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Sharing Medical Data Across Organisations and Systems

Author

Dr. Hanna Pohjonen

(above)

Healthcare IT Consultant

Rosalieco Oy

Finland

hanna.pohjonen@rosalieco.fi

The EU e-Health initiative and action plan is a driver for the sharing of patient information and networking of expertise across different institutions and countries. It was launched in 2004 and will be applied in its current form till 2010. Besides organisational eHealth, this initiative stimulates e-Health at national-level. At the same time the focus is being shifted from in-border health to more integrated healthcare provision across the EU.

Modern e-Health emphasises citizen empowerment and citizens' active participation in health and wellness management as well as coordinated resource sharing and problem solving in dynamic, multi-institutional virtual settings with equal participation by health professionals, patients and citizens. The keywords describing modern e-Health include patient/citizen-centric, seamless, shared, secure and trusted, preventive, independent of time and place, networked, cross-organisational, crossborder and interoperable.

It emphasises two aspects: sharing patient information and lining up a network of experts from different organisations or different countries. Changing the working environment so that patient information can be shared and the usage of networked expertise is easy and commonplace, will deliver significant benefits by improving availability of professionals; making specialist capacity available to improve efficiencies in delivery and to standardise working practices and enabling increased knowledge sharing across organisational borders.

Professionals need access to relevant patient data and knowledge in order to identify the issues (diagnose) and plan for a strategy (therapy, care plan, workflow), with expected outcomes (monitoring/follow-up of progress/ quality of care).

IT Supports the e-Health Community

IT has a central role to play in the reorganisation of the healthcare service delivery environment by facilitating and enabling new trusted and secure ways of working, collaboration and knowledge sharing. The generic IT services are common and can support any clinical e-Service. Besides generic IT services, e-Service-specific tools supporting a particular clinical e-Service implementation are needed.

Conceptually modern e-Health comprises a number of layers. At the top there are clinical e-Services; professionals deliver these in virtual working environments - making use of various IT services – both generic and e-Service-specific. The IT services themselves are supported by the basic infrastructure services providing also the necessary interoperability for healthcare service providers. Security and trust services are present at every layer. At the bottom there are the local clinical and administrative information systems producing the patient data to be transferred, stored, shared and used on the upper layers.

The workflow of clinicians is patient-centric and also highly nomadic – rarely are they able to accomplish all necessary tasks by remaining at a single location for an extended period of time. However, clinicians have difficulty in moving outside their own environments because of the need to have access to those IT systems that support their work. Similarly, contacts with patients at the bedside can be challenging because disparate sources of patient data need to be assembled for effective communication.

There are emerging generic technologies to support the realisation of the e-Health community: generic patient data repositories and streaming. The generic nature of the future offerings opens the market that was traditionally dominated by application vendors to 'new comers' as well.

Hitachi Data Systems is a good example offering both generic repositories to manage all data, but also streaming based viewers to retrieve and view the data.

Generic Patient Data Repositories

The traditional images-only archives are being replaced by new solutions which allow any type of fixed content data including images, laboratory results, video files, electronic patient data summaries, prescriptions, etc. To be stored in one storage system and in a patient-centric way. New generation enterprise archives are configured as network-attached systems and allow a set of standard interfaces and protocols – not just DICOM. The future repositories will form a GRID linked together via nationwide registries; the European Health Insurance Card (EHIC) will be used to access this GRID data in the coming years.

Sharing of patient data is changing dramatically: from 'point-to-point' to 'many-to-many'. The recent IHE XDS and XDS-I profiles for cross-enterprise document and image sharing are being applied in several e-Health projects in Europe and Canada. In this architecture, IT systems like PACS act as sources and consumers of information. The data are stored in a repository and published in the metadata registry: this is how we separate IT systems from data and data from metadata.

Data Retrieval

The metadata layer enables efficient searching and retrieval of patient data. The retention period for stored information varies country by country and it is different for images and other patient data. The new generation storage solutions allow intelligent information lifecycle management to automate and optimise storing of data taking different national legislations into account. The storage rules can be based on the DICOM metadata or even diagnosis or other data in the metadata layer.

The archives are changing from separate IT system attached silos to common shared architectures, but at the same time to e-Health platforms: the core is still archiving, but there are data privacy and security services, messaging services, patient's informed consent, coding services etc as well. The same platform can also be used for teaching and research.

Streaming Technology for Data Viewing

Streaming is a potential emerging technology to view patient data from the generic repositories. Streaming refers to sending portions of data from a source to a client for processing or viewing, rather than sending all the data first before processing or viewing. Streaming technology is used to overcome various limitations such as limited bandwidth connections, clients that are not powerful enough for the computation tasks required, and the handling of large data sets.

There are two types of streaming relevant in the healthcare field. Intelligent downloading is a form of streaming where only the data required for immediate viewing or processing are downloaded to a client. In general, processing of the data occurs locally on the client. Additional downloading may occur in the background. In adaptive streaming of functionality, data are not downloaded to clients, only frame-buffer views of the data or results of data analyses are streamed. The power of the server is used to render final screen images, which are then compressed and transmitted to client devices.

Advantages of Streaming Technology

There are several advantages with streaming technology. First of all, network bandwidth can be used more effectively than with traditional web-based solutions involving data downloading. Because data can be prevented from being downloaded to local clients, and only streamed for interactive viewing, an additional level of data security can be provided. Additionally, streaming requires only a single copy of data to be stored, which is accessed as needed, rather than maintaining multiple copies in order to meet distribution demands. Streaming also allows access to full processing functionality for all professionals; the clinicians can do 3D reconstructions and other advanced post-processing using their own laptops over low bandwidths. Even handheld mobile/ wireless devices can provide clinicians with enterprisewide access to all patient data and analysis tools on a pervasive basis.

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