

So, You want to buy a buy a Cardiovascular PACS?

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While there are plenty articles out there available to aid decision makers in selecting a radiology PACS, the same cannot be said for cardiovascular PACS (CVPACS). The arena of CVPACS is somewhat like the early days when radiology PACS were just being introduced and luck plays a major role in selecting the right vendor. The huge amount of information required (but not available), coupled with the confusion and hype generated by solution vendors touting their wares can be daunting to the first time buyers of complex information systems.

Diagnostic imaging is playing an increasingly important role in assessing, guiding and monitoring cardiovascular patient's condition but that does not imply that one should use the same criteria in evaluating a radiology PACS for a cardiovascular PACS as the workflow and technology utilized are relatively different, here are a few examples;

Radiology PACS	Cardiology PACS
<ul style="list-style-type: none">• Focus on image quality, uses high diagnostic monitors• E.g. Diagnostic monitors ranges from 2MP for CT, MRI and 3MP for Computed Radiology to 5MP for Mammography	<ul style="list-style-type: none">• Focus on functions of the anatomy• E.g. 1 MP Diagnostic monitor is sufficient for cardiologist's usage
<ul style="list-style-type: none">• Web images focus on image quality of high resolution, hence adopts• E.g. JPEG 2000 (Wavelet)	<ul style="list-style-type: none">• Web images focus on moving images (functionality of the anatomy)• E.g. Uses Motion JPEG

Table 1.0 Some differences between Radiology and Cardiology PACS

While it is impossible to highlight everything possible in selecting a Cardiovascular PACS, here are ten areas of focus that one should investigate when making a decision;

1. Integration

Integration comes in many forms, early radiology PACS solutions touted offerings of ‘integrated’ RIS-PACS solution that really just offers an application level integration with both the RIS and PACS having their own databases while communicating via a 3rd party PACS Broker.

Such ‘surface level’ integration is not really integration at all as data are still stored in different databases and this can cause serious issues with data integrity and consistency since failure in either system can cause patient’s data not being properly updated (if the system is not available, there is no updating.)

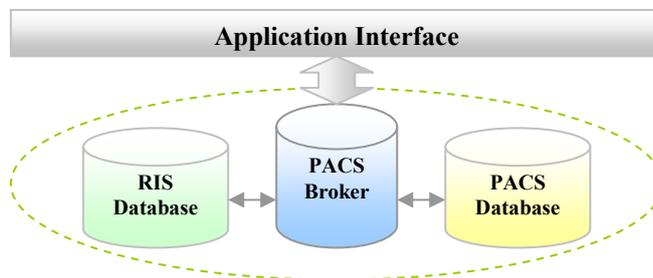


Fig 1.0 E.g. of ‘surface-level’ integration

True integration happens at the database level, a CVPACS should utilize a single database to store all information pertaining to the patient’s cardiac history, so that one can perform data mining for

- Accreditation purposes
- Statistical population assessment
- Data registry submission

The presence of multiple databases reveal hints of integration being done as an ‘afterthought’, something common in situations where vendors try to ‘gel’ different solutions (usually acquired through acquisition and mergers). In addition to issues pertaining data integrity and consistency, there are other concerns like;

- Additional cost. This includes addition database licenses, future upgrades and manpower cost for maintenance
- Additional effort. Every additional database translates to an additional point of failure, hence there is an additional need of effort in maintaining, monitoring and updating (patching) them

Integration Drawbacks of Traditional Cardiac Imaging Solutions
<ul style="list-style-type: none"> • Multiple proprietary systems, each archiving to disparate platforms • Inability to access ALL modalities from single workstation • Multiple user interfaces for different modalities • Different systems not ‘talking’ to each other (no integration) • No integration to Hospital Information System (HIS) or Electronic Medical Records (EMR) systems or Radiology PACS

Table 2.0 Integration Drawbacks

2. Interoperability

Mentioned interoperability and most would think of connectivity between modality equipment and the designated PACS, while this has been (almost) an issue of the past for the radiology domain, it is surprisingly, still a nightmare for the cardiology side. This is largely due to the rampant usage of private tags in the images' DICOM header by modality vendors.

The adopted CVPACS should not restrict you from having the flexibility and choice to purchase the "best of breed" modality equipment. Take for example ECGs, there is no logical reason why the implementation of an ECG Management System / module will have "locked in" to the vendor's proprietary environment where you are left with no alternatives but to purchase only their ECG carts in order to utilize the ECG management system. The same applies to ultrasound, angiography and all other modalities.

Another aspect of interoperability is "future proof" of your CVPACS investment. There are history of vendors discontinuing support for their PACS due to their product reaching its End-Of-Life (EOL) and the vendor wishes to replace it with new solutions acquired from 3rd party companies, such scenarios resulted in hospitals facing issues of;

- A total write off of investment because such upgrades is essentially a total replacement of the CVPACS except this time round, you don't have a choice in selecting the CVPACS
- Failure to upgrade / migrate the 'legacy' system, resulting in a need to keep it running parallel in order to retrieve old data

While there is absolutely no way one can prevent such disasters from happening, a good indicator is to look at the 'track record' as well as investment that the potential vendor has put in for their CVPACS. See if they are serious about being in the CVPACS business.

3. Scalability

Regardless if it is a departmental or an enterprise solution that you are looking at, ensure that your solution is scalable. The cardiology department of today faces staggering volume of images and data, the whole notion of implementing a CVPACS would be to streamline existing workflow in order to increase productivity while ensuring optimum patient care. The problem however, is the ever increasing amount of patients.

"The whole notion of implementing a CVPACS would be to streamline existing workflow in order to increase productivity while ensuring optimum patient care"

The need for immediate access to high volume of procedures with large images dataset quickly when needed (from the clinics to consultant's offices or home) will only intensify as days goes by, it is important that your CVPACS has the capability to 'keep pace' with the increasing workload.

4. Web based design

Lets face it, web based products are the way to go, not only in healthcare informatics but everywhere else. Web based applications are

- Easy to deploy with minimum maintenance (e.g. upgrade or patches)
- Remove the issue of being 'confined' to certain workstations (Cardiologist need not return to the cardiology department to finish their work)

Having said that, there is no known CVPACS vendor (at this point in time) that provides a total web based CVPACS simply due to the need to transmit (extremely) large DICOM images. However, there are solutions out there that provide web based administrator tools for 'Superusers' as well as reporting mechanism (I seriously recommend structured reporting) for end-users.

5. Ease of use

The best way to discover the 'user friendliness' of a CVPACS is to try using it without any instruction and see how far one can go. Take note of how many steps is required to accomplish basic tasks and how many mistakes you make in trying to perform certain task.

Such informal evaluation and trials of the CVPACS will give you a rough idea on how difficult it is to learn and operate it (which is important in determining the acceptance level of the CVPACS)

6. Know what (features) you want

Before you can buy what you need, you will first have to understand what you want. Uncover and list down your user's needs as not to get excited by the 'bells and whistles' that seems to offer exciting cutting edge features that isn't really necessary.

By understanding exactly what your institute needs, you can concentrate on functionality that will be used on a daily basis. A comprehensive requirements list will help you stay on course and provide you with an objective way to measure which solution is the best fit your needs.

Features Drawbacks of Traditional Cardiac Imaging Solutions
<ul style="list-style-type: none">• Poor quality of images over the web• Inability to report over the web (view only)• Inability to quickly compare similar studies on same screen• Inability to perform 'before' and 'after' analysis (for ECG, echo, cath, etc)

Table 3.0 Features Drawbacks

7. Having everyone (relevant) involved

From the start of your selection project, form an evaluation committee with representatives from all users involved (e.g. Cardiologist, Technologist and IT Personal). The active participation of key users will not only help ensure all aspect of the project is covered but also fewer number complaints after implementation.

One of the biggest frustrations users face during selection process is having the IT department take the lead. In most cases, IT management tends to focus more on the technological aspects of the system rather than functional requirements. The new system

may be easier for IT to support, but there's a good chance it will lack important functional capabilities.

Lastly, never have the radiology department spearhead your evaluation; remember, you are looking for a cardiovascular PACS, not a radiology PACS.

8. Clearing the hype

Look at how long the company has been offering CVPACS solution and the 'condition' of the product being offered, are they satisfying customers (both existing and potential)? Do they have a clear direction? Or do they offer multiple disintegrated solutions that do not work together?

Lots of companies spend huge budgets on marketing to promote their solution as the 'holy grail' of cardiology. However, without a robust solution that really satisfied cardiologists' needs, these vendors can only get 'so far'.

Look at the marketshare of these vendors and take the effort to speak to cardiologists and technicians that has actually used their products. Better still, drop by for a site visit and see the solution in action to determine if you like it (and see if you can request for changes to portions that you don't).

9. Be prepared for changes

Most PACS implementation fails to take off immediately because there is an expectation for status quo in the radiology / cardiology department, this is a timebomb waiting to explode. Change is the only thing constant in life, and it is inevitable that there will be changes of existing workflow from any automation process (be it in healthcare or not).

Taking the Multi-Slice CT (MSCT) for example, when it was first introduced, radiologist kept to reading one image per film. The MSCT was unable add value in clinical workflow simply because radiologist refused change their way of interpreting CT procedures, the true benefits (including clinical benefits and operational efficiency) of MSCT was only realized when radiologist started to read multiple images per film. 3D reconstruction and visualization wouldn't even exist if radiologists were adamant on reading only one CT image per film.

10. Last but not least

Ask yourself if the key stakeholders (end users, management and IT department) would be able to achieve the following (if not all) benefits if you implement a particular CVPACS,

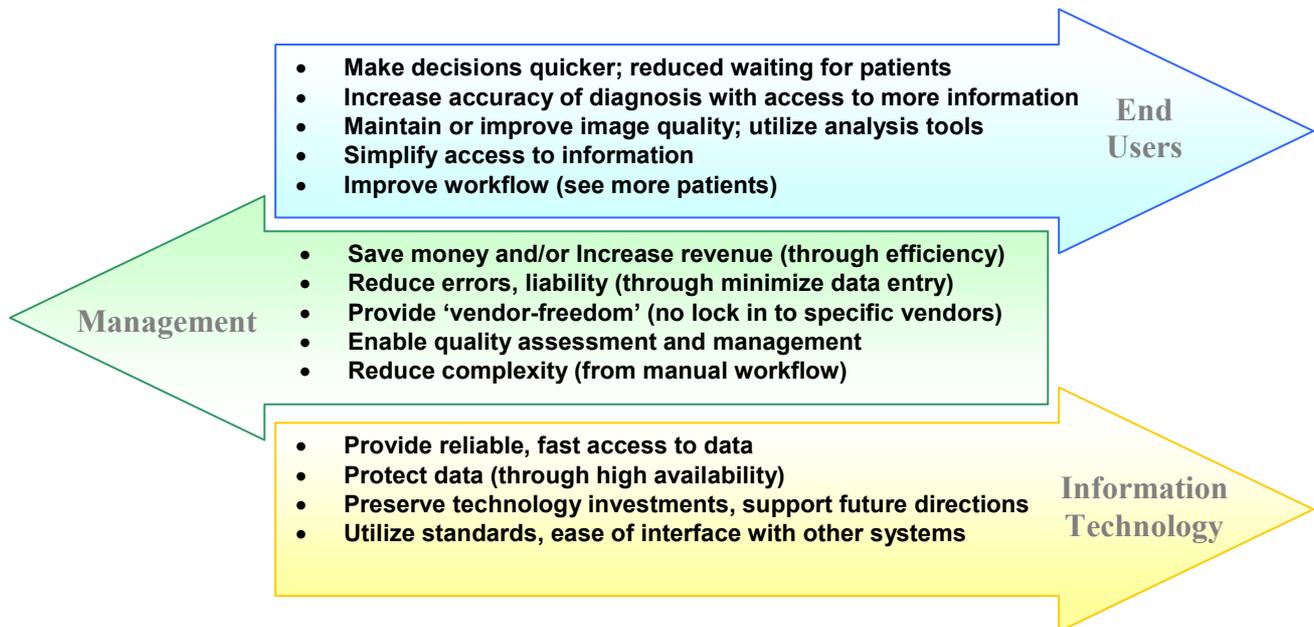


Fig 2.0 Benefits for key stakeholders

Selecting a cardiovascular PACS is a paramount decision that will either 'make or break' your department's operational effectiveness, the end results of an effective implementation should result in faster turnaround, more efficient workflow, and improved patient care.

Choose wisely and your returns will far outweigh your (long term) investments.

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