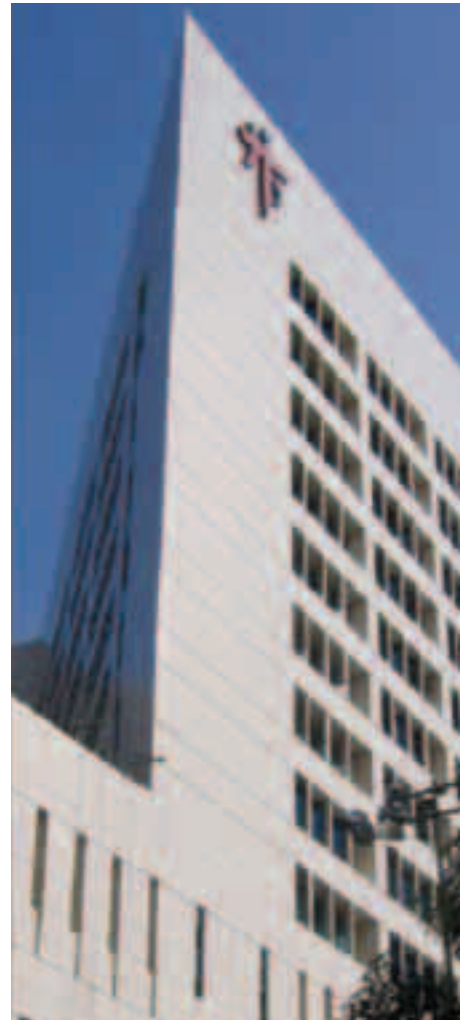


GE Healthcare  
Technologies

# Centricity RIS/PACS

Tan Tock Seng Hospital, Singapore



Tan Tock Seng Hospital (TTSH), established in 1844, is the second largest hospital in Singapore, with specialty centers in Rehabilitation Medicine and Communicable Diseases. The hospital has 1400 beds served by 3,900 healthcare workers. TTSH has obtained ISO14001 and ISO18001 quality certification since 2002 and JCI Accreditation in 2005.



### Profile of Tan Tock Seng Hospital (TTSH)

The hospital was named after its founder, Mr Tan Tock Seng, a Chinese entrepreneur and philanthropist. TTSH is a member of the National Healthcare Group (NHG) that provides high quality holistic healthcare services to the people of Singapore. After three major moves in its long and distinguished history, the hospital now provides nearly all its services in one modern complex, comprising the Hospital Block, the TTSH Medical Centre and the Podium Block. The hospital is equipped with state-of-the-art facilities and medical equipment, as well as the latest communication and information technology tools.

### Background to the TTSH RIS/PACS project

The decision to implement the Radiology Information System (RIS) and Picture Archiving and Communications System (PACS) was made by the TTSH in 2001.

The intent of the RIS/PACS system is to provide both hospital-wide and NHG cluster-wide distribution of compressed images and reports to all wards, operating theatres, outpatient clinics and clinicians' offices, that does away with X-ray film and paper reports. The system will also serve to provide teleradiology capabilities for both referrals to other institutions and in-bound consultations by other institutions.

The GE Centricity RIS/PACS system installed at TTSH became operational in February 2003. At the same time, both National University Hospital (NUH) RIS/PACS systems was also upgraded to the same version as well.



*"The time factor was very important then, since some of the patients could be potentially infectious and a rapid radiological opinion was important. Not using hard copies of images also helped reduce the risk of the virus transmission."*

*"Our three partners, GE, EMC and Intel, offer us solutions to help preserve our infrastructure and investment, and also give us the opportunity to upscale our operations when necessary."*

– Associate Professor  
Thomas Chee  
Head and Senior Consultant  
Department of Diagnostic  
Radiology  
Tan Tock Seng Hospital

Below shows a single line diagram of the Centricity RIS/PACS architecture in TTSH Radiology department.



### Seeing the Benefits during the SARS Crisis

An outbreak of Severe Acute Respiratory syndrome (SARS) was detected in Singapore at the beginning of March 2003. The outbreak, initiated by a local traveler to Hong Kong in late February 2003, led to sequential spread of SARS to three major acute-care hospitals in Singapore. The Singapore government made a decision to centralize the care of suspect and probable cases of SARS including pediatric cases to TTSH. By the 31 May 2003 when WHO (World Health Organization) took Singapore off the list of SARS affected countries, TTSH had screened more than 9000 patients.

Due to the highly infectious nature of this new air-borne disease, prevention was through the use of masks, gowns and gloves by healthcare workers in high-risk clinical areas and triaging febrile patients at emergency departments and outpatient clinics. Hospitals saw the true benefits of Centricity RIS/PACS system during the SARS crisis, as it eliminates contact risk between radiologists and patients in many situations, eliminates a source for formite transmission via repeated manual handling of x-ray films and improves turnaround time of radiological reporting.

### Seeing the Benefits during the SARS Crisis

At TTSH, where the Centricity RIS/PACS was available to medical staff, doctors said it could not have been better timed. It came online just two weeks before SARS hit Singapore. The Communicable Disease Centre soon became a SARS screening centre and about 350 to 500 people turned up each day for X-rays. Previously, the X-rays had to be physically dispatched by van in batches, once every hour, to the radiologists at TTSH, a few minutes' drive away. With the new RIS/PACS system, the X-rays were uploaded onto a central server and could be accessed by the radiologists almost immediately.

### Reaping Productivity Gains from the Centricity RIS/PACS Implementation

Prior to implementing the GE Centricity solution, TTSH used the traditional manual reporting methods for Radiological studies with film based images. With the new Centricity RIS/PACS system which does away with X-ray film and paper reports, retrieving X-ray results from TTSH and NUH is now expeditious, instead of up to the usual two days.

Doctors at TTSH and NUH can view the X-rays on their computer screens, together with the radiologists' reports. Radiologists just have to dictate their radiological opinions directly into the computer, which automatically transcribes into typed reports using the accompanying Voice Recognition (VR) technology. The technology enables X-Ray film to be a thing of the past, as the new system provides digital images for Radiological diagnosis.

Before, they would record about 20 to 30 reports onto a cassette tape, which a transcriber would later type into the system. The reports are now archived together with the images, unlike before when they were often stored separately and risked being misplaced. On this same system, scheduling, billing and patient information functions have also been integrated. This enhancement further reduces clerical and process costs. Such improvements eventually cut the average time to produce a report from one or two days to a few hours, and save an estimated \$500,000 each year in films and film processing. They also make it easier for doctors to confer on cases from various locations, and result in quicker decisions on treatment.

## Key Technologies in Centricity RIS/PACS System

- GE Centricity RIS/PACS, an integrated image and information management system, provide both hospital-wide distribution of high-resolution radiological images and reports.
- The hospital's front-end client workstations and back-end Web servers feature powerful Intel® processors that include the Intel® Xeon® and Intel® Pentium® processors, to crank through massive amounts of real-time data. These deliver digital images and reports from Centricity RIS/PACS to clinicians on demand, providing near-instant access to medical data and dramatically reducing waiting time.
- EMC Centera, a usable 24-Terabyte scalable and secure storage system, is installed as the central storage solution for RIS/PACS data.

### Radiology Scheduling, extending the Business Value of the Solution

TTSH RIS/PACS is tightly integrated with the HIS. Patient information is entered once during registration and information flows into the Centricity RIS/PACS when exam is scheduled in the RIS. The benefits of this are several. Data entry work and paper handling is greatly reduced. In addition, it improves on the quality and accuracy of information placed into the system.

The Centricity RIS/PACS has established a real-time electronic information pipeline between the HIS and the RIS. This is generally referred as EDI (Electronic Data Interface). The electronic sharing of information increased user productivity and reduced the possibility of data duplication and errors between the linked systems.

The information sharing with Centricity RIS is performed through data messages described and defined by Health Level Seven (HL7)

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Patient Admission, Discharge, Transfer and updates have been made easy between HIS and Centricity RIS/PACS. At the same time, the procedures performed at the radiology department are also sent to HIS to consolidate the billing information.

Moreover, the radiology results have been sent to the cluster wide EMR systems, like Computerised Patient Support System (CPSS) and Cluster-Shared Patient Record System (CPRS). This enabled the clinicians to view the results without being switched on and or logging on to the RIS.



*"There are other RIS/PACS systems but GE Centricity RIS/PACS\* system best meets our requirement for functionality, performance and reliability."*

– Dr Jeffrey Goh  
Consultant Radiologist  
Department of Diagnostic  
Radiology  
Tan Tock Seng Hospital

## Key Improvements:

- TTSH is projected to save approximately SGD 500,000 (USD 309,000) each year in films and film processing after conversion from traditional X-ray film to filmless radiology, reducing total cost of ownership in the long run.
- The new digital workflow transcribing and archiving radiologists' reports together with the filmless radiology process minimises clerical and processing costs, and reduced the average time to produce a report from one or two days to a few hours.
- TTSH radiologists and doctors are able to provide faster and more accurate diagnosis of patients, with near instant access to radiologists' reports and digital X-rays, improving hospital turnaround and service quality across the board.



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