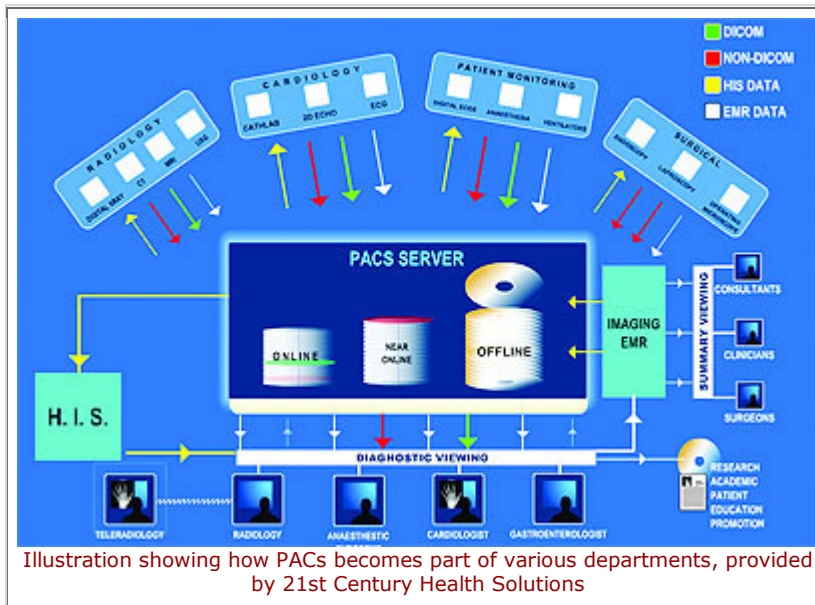


## Ready to Implement a Digital Archiving System?

**Nayantara Som** explains how PACS can improve patient care by enabling fast access to medical images



Picture Archival and Communications System (PACS) is a technology that enables images from various modalities such as ultrasonography, magnetic resonance imaging (MRI), endoscopy, mammography and radiology to be stored electronically. At the click of a button, these images can be retrieved, transferred and viewed simultaneously by physicians and practitioners at various locations, who interpret and store them in archives for future use.

PACS is poised to replace the age-old method of storing medical images in a hard copy or on film. PACS consists of four major components: the imaging modalities such as CT and MRI, a secured network for transmission of patient information, workstations for interpreting and reviewing images, and long and short-term archives for the storage and retrieval of images and reports

Images from different modalities come in to the PACS station simultaneously. Typically, the storage capacity of a PACS server varies between 1.5-2 terabytes for a 100-bed hospital. Experts also suggest that the time duration for storage of images should be a rule-based archival.

Combined with available and emerging Web technology, PACS has the ability to deliver timely and efficient access to images, interpretations and related data. PACS breaks down the physical and time barriers associated with traditional film-based image retrieval, distribution and display.

## Why Implement PACS?

1) Storing medical images in film archives proves to be cumbersome for the hospital where the number of X-Rays and CT scans conducted per day exceeds 500.

2) As images produced in a CT scanner or an MRI are digital, it makes sense to have a system that offers digitalised image retrieval.

PACS enables experts to either view the entire image or zoom into one part of the image. Soft copies of images can also be mailed to any part of the world for review and consultation.

3) Digital archives have a longer life. Explains Aniruddha Nene, Principal Consultant, Imaging and Director, 21st Century Health Solutions, Mumbai, "Medical images stored as film have a shortlife span of six to seven years. Moisture and exposure to sun hampers the life span of these films."

4) Monetarily, storing medical image turns out to be expensive both for the hospital as well as for the patient. "The problem arises when the patient wants another copy of the report. In most cases, the hospital cannot provide a copy or the patient is reluctant to shell out extra money for the copy," Nene adds.

5) Patients also find it tedious to carry reports from one department to another within a hospital.

6) Vendors can now customise PACS model in a way that makes it very user-friendly. Tarit Mukhopadhyay, Head of PACS Business, Siemens Medical Solutions, India, explains, "Every PACS solution is to be customised for the following parameters: types of modalities to be connected, number of users in radiology for diagnostic viewing, number of users for clinical viewing, number of studies per year per modality, storage, security data and data migration requirement."

## Integrate for Filmless Future

If implemented and used well, PACS also becomes a potential source of saving revenue for the management. Monetarily, the returns may not be immediate, but it is a one-time investment, as in the long run, films work out more expensive than establishing a PACS network. "Medium-size hospitals typically do more than 1,00,000 tests a year. PACS generates substantial saving on film costs running into Lakhs of rupees. Implementing PACS lowers the cost of logistics leading to further savings," informs Satish Kini, Chief Mentor, 21st Century Health Solutions, Mumbai.

With these advantages, health experts and vendors are now exploring more ways to popularise this technology. And one such item on their priority list is integrating Hospital Information System (HIS) with PACS. Despite both the systems pertaining to different functions, industry experts assert that administrative efficiency can be achieved through synergy of both these systems. "Few systems across the world have integrated PACS, Hospital Information System (HIS) and Electronic Medical Records (EMR)," points out Nagendra Swamy, Group Director, Medical Services, Manipal Hospital. Only when a PACS system is Health Level 7 (HL7)-enabled can these systems communicate with each other.

"In our 11-storey hospital where the radiology department is on the first floor, the time lost in communicating can be crucial for a patient's health. PACS allows doctors to take decisions without losing the crucial time."




- **Nagendra Swamy,**  
Group Director, Medical Services,  
Manipal Hospital

"A PACS which is HL7-enabled will help a consultant at the viewing station to access the service request, his hospital records and the number of tests he had undertaken in the hospital from the HIS records," says Aniruddha Nene of Mumbai-based 21st Century Health Solutions.

This makes things easier because departmental staff can access all relevant information to schedule and administer the examinations effectively and generate statistics and management reports. The radiologist can view and report the images online and add EMR findings instantly when he comes for a scan.

“Proper planning and deployment of PACS and Radiology Information System (RIS) can totally eliminate the need for X-Ray films, thus saving large amounts of expenses on films which includes material, processing and logistics,” opines Kini. Wipro has plans to integrate PACS, HIS and RIS. “We are conducting research with integration solutions along with a number of PACS brokers. Though the majority of our clients are from North America, Japan and Europe, we are now coming up with integration solutions for major private groups even in India,” says Kapil Khandelwal, Head-Healthcare, Wipro Healthcare and Life Sciences, Bangalore.

But with PACS just taking root here, is it not too early to jump in for integration? “PACS is not in its nascent stage. It has reached a mature stage whereby experts and vendors can experiment for new avenues,” asserts Nene.

<b>Perspectives on PACS</b>		
 <p><b>"In the near future, PACS will lead to enterprise connectivity. This will lead to an ability to pool data across hospitals and benefit clinical research initiatives"</b></p> <p><b>- Aniruddha Nene</b> Principal Consultant Imaging and Director 21st Century Health Solutions Mumbai</p>	 <p>"The 10-12 per cent per annum market demand for PACS in India and 6-8 per cent globally is a positive sign"</p> <p><b>- Kapil Khandelwal</b> Head-Healthcare Wipro Healthcare and Life Sciences Bangalore</p>	 <p>"We are considering implementing PACS. At the moment, issues like the number of viewing stations and the software to be implemented are being considered by us"</p> <p><b>- Mahesh Shinde</b> IT Head PD Hinduja Hospital Mumbai</p>

**Still finding feet in India**

Despite its benefits, only a handful of hospitals in India have plans to implement PACS in the near future. Dr Ashish Banerjee, Medical Director, Ruby Hall Clinic (RHC), Pune which has been using it for the past four years feels that technology does not appeal to experts: "Ideally, every single critical patient in ICU and CCU should have their own computer so that viewing images using PACS becomes easy. This is not practical in India." A huge initial investment between Rs 10 lakh to a few crore also makes hospitals reluctant to invest in technology, which does not yield immediate returns.

Ignorance about benefits of PACS is cited as another reason for the technology not taking off in India. "Vendors for PACS do not create much awareness among industry experts and some hospital managements even mistake an electronic storage solution for PACS," says Dr Uday Patil, Consultant Radiologist, Manipal Hospital, and Bangalore.

Moreover, some hospitals do not want to do away with films because doctors get commission for using films.

This does not mean that hospitals have closed their doors to PACS. Max Healthcare, New Delhi, plans to invest around Rs 20 crore for implementing PACS in all their five branches. At their head office at Okhla in South Delhi, radiologists will be stationed at the data centre where all images would be stored. Says Pradeep Saha, IT Head, Max Healthcare, New Delhi, "The departments which will be benefited are radiology, neurology and nuclear medicine."

Additionally, Manipal Hospitals Group which has been using PACS since 2000 in their flagship hospital in Bangalore, soon would be venturing into an 'Enterprise Wide PACS' which will link the entire chain of hospitals." Instead of physically sending data amongst consultants, now they can be sent online and second opinion can be taken from our chain of hospitals and other enterprises," mentions Dr Patil. The group has tied up with one vendor, but is open to multiple vendors, which can further lead them to an integrated solution.

A year back, Mumbai's PD Hinduja Hospital had chalked a roadmap to implement PACS. Informs Mahesh Shinde, IT Head, PD Hinduja Hospital, "Aspects like the number of viewing stations and the type of software to be implemented are being considered by us."

Says Kapil Khandelwal, Head-Healthcare, Wipro Healthcare and Life Sciences, Bangalore, "10-12% per annum market demand for PACS in India and 6-8 % globally is a positive sign. This demand stems from the need for a centralised system, telemedicine and teleradiology."

### **Affordability Through Integration**

Though PACS is not very popular in India (See box), industry experts are optimistic that PACS has a bright future. PACS can perhaps be a catalyst for attracting more international patients.

If integrated, PACS can be made affordable and mid-size hospitals could soon have some form of PACS in the next 8-10 years. At present, a trend of setting up a central data server for a chain of hospitals is being explored. As the industry matures, the 'pay-by-use' model (one central data server renting out the facility of archiving images to other corporates) will be the most convenient method, as the upfront capital investments will be curtailed. With proper research, study and planning, PACS is a reality, which is here to stay, connecting all and changing lives.

### **Synthesising PACS & DICOM**

The advent of PACS would not have been possible without the wonders of Digital Imaging and Communication in Medicine (DICOM). Prior to the entry of DICOM, different modalities worked in watertight compartments. Coming up with a holistic solution for a hospital, connecting each and every modality was an uphill task.

Moreover, to connect different modalities to a common server, earlier experts were forced to stick to one vendor or manufacturer. The option of choosing multiple vendors was out of the question. Along with this predicament, experts also realised the irksome obstacles and drawbacks pertaining to film archives.

Medical images in almost all modalities except X-Rays were originally digital in form. Academicians and medical experts realised that since images could be accessed digitally, why have a hard copy at all and instead access images in the digital format itself. For that, a language was needed to connect all the systems.

### **Need for a standard**

This urgent need for a set standard for systems to communicate easily and effectively with each other led to the genesis of DICOM. The introduction of DICOM in 1982 by a group of academicians from the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) was a solution to the predicament.

DICOM thus is a systematically developed set of standards for handling storage, printing and transmitting of images. DICOM-compatible systems can interact easily with each other and can respond faster to various commands.

"A CT scanner made by one manufacturer and an MRI from a second manufacturer can all communicate with the same PACS. It is because of DICOM, that images from the two modalities and others as well can be connected to the same PACS station. The prevalent version of DICOM is 3.0.

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