The trouble with DICOM importing and how it impacts you and your patients.

Import (verb): *to be of consequence or importance; to matter*.

While "importing" is well understood in Information Technology terms, its alternative meaning underlines the critical nature of the movement of medical images to techs, doctors and - most importantly - patients. In this White Paper, we will look at this *import*ant process. Patients often visit a number of different healthcare facilities, acquiring medical images along their care-path. Aside from being referred to multiple institutions for imaging, diagnosis, special procedures etc., even the more mundane acts of changing physicians, out of town trips, home relocation, etc. require that clinicians view these prior studies and store them at their local hospital.

Statement of Problem

The classic problem is managing the transfer of a prior study performed while the patient was being treated at another facility or remote imaging center. Often the patient's clinical provider determines that these prior studies are clinically significant and need to be included in the patient's record as reference images. Accordingly, the patient brings (or referring physician sends) the CD containing the prior study to the care provider selected for treatment. This solution then involves importing the third-party study which is unknown to the receiving system or PACS (Picture Archiving Communication System).

The radiology equipment manufacturers use proprietary formats, File Set Readers (FSRs), Pixel Data Value Sets, Retired Tags, OEM specific tags, Presentation States, and other specific formats that can substantially limit the ability to import and ultimately use the images in the local systems. This often results in unnecessary rescans and eliminates the chance to compare priors in clinical decision making. The direct healthcare cost of unreimbursed rescans and deferred care is tremendous, the on-costs of the loss of a holistic view of the patient, unnecessary radiation exposure and diminished quality of care (e.g. HEDIS penalties) only adds to the exposure.

Standards and Related Specifications

There are a number of very specific international standards and protocols defining the management of medical images.

Part 10 of the DICOM standard requires that there be a DICOMDIR or DICOM directory file on the media which contains the hierarchal listing of every DICOM object (including images) that are on the media. The DICOMDIR file contains the patient and study identifiers along with some additional information (study description, study date and time, series information, institution, modality, OEM, SOP Class, transfer syntax, etc., and the file paths of the DICOM objects).

Portable Data for Imaging (PDI) further standardizes the distribution of imaging-related information on interchangeable media, allowing users who receive exchange media to more reliably import, process, archive, display or print the information transferred.

The IHE PDI builds on the DICOM standard and promotes implementation interoperability. While most new devices that create portable DICOM media support the DICOM Standard and follow IHE PDI, unfortunately, some legacy PACS and OEMs still generate CDs and DVDs of DICOM objects in proprietary formats. They do this in an effort to control the environment. i.e. "If you had bought all GE, you wouldn't have any problems." This places the patient at risk because it is difficult to import DICOM objects from media that fails to conform to the DICOM Standard) - leading to rescans and deferred care.

Proper reconciliation (matching the correct patient demographics) for importing prior studies is best performed by creating a new order on the institution's imaging system and then associating the DICOM objects from the prior study with it. In this way, the prior study is actually inserted into the imaging system's electronic health record (EHR) and is properly indexed so that it can be identified later and then retrieved as needed to use as primary images or priors for comparison. This is critical for disease state and healing progression to make better clinical decisions.

Currently, importing prior DICOM studies into the institution's systems is a very slow labor-intensive process. The user loads the media into a drive and then waits for the commercial importer product to read all the DICOM files. Many of these commercial importers, some costing many thousands of dollars, don't account for unique formats or structures and simply don't import many images such as JPEG2000 and proprietary DICOM objects preventing the viewing and clinical use of the images. This also leads to rescans and deferred care, causing lost efficiency and billions in cost let alone unnecessary exposure to radiation for patients.

Typical importing protocol is painfully slow. First, the user has to review the study on the commercial importer. The user then goes to the institution's Radiological Information System (RIS) and places an order for an equivalent radiology study. Then, the user returns to the commercial importer and use DICOM Modality Worklist to retrieve the order, have the commercial importer update the DICOM images with the institution's patient and order information, and have them sent to the institution's imaging system or PACS. Finally, the user loops back to the institution's RIS to update the study status to indicate that it is complete. Processing a single study this way takes anywhere from 10 to 30 minutes. And the user would have to repeat this effort for each study on the portable media that needs to be imported. This is a rather overwhelming task, given the volume of studies that need to be imported at most institutions. Many sites have full-time employees managing this process. The result is that the prior studies are often not imported and examinations are unnecessarily repeated.

Best Practice Solutions

Best practices should include:

Importing updates patient and exam metadata through standard DICOM Modality Worklist (DMWL) queries to the local information system. Importantly, based on the results of the query, users can quickly select the appropriate patient and exam data to be systematically updated on the study for optimal care. For example, many images (skin, cytology, pathology) are normally ignored in diagnostic decisions for radiologists. Even so, these images are being captured in the clinical setting and many end up in the patient record, but not in the PACS system as DICOM images. Their inclusion is problematic for a number of reasons, not the least of which is the use of consumer-grade capture and display devices – an unregulated activity that has the potential to disadvantage the diagnostic decision process.

The development of new care delivery models requiring much reduced capital investment are at the core of most healthcare savings initiatives. However, ways must be found at the same time to maintain the integrity of the care delivery system through device characterization and process validation for all clinical specialties. The compatibility achieved across the complete diagnostic imaging chain as a result supports better clinical decision-making. There is also a need to account for the effects consumer devices have on the imaging chain and how to enable these emerging imaging modalities that have the potential to enhance diagnosis (i.e. camera phones used in dermatology and wound management).

In the final analysis, it doesn't matter why or how diagnostic information is lost. If necessary information is not available for diagnostic decision making, more errors will be made. It is crucial, therefore, to consider all the influences that impact the creation of an image and its subsequent viewing. To this end, users must seek out import techniques and workflow that mitigates these issues in preventing unnecessary rescans and unsupported clinical decision making and diagnosis.

TeleRay offers a robust import and reconciliation tool within their MatrixRay software. This importing tool is available at no cost to any registered user to import, view, mask, edit, reconcile and send to PACS or other DICOM nodes.

TeleRay is an industry leader in the field of cloud platform in radiology for the management and distribution of medical images and patient information. TeleRay is widely recognized as the most reliable and advanced software on the market. With well over 3000 users, and 34 of the top 50 medical centers including Cleveland Clinic, Shriner's, Cedars-Sinai, Harvard, Cornell, Beth Israel, Baylor, Northwestern, UPMC, UPENN, NY Presbyterian, Cornell, Columbia, Barnes-Jewish, and many more. TeleRay has been growing overseas and can be found in more than 20 countries. MatrixRay is the best image management platform available with no set up fees, storage fees, training fees, monthly fees, hidden fees, or equipment to buy. A true pay-per-use system with the most features including our peer-to-peer fast and easy exchange network that is the most secure method available. Scanning, masking, editing, anonymizing, burning, print to DICOM, DICOM conversion, importing, robust viewer and more are included in the software for no extra fees of minimum commitments.

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