Volume 7 - Issue 1, 2007 - Features

Clinical Images and the Electronic Patient Record:The Best Way to Integrate Images

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Since the introduction of the Electronic Patient Record (EPR), there has been significant debate about the best way to integrate images. Initially, there was discussion as to whether the EPR would be the centre for storage of images, or if images were to be stored on an external source (such as a radiological PACS). Over recent years, the very definition of what we mean by EPR has changed and other terms have been introduced to cover several of the areas originally referred to as the EPR. There is still some variance internationally on the use of the phrase, whether it means a record held, possibly on a smart card by the patient, or a record held centrally within a hospital environment.f the latter is the case, is this record available nationally or even internationally or only across a hospital-wide enterprise?

Introduction

This article works on the premise that EPR is held centrally within a hospital environment, which is the current thinking in the UK. Ideally an EPR integrates all the data of a patient from different clinical systems, or at least provides links and access to such data. In this context what the EPR has provided is a clinical results solution to enable easy access to and switching between different clinical applications without the need for re-authentication and re-login, enabling access to clinical data, including images, at a single mouse click.

When looking at how images are handled and integrated within the EPR, it is key to define what we mean by "images" and the range of images. It is often assumed that the only images to be considered are radiological, and while this is the area with most experience, in practice there are a broad spectrum of other images, which are in some ways more significant and more of a challenge to integrate since they are in a wider variety of formats.

Storage of Radiological Images

Radiological images are normally stored in a PACS and in DICOM format. Other images such as pathology, endoscopy, retinal, etc., can often be generated in other formats including JPEG. Pathology images, for example, are also large file sizes and colour images and therefore present different issues. In many centres the primary archive is the original pathology slide and a digital archive is seen only as an option. This will have to become standard if pathology images are going to be accessible through the EPR.

There are currently two main approaches being considered for handling and accessing images within the EPR. Firstly, that of using a reference within the EPR to what clinical images exist for the patient and a link to where they are stored, enabling direct access to the images. The second is to store the images, or more normally a key subset of the images, within the EPR storage space itself. Given the size of the image datasets the first solution, which links to the images stored in the clinical system, has the benefit of saving storage space within the EPR and enables access to the entire image dataset stored within the clinical PACS system, whilst the second solution has the potential benefit of providing a truly integrated patient record.

Storing Non-Radiological Images

With non-radiological images the decision is whether the EPR has a reference to where the images are stored within a local clinical system, or whether to transfer these images into the established PACS system (and to store all images, radiological or not, in the PACS) or to store the images within the EPR itself.

In several cases, additional images are being generated within hospitals such as scanning request forms. The issue of how these are handled by the EPR raises the question of which images to include or exclude from the EPR. One option is to define the boundary based upon a formula which considers the volume of data and how clinical the information is. When considering how much information is integrated from clinical systems into the EPR, many hospitals differentiate between clinical and non-clinical information, retaining clinical information within clinical systems and using the EPR to predominantly store non-clinical data, since, within the EPR, data cannot be changed and updated in the same way as it can be in the clinical systems (for example PACS).

Accessibility

The EPR is often considered as a portal, providing access to collections of data, either stored locally or with links to storage in other clinical applications and the way that the links are set up through such a portal is the key to the success of the EPR and to the accessibility of the data. The interlinking of the different elements of the EPR to other systems is critical to ensure that the different users are aware of what data is available, how to access it and the ease of access. It is critical that once working within the EPR, images can be accessed by a single mouse click, whether they are stored within the EPR or not.

Standards Key to Ease of Access

Standards such as those defined by CEN and ISO are key to inter-accessibility, not only for image format but also the language for talking between EPR systems and hospitals. There are still areas to be defined in the standards. For example, the data structure in which image data such as multimedia reports are conveyed, has not yet been developed for diagnostic imaging reports. Standards currently used for images and text data, DICOM and HL7, do not necessarily fully meet the range of standards required. However, a significant number of organisations throughout Europe are working on a wide range of projects to define how to handle image data within the EPR.

A New Approach

One Europe-wide initiative has been working on an approach, which uses a system of building blocks, similar in concept to Lego. Each of the building blocks acts like a template for a different area. (For example: a template for orthopaedic surgery, a template for blood pressure measurement, potentially, a template for images) Here each hospital enterprise can create their own optimised EPR selecting and using the blocks that are appropriate to their needs. Since there is compatibility in the Lego type building blocks, different hospitals, using this approach, would be able to exchange EPR data freely; institution to institution. In practise most patients re-present at the same hospital or within a local geographic area, so the ability to exchange EPR data between hospitals at a distance may not be considered a major requirement, though it contradicts the initial objective of creating a comprehensive transportable record of a patient's medical history.

Although the concept of EPR systems has been around for several years, there is no fixed approach on how to integrate the range of images into the EPR. There are few proven commercial systems with integrated resilience and there is limited experience in creating a fully operational integrated system. There is still some way to go to universally agree on a single approach for images as part of the EPR, and to achieve an enterprise-wide working solution which can be extended to enable interchange of patient information, including images or links to images, between hospitals across a region, country or internationally.

Published on : Thu, 1 Feb 2007