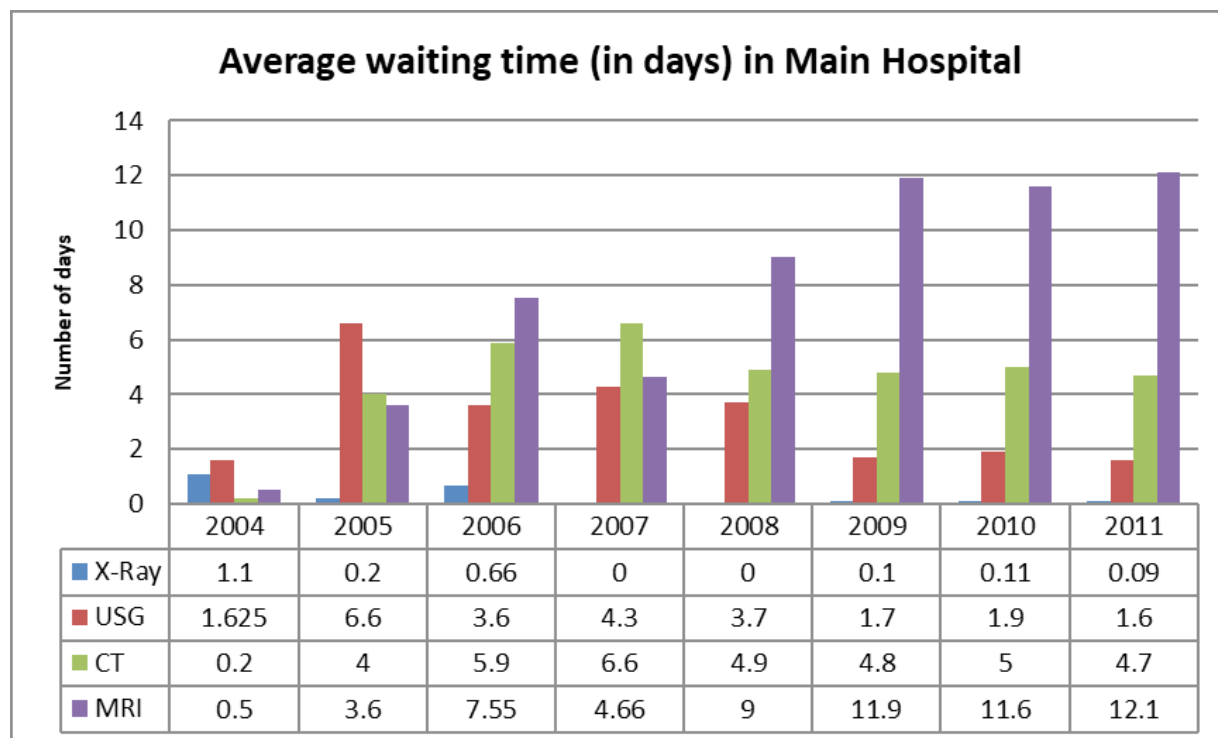


Figure 1. Modality wise Examinations conducted for the Years 2010 & 2011 in Main Hospital



**Figure 2. Modality wise Examinations conducted for the Years 2010 to 2011 in Associated Hospital**



**Figure 3. Average Examination Waiting Time (in Days) in Main Hospital**

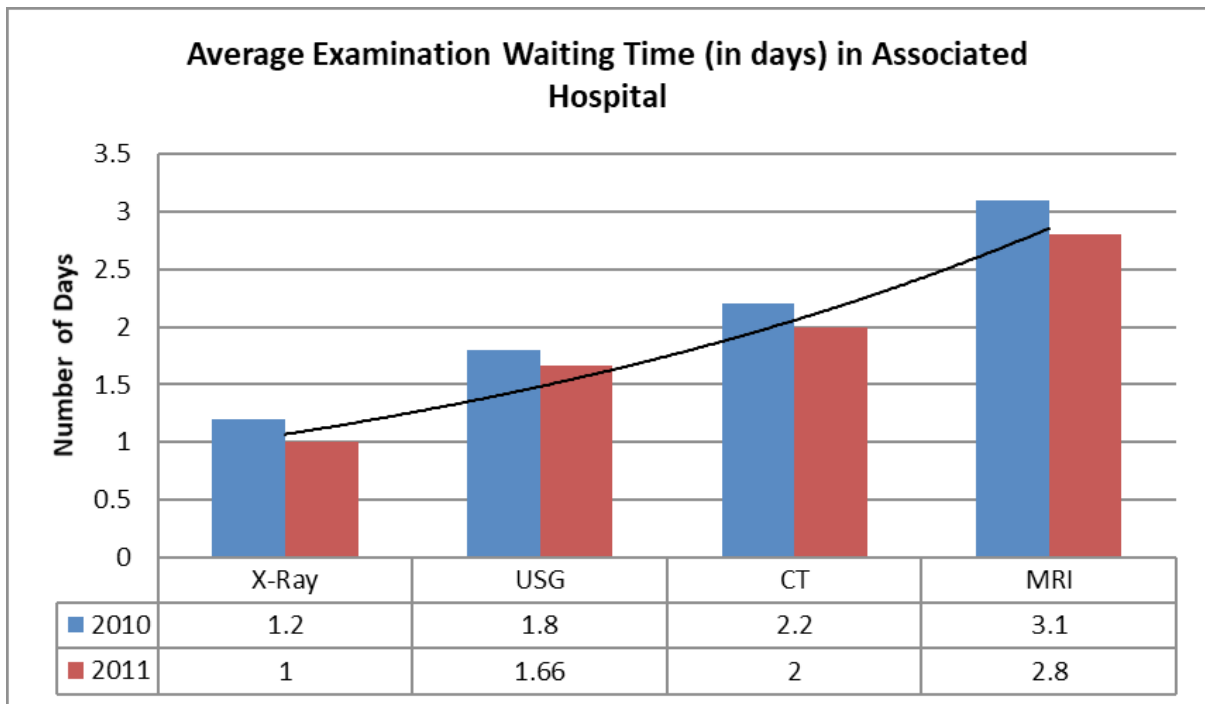


Figure 4. Average Examination Waiting Time (in Days) in Associated Hospital

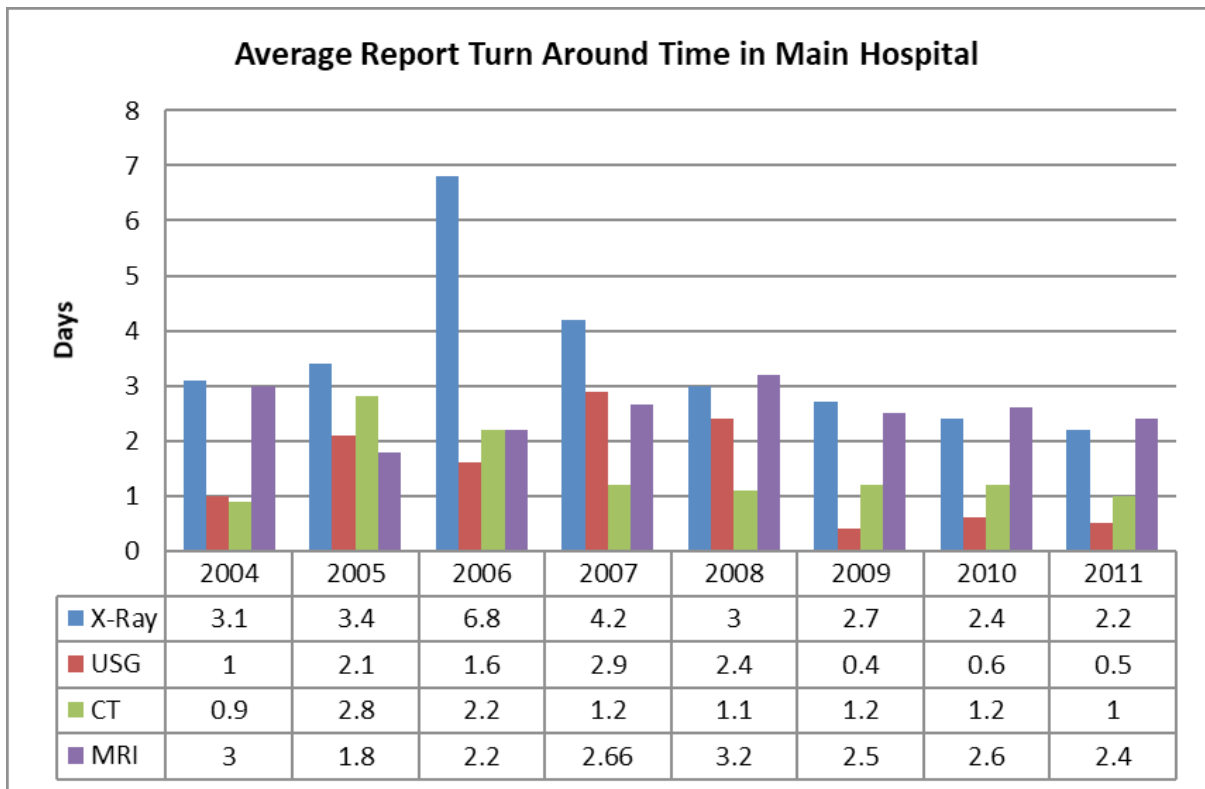
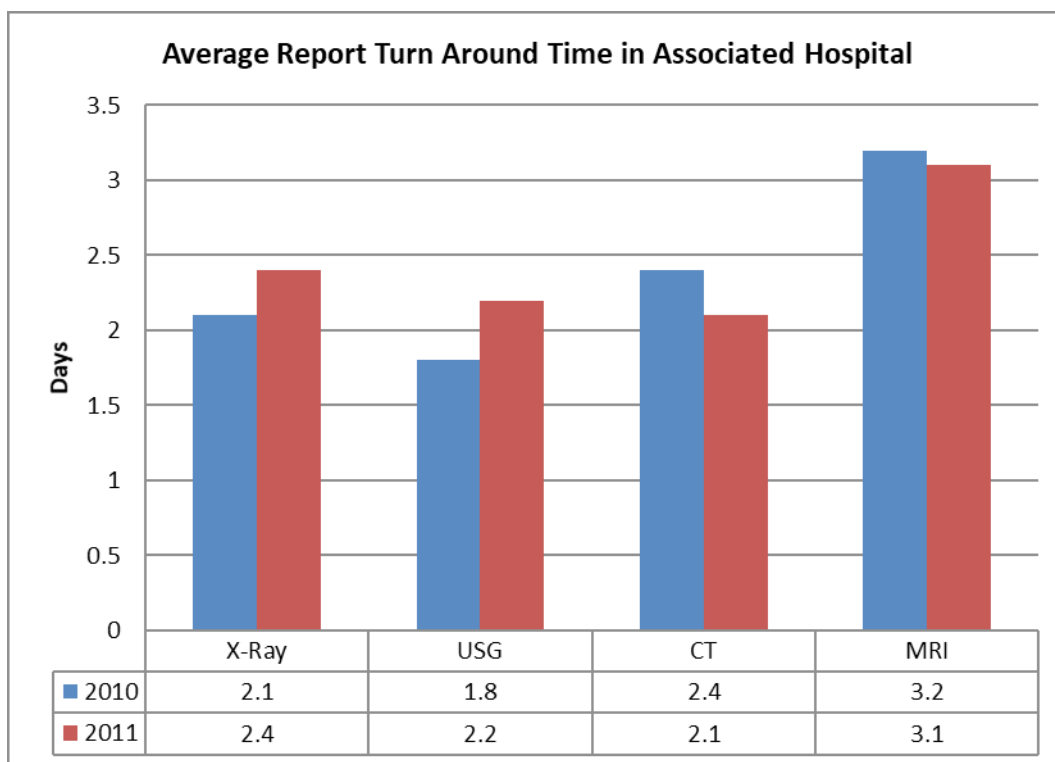


Figure 5. Average Report Turnaround Time (in Days) in Main Hospital



**Figure 6. Average Report Turnaround Time (in Days) in Associated Hospital**

The findings showed improvement in the TAT following PACS implementation at Main Hospital. A noteworthy improvement had been in the case of X-ray unit which had declined considerably from the peak value of 6.8 days in the year 2006 to 2.2 days in the year 2011. In the case of USG, the TAT had reduced similarly and the reports were available on the same day with an average TAT of 0.5 days. In the case of CT too, the TAT had reduced by more than 50% to 1 day on an average. In the case of MRI, the TAT had reduced from 3 days in the year 2004 to 2.4 days in the year 2011. On the other hand, the TAT in case of Associated Hospital was higher in almost all the modalities. It may be concluded that introduction of PACS in Main Hospital had paid the dividends and the decision to install and implement the PACS in Associated Hospital was a pragmatic one.

**Discussion and Conclusion**

PACS is an integral part of the radiology department of a hospital.<sup>10</sup> Many studies have revealed the reduction in the turnaround time post PACS installation.<sup>11</sup> PACS leads to reduction in waiting time, average length of stay as it speeds up the phases of diagnostic process and reduces the time needed to obtain radiological results.<sup>12</sup> The impact of PACS on the overall efficiency

of delivering imaging services revealed a reduction in the cost per image produced in the face of increasing demand for the service.<sup>9</sup>

PACS will play an important role in the total digital conversion in healthcare, and will improve the quality of patient care delivered to a large extent and lead to the faster decision making.<sup>13</sup> It leads to the reduction in repetitive data entry at different levels. There are significant changes in physician diagnostic behavior after PACS implementation.<sup>14</sup>

The addition of PACS improved availability of alphanumeric preliminary reports of abdominal and pelvic CTs on the HIS, by 85.0%. There was no gross perceived impact with a PACS on the time to final sign reports by a radiologist as signing patterns remained relatively constant over the two interpretation formats. This improvement in turnaround times can be used in justifying PACS.<sup>15</sup>

The study revealed that there was an improvement in the TAT following PACS implementation at Main Hospital. A noteworthy improvement had been seen in the case of X-ray USG, CT and MRI. The TAT in case of Associated Hospital was higher for almost all the

modalities. This was, in fact, the reflection of Pre-PACS era in case of Main Hospital. It may be concluded that the introduction of PACS in Main Hospital had paid the dividends and the decision to install and implement the PACS in Associated Hospital was pragmatic one.

**Conflict of Interest:** Nil

**Source (s) of Support:** Nil

**Ethical Clearance:** The study was conducted as a dissertation for Master in Hospital Administration after administrative approval.

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