Health Care Chronicles

Molecular Imaging and Enterprise PACS

By Xiaoyi Wang

Diagnostic imaging for oncology is the fastest growing segment of radiology. PET-CT is the gold standard for imaging function and reliability. Health care organizations are paying increased attention on how to incorporate molecular imaging into enterprise PACS to bring this specialty up to the same level of efficiency. With nuclear cardiology as the key to non-invasive cardiology, making molecular imaging accessible at an enterprise level is of paramount importance.

Over the past several years, some major conventional radiology PACS vendors have tried a number of solutions to address molecular imaging. Unfortunately, most of their efforts proved fruitless and their end-users have found these attempts to be either too cumbersome to use efficiently or not usable at all. We observed most users go back to their old routines: using modality workstations. As a result, conventional PACS vendors have been avoiding the subject of molecular imaging as much as they can, and they have convinced most of their customers to leave molecular imaging out of PACS.

Most enterprise PACS request for proposals (RFPs) issued today are mandating prospective PACS platforms provide comprehensive support for molecular imaging modalities.

So why is molecular imaging so complicated and why do most conventional PACS fail to support it?

Molecular imaging is functional imaging, which makes the modality intrinsically difficult. Obtaining images is only the first step; the more important steps are how to process and view the images in meaningful ways, as well as how to analyze the images to make an accurate diagnosis. Unlike general radiology modalities, which acquire images and present them "as-is" on PACS, molecular imaging requires a comprehensive suite of processing and quantification applications on PACS in order to make proper diagnoses. These clinical applications are normally associated with device manufacturing and are beyond the scope of conventional PACS' IT solutions.

Secondly, molecular images are formed by collecting radiations from patients generated by radioactive isotopes administered to them. Compared to general radiology modalities, information available to form images is very limited. In order to improve image quality, manufacturers devised their own special technologies to make the best use of the information available. These special technologies often result in proprietary information that no other vendor can support. It is not uncommon to find data incompatibility even among same vendors' equipment of different models. Such technology challenge is rarely a concern in general radiology.

Next, many institutions still use "legacy" nuclear medicine equipment from the '80s and '90s, which do not support DICOM. For such old equipment, it is simply impossible to send images to PACS. Even the devices that claim to be DICOM-compatible would only support sending some simple image types or screen captures at best.

Finally, being able to store raw molecular image data on PACS and being able to bring the data back to modality is a major challenge for most PACS. For example, most PACS either will not accept raw data, or when raw data is retrieved back, it is no longer usable. The majority of health care institutions still do not use PACS for long-term archiving of molecular imaging data. In fact, the majority of nuclear medicine departments still maintain their image archives on CD/DVD or MOD.

It is apparent that in order for a PACS to handle molecular imaging, the solution needs to include the ability to handle the four aspects mentioned. There are two ways to accomplish this:
• Implement a PACS that has such capabilities built into the program.
• Enhance a conventional PACS with molecular imaging capabilities.

Clinical diagnostic applications need to be specially designed for radiologists, while the image processing and dataflow control applications need to be designed for technologists. Additionally, workflow and dataflow need to be customized for each site to accommodate the wide varieties of devices to provide the highest efficiency.

The main reason many PACS vendors' attempts do not yield the desired results is because they focus solely on putting clinical applications on PACS and ignore how to get data to and from PACS. To further reduce the usability of such solutions, many of these solutions are simply a piece of nuclear medicine technologist processing software awkwardly plunked into a PACS workstation. Such technologist processing software is often unusable for radiologists for diagnostic interpretations. In many ways, such solutions are often hardly any better than running two pieces of software on the same computer. This is a pitfall to watch out for.

Molecular imaging and enterprise PACS are not mutually exclusive. On the contrary, the combination is a must for successful enterprise diagnostic imaging, as healthcare organizations are finding out.

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