

Key DICOM Features and a Sample Radiology Workflow

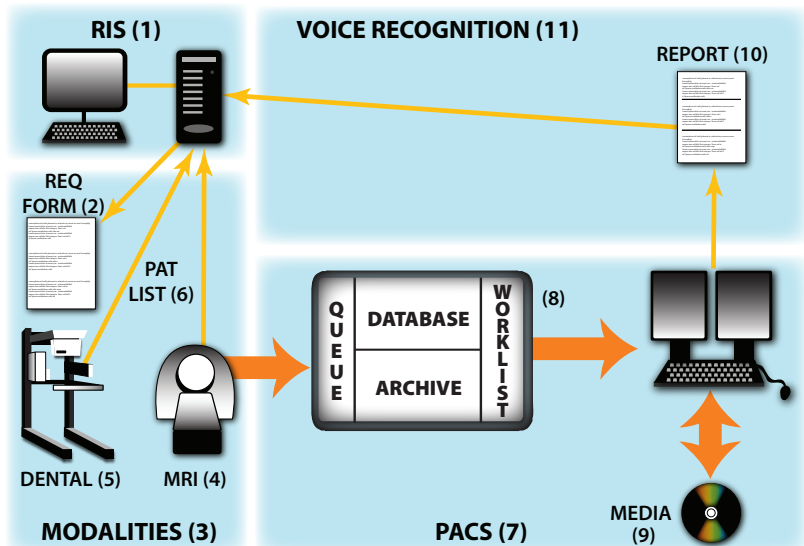
A PACS stores, retrieves, distributes, and presents digital medical images. In a typical PACS, DICOM is used for image storage, retrieval, and data exchange. DICOM also provides a framework for image information management such as Modality Worklist (MWL), Modality Performed Procedure Step (MPPS), and Storage Commitment (STC). Furthermore, DICOM standardizes hard- and soft-copy display consistency and image import/export on rewritable media such as CDs or DVDs.

Another standard, HL7 (Health Level 7) provides the “glue” that integrates the imaging department’s PACS with the RIS (Radiology Information System) and/or HIS (Hospital Information System) used by the rest of the institution. Orders for radiology/ imaging procedures entered in a HIS, a RIS, or in a generic order entry application are communicated to the PACS as an HL7 message. Another HL7 message is typically used to transmit the results of the procedure (the report) back to the HIS (or RIS).

Both DICOM and HL7 are flexible by design, which has encouraged broad implementation. However, the same flexibility can interfere with interoperability between components in a PACS or with a PACS’s ability to communicate with a HIS or RIS.

A sample workflow is the best way to illustrate the key functions of a PACS. Consider the following scenario: *A patient complaining of headaches arrives at a hospital for a scheduled follow-up exam. He will be getting an MRI and dental x-rays that were ordered for him after his initial visit last week. He has brought with him a CD of a CT and skull X-rays that were performed last year at a different hospital.*

The following figure illustrates how each component in a “typical” PACS is employed as our hypothetical patient’s order is processed, his exams performed, and his images interpreted. This figure also illustrates the organization of this reference guide. Each major step in the figure is described in greater detail later on.



When the patient arrives in the radiology department, his arrival status is entered in the RIS (1) and a requisition form is printed (2). This requisition form includes the reason for the study (headaches) as well as a barcode representing the Accession Number of the exam. The Accession Number is a unique number used to identify the exam from beginning to end.

At the acquisition modalities (3), patient information and the details of the procedure to be performed need to be retrieved. At the MRI (4), our patient's procedure is included on the patient list of pending procedures to be performed (6). This list—the modality worklist—could be retrieved on demand by the MRI technologist or it could be automatically retrieved by the MRI as it periodically polls the central worklist provider. At the dental x-ray (5), a technologist uses a barcode scanner to retrieve the exact exam record using the Accession Number printed on the requisition form.

Once patient information is verified, images are acquired at each modality. At this point many hospitals have a QA step where positioning and image quality are checked. After acquisition is complete, the images are stored on the PACS (7).

After image acquisition and any QA steps are complete, the PACS adds the images to the viewing station worklist (8). A radiologist uses the worklist to retrieve the images and reviews the images at a PACS display workstation. Optionally, if outside/previous exams on CD have been imported (9), the radiologist will review these exams as well.

The radiologist then generates a report (10). If an integrated VR (Voice Recognition) system (11) is present, the appropriate report template can be automatically displayed as soon as the radiologist selects an exam to be read. After the exam results are dictated, the radiologist verifies and electronically signs the report. Signing the report automatically triggers a process that sends the report from the VR system to the RIS for distribution.