HEALTHCARE IT MANAGEMENT

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THE OFFICIAL JOURNAL OF THE EUROPEAN ASSOCIATION OF HEALTHCARE IT MANAGERS

HEALTHCARE IT STANDARDS – DICOM, HL7 & SNOMED International

RIS-PACS-VR-DMS INTEGRATION

DEVELOPING A HOSPITAL-WIDE STANDARDISED COMMUNCATIONS PLATFORM

eHEALTH DECISIONS-COST BENEFIT ANALYSIS VS. RETURN ON INVESTMENT

Volume 1 / Issue 3
Autumn 2006

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Healthcare IT Management is the official voice of the European Association of Healthcare IT Managers

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Letter from the Publisher

Dear Reader,

As globalisation increases, healthcare facilities across the world are becoming more and more inundated with the need to transfer, process and store growing amounts of data and images. Coupled with the adoption of global network infrastructures and networking concepts, the need to create, test and adopt international healthcare IT standards has never been more imperative. As information technologies, by nature, must work with each other to function effectively, no stand-alone solution or provider can exist without the support and cooperation of other organisations.

Because of the necessity to have open systems, distributed processing and systems integration, organisations such as DICOM, HL7, SNOMED International and IHE (amongst others) have already made significant progress in developing the international standards that are so needed in healthcare IT. In the Cover Story section of this issue of *Healthcare IT Management*, we have therefore asked the standards bodies of DICOM, HL7 and Snomed to explain their most recent standardisation developments affecting the healthcare IT sector.

Closely tied in with our Features section articles, we explore the impact of standards development in the systems integration of RIS-PACS-VR-DMS. We also present articles covering PACS and reporting, and how to build trust in reporting to ensure future viability. The section concludes with part three of three, our series on designing a high-performance telemedicine system.

Our Country Focus section highlights Germany, with a report from the German Association of Hospital IT Managers - who have just celebrated their 10th anniversary. Also included is an analysis of the start of the test phase of the German health card. In our Best Practices section, we explore the steps for developing a hospital-wide standardised communications platform as was implemented at the Heidelberg University Hospital.

Finally, in our Management section, we present a comparison of Cost-Benefit Analysis (CBA) versus Return on Investment (ROI) methodology to assess the viability of healthcare IT investments. Also, be sure to read the latest news and membership information from the European Association of Healthcare IT Managers on page 5!

We are pleased to present these, and other interesting articles to the readers of *Healthcare IT Management*. As always, your opinions and suggestions are important to us – we invite you to contact our Managing Editor, Karmin Ruocco at k.ruocco.me@eahitm.org and let us know what you think!

Yours faithfully,

Christian Marolt
Publisher

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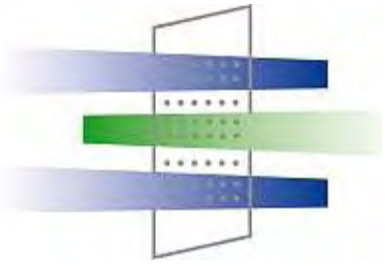
The European Association of Healthcare IT Managers (HITM)



HITM News

Heading into the last quarter of 2006, membership in HITM continues to steadily grow. We have been busy over the past few months, with the honour of meeting potential member associations and forging new relationships between HITM and other healthcare IT organisations throughout Europe. Our Executive Director, Christian Marolt, recently had the pleasure of representing HITM and delivering a speech on European developments affecting healthcare IT to the 10th anniversary congress of the German Association of Hospital IT Managers in Kassel, Germany which was held 20 - 21 September 2006.

We'll be taking HITM 'on the road' over the next couple of months, where we will have a booth for the association at upcoming healthcare IT conferences in Europe. You may have met the HITM team at the Medmatic@ show, held 28 - 30 September in Fiera di Vicenza, Italy and will have an opportunity to do so again at the World of Health IT (where we will be an exhibitor), to be held 10 - 13 October in Geneva, Switzerland. If you plan on attending, we invite you to stop by and let us tell you more about the benefits of joining this unique association.

On the communications front, the HITM website (www.hitm.eu) is also growing in popularity, with a steady increase in traffic and requests for membership applications and subscriptions to *Healthcare IT Management* each month. If you haven't visited our site yet, we encourage you to do so – it's the best way to keep yourself informed of the most recent developments in HITM.

About the Association

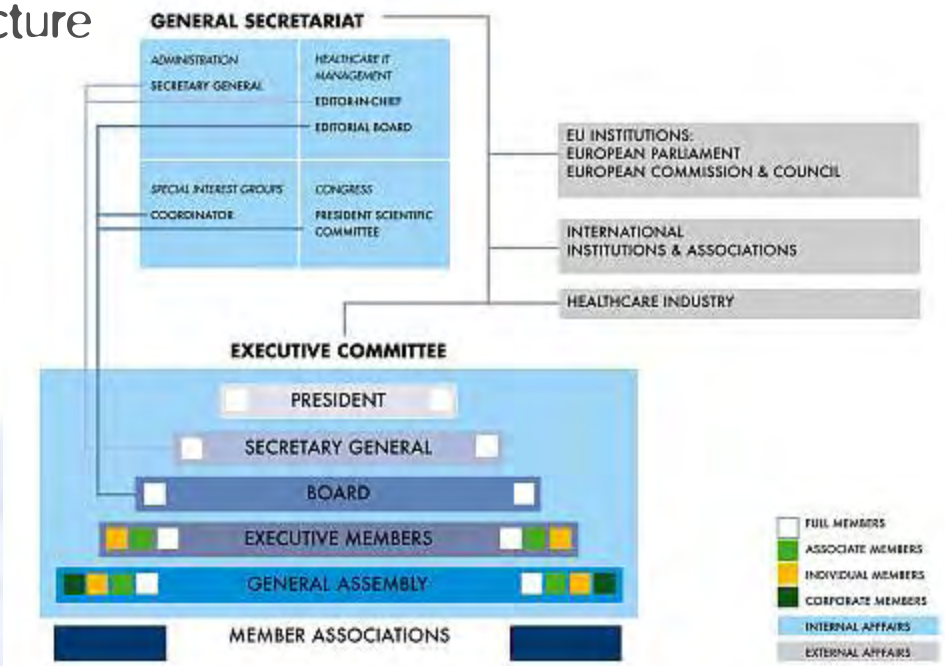
HITM is a non-profit organisation outlined as the pan-European umbrella association of all relevant national healthcare IT associations in Europe. Believing in the fundamental importance of unifying healthcare IT professionals at European and global levels, HITM is committed to increasing the professional authority and responsibility of healthcare IT managers and representing their interests to international institutions and associations. With membership in HITM steadily growing, the first annual General Assembly is being planned for the end of 2006.

Mission

The mission of HITM is:

+ To establish common healthcare IT standards, policies and strategies at EU and international levels,
+ To increase the visibility, importance and role of IT management in healthcare facilities,
+ To educate key policy makers, industry players and the general public of the benefits of healthcare I, and
+ to promote cross-collaboration of various healthcare sectors.

Organisational Structure



Membership

As the only pan-European association dedicated to healthcare IT management, HITM offers its members unique opportunities to:

+ Participate in advocacy groups that impact EU healthcare IT legislation,
+ Share your knowledge with and learn from the experiences of your peers,
+ Learn industry best practices and standards, and
+ Attend the HITM annual General Assembly, Congress and other special events.

Membership in HITM consists of four levels:

Full Members

Full members are comprised of national healthcare IT management associations, who can nominate one representative to the HITM Annual General Assembly. This representative will have the power to speak and vote on HITM priorities and organisational objectives, fundamental advocacy efforts, election of the Executive Members and the Board, and much more.

Associate Members

Associate members are representatives from healthcare organisations, who have the opportunity to speak, but not vote, at the HITM Annual General Assembly. Associate members will also have the privilege of electing one member to represent them in the Executive Members group.

Individual Members

Individual members are directly involved with healthcare IT management, with the opportunity to elect one member with the power to speak, and vote, at the HITM Annual General Assembly. Individual members will also have the privilege of electing one member to represent them in the Executive Members group.

Corporate Members

Corporate members are representatives from corporations engaged in supplying products and services to the healthcare IT sector. While corporate members may attend the Annual General Assembly, they do not have the power to speak or vote. However, corporate members may elect one member from amongst the Diamond Founding Supporters to represent them in the Executive Members group.

European Association of Healthcare IT Managers (HITM) Membership Application

❑ **Yes,** I would like to apply for an organisational membership with HITM.

❑ **Yes,** I would like to apply for an individual membership with HITM.

Organisation Information

Organisation Name:

Street Address:

City/Town:

Postal Code:

Country:

Website:

Personal Information (representative of the association above or an individual applicant)

Preferred Title:

Gender:

First Name:

Surname:

Position:

Department/Division:

Email Address:

Telephone:

Fax:

Mobile:

Membership categories per year:

(In the start-up process, all memberships are valid until December 2007)

Full Members: (those directly involved in healthcare IT management)

❑ Cat. A - Associations with more than 2,500 members (€2,500)

❑ Cat. B - Associations with more than 1,000 members (€1,800)

❑ Cat. C - Associations with less than 1,000 members (€1,000)

❑ I apply for an initial reduction of my membership fee of 50%, valid until 31 December 2006

Associate Members (those indirectly involved in healthcare IT management)

❑ Cat. A - Associations with more than 1,000 members (€1,500)

❑ Cat. B - Associations with less than 1,000 members (€1,000)

As part of their membership benefits, Full and Associate Members will receive a subscription to *Healthcare IT Management* for all of its members.

Individual Membership: (those directly involved in healthcare IT management)

❑ Yearly membership, including a one-year subscription to *Healthcare IT Management* (€ 40)

Corporate Membership (companies working in the IT field)

❑ *Please send me an offer.*

For more information on joining the European Association of Healthcare IT Managers, please contact Karmin Ruocco, Project Director, at k.ruocco.pd@eahitm.org.

Subscription form

HEALTHCARE IT MANAGEMENT

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Agfa Healthcare to Showcase New Technologies at RSNA 2006

At the 2006 RSNA Conference, Agfa will be highlighting new solutions in Mammography, CR, RIS / PACS, Cardiology, enterprise scheduling and access, decision support, reporting, advanced clinical applications and clinical information systems. Customers have indicated that they are interested in solutions that help them accomplish more. Healthcare providers are continuing to feel the pressures that plague many other industries - more, faster, better - and as such, are in need of imaging and IT solutions that integrate seamlessly into their current environments and offer a path for growth and expansion in the future.

Agfa is constantly working to lower the rising costs of healthcare delivery through the introduction of scalable solutions that enhance the return on investment; working with customers on flexible, effective business models that make digitisation cost-effective; and creating products that easily integrate and leverage existing investmeents throughout the facility.

Over the past years, Agfa demonstrated to its customers a successful transition to digital, and introduced a new lineup of digital workflow solutions supported by expert services. Last year, Agfa continued to show its commitment to becoming a strong IT player with new acquisitions, such as Heartlab and GWI, and new solutions, such as IMPAX Enterprise and ORBIS. Reports of higher productivity, faster return on investment and patient-centric solutions proved the power of these solutions. In 2006, Agfa will show new levels of performance and demonstrate its continued commitment to developing solutions that help healthcare organisations achieve.

Agfa will showcase their latest products and services at their booth (South Building - Hall A: 3339) at the upcoming RSNA 2006 Conference.

OMNILAB SELECTED BY ABBOTT DIAGNOSTICS AS SUPPLIER FOR UK HEALTHCARE IT PROJECTS

Omnilab has been selected by Abbott Diagnostics as the supplier in two large projects in the United Kingdom to provide LABONLINE, the middleware application to interface the pre-analytical instruments and diagnostic analyzers to the Laboratory.

Information System. In the first project, a seven-year contract, LABONLINE will be installed in the Greater Glasgow Health Board community in seven labs with more than 8,000 daily examinations requests to be managed.

The second project is a five-year contract across two different Trusts: United Lincolnshire Hospitals NHS (Lincoln Hospital, Grantham Hospital, Louth Hospital, Pilgrim Hospital) and Hospitals on the NLAG Network (Grimsby Hospital, Scunthorpe Hospital).

With these projects, Omnilab consolidates its presence on the international market (Germany, Holland, Denmark, Turkey, South Africa, UK, North Ireland).

Omnilab has been an Italian market leader in the provision of advanced solutions for automated management of clinical laboratories and transfusion centres since 1998. Omnilab develops and adapts data manager software and middleware for any system, whether pre-analytical, analytical or post-analytical. Omnilab boasts more than 350 installations with more than 3.500 analyzers connected worldwide.

Rising to the Challenges of eHealth Across Europe's regions - eHealth 2006 Conference Report

This report is meant to set the scene on some current issues in eHealth. It seeks to provide a working definition of eHealth and a broad overview of current EU level eHealth policy.
As such, the report provides a background to EU level eHealth policy spanning the early years of health telematics research and technological development, through the adoption of the eEurope Action Plan 2002 and eEurope Action Plan 2005, the adoption in 2004 of the Action Plan for a European eHealth Area and looking ahead to further eHealth policy developments within the context of the European Commission's i2010: European Information Society initiative. Having outlined the broad EU policy, the report looks in more detail at some of the key targets of that policy – including delivering safe and efficient healthcare, the development of citizen empowerment and the use of eHealth tools and services to facilitate and support patient and professional mobility across the European Union.
The report moves on to consider some of the common themes in national and regional eHealth plans – concluding that three common themes exist:

- The use of eHealth tools and applications and services to address pressing contemporary health issues,
- The integration of key eHealth tools in everyday healthcare delivery, and
- The integration of key eHealth services into daily healthcare practice.

The report concludes by looking in more detail at the target of using eHealth tools and services to address the common European challenge of delivering high quality health services, and looks at some of the initiatives of using electronic patient records, decision support systems and integrated eHealth networks to overcome some of the cause of medical accidents and errors.
For more information, contact: eHealth@ec.europa.eu
Source: http://europa.eu.int/information_society/newsroom

Journées Françaises de Radiologie - 2006

JFR
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October 21-25

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- Congress Program on line
- Registration and courses enrollment

Highlights

- Medical Personal Record (DMP)
- Molecular Imaging
- Interventional Imaging
- Management

Scientific Program

- 88 Scientific sessions
- 211 Educational courses and Workshops
- and more than 1000 Electronic Scientific Posters

Technical Exhibition

- More than 120 Medical compagnies (15,000m2)
- IHE
- Informatic Forum
- Symposiums

SFR
Société Française de Radiologie

The Council of the European Union (EU)

The main decision-making body of the EU

This is the third part in a series that covers the structure and operations of the EU institutions. In the first part of the series (Spring 2006), we introduced the European Commission (EC).

In the second part (Summer 2006) we focused on the European Parliament – its composition, functioning and main role. In this issue, we cover the role of the Council of the European Union, the main decision-making body of the EU.
The Council has the primary role in agreeing legislation – in most cases together with the European Parliament. Sonja Planitzer describes the key responsibilities of the Council, its functioning and organisation.

The final part in this series, to be published in Winter 2006, will cover the European Court of Justice.

THE KEY ROLE OF THE COUNCIL

The European Parliament as well as the Council of the European Union were set up by the founding treaties in the 1950s. The Council of the EU is the main decision-making body. It represents the member states, and its meetings are attended by one minister from each of the EU´s national governments.

The Council of the EU has the main role in agreeing legislation, although in recent years this has been shared more and more with the Parliament under the co-decision procedure. When the Council acts as a legislator, in principle it is the European Commission that makes proposals. The Council can then modify the proposals before adopting them.

The Council consists of one government minister from each Member State. Although there is just one Council, different groups of ministers meet depending on what topic is being discussed at the weekly meeting. Each minister is empowered to commit his or her government and is accountable to their own national parliaments for decisions taken in the Council.

THE NINE COUNCIL CONFIGURATIONS

Depending on the matter under discussion, the Council meets in different configurations, within which each country is represented by the minister responsible for that subject. If the Council, for example, is to discuss environmental issues, the meeting will be attended by the environment minister from each country and it will be known as the "Environment Council". The nine Council configurations are illustrated in Figure 1.

THE NINE COUNCIL CONFIGURATIONS

- General Affairs and External Relations,
- Economic and Financial Affairs (ECOFIN),
- Justice and Home Affairs (JHA),
- Employment, Social Policy, Health and Consumer Affairs,
- Competitiveness (Internal Market, Industry and Research),
- Transport, Telecommunications and Energy,
- Agriculture and Fisheries,
- Environment, and
- Education, Youth and Culture.

Figure 1

Each minister in the Council is empowered to commit his or her government. That means the minister´s signature is the signature of the whole government. Moreover, each minister in the Council is answerable to his or her national parliament and to the citizens that parliament represents, which ensures the democratic legitimacy of the Council´s decisions.

SIX KEY RESPONSIBILITIES OF THE COUNCIL

The Council has six key responsibilities, as outlined in Figure 2.

Most of these responsibilities relate to the "Community" domain – for example: areas of action where the member states have decided to pool their sovereignty and delegate decision-making powers to the EU institutions. This domain is known as the first "pillar" of the European Union.

However, the last two responsibilities relate largely to areas in which the Member States have not delegated their powers but are simply working together. This is called, "intergovernmental cooperation" and it covers the second and third "pillars" of the European Union.

SIX KEY RESPONSIBILITIES

- To pass European laws. As above-mentioned the Council legislates jointly with the European Parliament,
- To coordinate the broad economic policies of the member states. This coordination is carried out by the economic and finance ministers, who collectively form the ECOFIN Council,
- To conclude international agreements between the EU and one or more states or international organisations,
- To approve the EU budget, jointly with the European Parliament,
- To develop the EU Common Foreign and Security Policy (CFSP), and
- To coordinate cooperation between the national courts and police forces in criminal matters.

Figure 2

The European Council

The European Council Defines Political Guidelines of the European Union

The European Council brings together the heads of state or government of the European Union and the President of the Commission. It defines the general political guidelines of the European Union. The European Council meets at least twice yearly (in practice, four times yearly, and sometimes if necessary more), usually in Brussels.

The European Council provides the impetus for the major political issues relating to European integration: amendments to the Treaties and changes to the institutions, declarations on external relations in the context of the common foreign policy and security, etc. But its guidelines and declarations are not legally binding. To be put into effect, they must follow the routine procedure through the European Parliament and the Council of the European Union – followed where necessary by implementation at a national level.

Article 4 of the Treaty on the European Union says: "The European Council shall provide the Union with necessary impetus for its development and shall define the general political guidelines thereof."

Brussels European Council, 16/06/2006 *© European Community, 2006*

ORGANISATION OF WORK IN THE COUNCIL: THE COREPER

In Brussels, each EU Member State has a permanent representation to the European Community. This representation represents and defends its national interest at EU level. The head of each representation is, in effect, his or her country's ambassador to the EU.

These ambassadors (also known as permanent representatives) meet weekly within the Permanent Representatives Committees (COREPER). The role of this committee is to prepare the work of the Council, with the exception of most agricultural issues, which are handled by the Special Committee on Agriculture. COREPER is assisted by a number of working groups, made up of officials from the national administrations.

The 'Presidency of the Council' rotates every six months. In other words, each EU country in turn takes charge of the Council agenda and chairs all the meetings for a six-month period, promoting legislative and political decisions and brokering compromises between the member states. Currently, Finland chairs the EU. In January, Germany will take over the EU Presidency until June 2007.

The Presidency is assisted by the General Secretariat, which prepares and ensures the smooth functioning of the Council's work at all levels.

In 2004, Javier Solana was re-appointed Secretary-General of the Council. He is also High Representative for the Common Foreign and Security Policy (CFSP), and in this capacity he helps coordinate the EU's actions on the world stage. Under the new constitutional treaty, the High Representative would be replaced by an EU Foreign Affairs minister. The Secretary General is assisted by a Deputy Secretary-General, in charge of managing the General Secretariat.

Summary

We now have an overview of the European Council, the Council of the European Union and last but not least we will cover the Council of Europe. Three different institutions whose roles should not be mixed up: The European Council is, as mentioned, the Heads of State or government of the European Union and the President of the Commission. The role of the European Council is crucial, but differs to that of the Council of the European Union, whose members are ministers from the Member States. The Council of the European Union exercises the power conferred on it by the Treaty, subject to review by the European Court of Justice, and it adopts Community legal instruments. Finally, the Council of Europe, which is described below, is distinct from the European Council, an international organisation outside the European Union, which deals with education, culture and above all the protection of human rights. It currently has 46 members.

Council of Europe: Power of Legislation

The power to legislate is shared by the Council and the European Parliament. In most situations, European laws are made by a co-decision procedure.

This means that the Council and the Parliament jointly adopt proposals for legislation that have come from the European Commission. The Council and the Parliament can make amendments to the legislation under this procedure.

However, there are certain important areas, for example, tax legislation, where the Parliament may only give an opinion as to whether a proposed piece of legislation can become law. Also, the Council only acts, as a rule, on a proposal from the Commission, and the Commission normally has responsibility for ensuring that EU legislation, once adopted, is correctly applied.

How the EU Makes Decisions

In general, it is the European Commission that proposes new legislation, but it is the Council and Parliament that pass the laws. Other institutions and bodies also have roles to play.

The rules and procedures for EU decision-making are laid down in the treaties. Every proposal for a new European law is based on a specific treaty article, referred to as the legal basis of the proposal. This determines which legislative procedure most be followed. The three main procedures are consultations, assent and co-decision.

Under the consultation procedure, the Council consults the Parliament as well as the European Economic and Social Committee (EESC) and the Committee of the Regions (CoR). The Parliament has three opportunities:

1. To approve the Commission proposal,
2. To reject it, or
3. To request amendments.

If the Parliament asks for amendments, the Commission will consider all the changes the Parliament suggests. If it accepts any of these suggestions, it will send the Council an amended proposal. The Council examines the amended proposal and either adopts it or amends it further. In this procedure, as in all others, if the Council amends a Commission proposal it must do so unanimously.

The assent procedure means that the Council has to obtain the European Parliament's assent before certain very important decisions are taken. In this case the Parliament cannot amend a proposal – it must either accept or reject it. Acceptance ("assent") requires an absolute majority of the vote cast.

Finally, co-decision is now used for most EU law-making. In the co-decision procedure, Parliament does not merely give its opinion; it shares legislative power equally with the Council.

If the Council and the Parliament cannot agree on a piece of proposed legislation, it is put before a conciliation committee composed of equal numbers of Council and Parliament representatives. Once this committee has reached an agreement, the text is sent once again to Parliament and the Council so that they can finally adopt it as law.

Different Ways the Council Makes Decisions

There are different ways that the Council makes its decisions. A unanimous decision is required in important areas, for example, common foreign and security policies and taxation. Each member state has a vote in those areas.

In other fields the Council makes its decisions by Qualified Majority Voting. Each Member State has a specific number of votes (see Figure 3), which is related to the size of its population. A qualified majority will be reached, if a majority of member states approve and if a minimum of 72.3 % of votes are cast in favour.

Since November 1, 2004, the total number of votes is 321. The number of votes each country can cast is as follows:

+ Germany, France, Italy and the UK	29
+ Spain and Poland	27
+ Netherlands	13
+ Belgium, Czech Republic, Greece, Hungary and Portugal	12
+ Austria and Sweden	10
+ Denmark, Ireland, Lithuania, Slovakia and Finland	7
+ Cyprus, Estonia, Latvia, Luxembourg and Slovenia	4
+ Malta	3

Figure 3

Tarja Halonen, President of Finland (l) and José Manuel Barroso, President of the European Commission, photographed prior to their meeting in Helsinki on 3 July 2006.

Modernising the System with the Constitution

The EU is growing bigger and bigger. But the decision-making system, which was originally designated for a community of just six nations, has continued to evolve over the course of half a century.

The EU now has 25 Member States and its membership will increase further in the years ahead. The decision-making system therefore needs simplifying and streamlining.

To avoid paralysis, most decisions will have to be taken by qualified majority voting rather than requiring each individual country to agree.

The proposed Constitution agreed by the European Council in 2004 tackles these questions head on. It spells out much more clearly than in previous treaties what the European Union is and where it is going. It also lays down the new rules for a more streamlined decision-making process.

Author

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product comparison chart

Picture Archiving and Communications Systems (PACS)

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ECRI (formerly the Emergency Care Research Institute) is a nonprofit health services research agency and a Collaborating Center of the World Health Organisation (WHO). Such organisations are appointed to contribute to the WHO's public health mission by providing specialised knowledge, expertise and support in the health field to the WHO and its member nations. ECRI's mission is to improve the safety, quality, and cost-effectiveness of healthcare. It is widely recognised as one of the world's leading independent organisations committed to advancing the quality of healthcare with over 240 employees globally.

ECRI's focus is healthcare technology, healthcare risk and quality management, patient safety improvement and healthcare environmental management. It provides information services and technical assistance to more than 5,000 hospitals, healthcare organizations, ministries of health, government and planning agencies, voluntary sector organizations, associations, and accrediting agencies worldwide. Its more than 30 databases, publications, information services, and technical assistance services set the standard for the healthcare community.

Amongst its many products and services, ECRI is pleased to provide the readers of *Healthcare IT Management* with sample information on products for Picture Archiving and Communications Systems (PACS) from its Healthcare Product Comparison System (HPCS), which contains over 280 reports. This Product Comparison covers PACS that acquire, display, store, and retrieve diagnostic radiologic images at single or multiple sites and that can store an unlimited amount of patient data and images. Most systems listed are configurable as mini-PACS / modular systems for serving a specific imaging area, such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI), nuclear medicine, ultrasound, or radiation oncology.

This extract from the ECRI database contains model by model specifications for easy assessment and review and also includes ECRI's 'Recommended Specifications' (generic templates) which can be used for comparison and tendering purposes.

The data presented are extracted from ECRI's 2005 database and have additionally been reviewed and updated, where possible, by the respective manufacturers. Publication of all submitted data is not possible: for further information please contact ECRI or k.ruocco.me@eahitm.org.

MODEL
WHERE MARKETED
SYSTEM CONFIGURATION
Architecture
Hardware
OPERATING SYSTEMS
Image server
Web server
Security
Database server
Management
LONG-TERM STORAGE
Media
Max capacity, TB
ON-DEMAND STORAGE
Hardware
Max capacity, TB
Multiple remote servers capable
DIAGNOSTIC WORKSTATION
Independent log-in
Admin-controlled worklist
Ad hoc patient search capability
Auto notification of prior exams
Prior reports (without images)
User-defined hanging protocols
Session interruption function
Color and grayscale display
Key image select
3-D image processing
Specialist physician tools
Integrated report dictation
Voice recognition
WEB IMAGE ACCESS
Radiologist-specific web app
Max # monitors supported
TOOLS
Patient search
Image compression
Image manipulation
Image selection
Auto remote software updates
IMAGE SHARING
Printing support
Produce self-executing CD-ROM
SYS. ADMIN. GUI TOOLS
Patient manage
Hardware manage
Auto fail-over of critical comps.
BACK-UP
Power
Dbase frequency
AUTO DUPLICATION OF LONG-TERM
Archive
Remote system monitoring
Auto alert of system failure
Test server
INTERFACES
IHE conformance
RIS
Electronic patient record
Report dictation
Other
DICOM 3.0
Query/ retrieve SCP
Query/ retrieve SCU
Worklist management
Performed procedure step
DICOM JPEG2000

EORI-RECOMMEND-SPECIFICATIONS	CEDARA Software	FUJIFILM	KODAK
PACS	Cedera RIS / PACS	Synapse	DirectView PACS
	Available throughout Europe	Worldwide	Worldwide
Single server cluster	Centralised, clustered, distributed	Scalable from single server to multi site clusters	Centralised, distributed
Hardware independent	Independent, minimal server configuration provided	Windows compatible	Sun, Wintel
Windows or UNIX	Windows 2003 server	Windows 2003	Sun Solaris, Windows
Windows or UNIX	Windows 2003	Windows 2003, IIS	Sun Solaris, Windows
128-bit SSL	SSL	128-bit SSL	128-bit SSL
Windows or UNIX	Windows	Windows 2003	Sun Solaris, Windows
Experienced database company	MS SQL Server, Sybase	Oracle	Oracle
Hardware independent	NAS, SAN, DVD Jukebox, DVD	Selectable to customer requirements	Spinning disk, DVD jukes, tape jukes
Unlimited	Unlimited	Unlimited	Unlimited
RAID (SAN)	RAID 5 (SAN/NAS)	Any spinning disk technology	RAID (SAN/NAS)
Unlimited	Unlimited	Unlimited	Unlimited
Yes	Optional	Yes	Optional
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Administrator/user
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	With/without images
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	With 3rd party	Yes
Orthopedics, cardiology	Orthopedics, Mammography, PET/ CT, and other clinical applications	All tools available to all users	Orthopedic templating, mammography
Yes	Yes	With 3rd party	Optional
Yes	No	3rd party integrated	Optional
Yes	Yes	Same for all users	Yes
2	4 (plus a workflow monitor)	5	2
Name or MRN	Name and/ or MRN	Name, MRN, census, Query By Example (QBE)	Any defined worklist field; worklist can select DICOM fields
Automatic based connection bandwidth	JPEG2000 Lossless, lossy; progressive decompression	Lossless, user selectable lossy	User selectable
Identical to diagnostic workstation, except 3-D	Yes	Window/level, zoom, pan, magnify, cine, density value, ROI, angle/ruler measure	All, except 3-D
Thumbnails	Thumbnails	Thumbnails, crosshair for across series in different planes	Thumbnail, key images, series, study/image level searches
Yes	Yes	Workstations Yes	Yes
Yes	DICOM, PostScript, GDI	Yes	Yes
Yes	Yes	With 3rd party	Optional
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Optional
UPS standard	UPS recommended for all system servers	UPS	UPS
Every hour	Configurable	Daily, configurable, perm. transaction log	User defined
Yes	Yes	Optional	Yes
Yes	Yes	Yes	Optional
Yes	Yes	Optional	WIP
Yes	Yes	Yes	Optional
Year 4	Yes	Year 4, selected profiles	Year 4
Brokerless, bidirectional	HL7 ADT/ORM/ORU messaging	Brokerless, bidirectional, HL7 Web interface	Brokerless
Yes	Yes; HL7 Integration	Yes	Via URL activation
Yes	Yes	Yes	Optional
	Not specified		Stds based LDAP, DICOM, HL7, URL
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Optional
Yes	Yes	Yes	Yes
Yes	Yes	No	Yes

	EDRI-RECOMMEND-SPECIFICATIONS	AGFA	Computer Systems MERCURY
MODEL	**PACS**	**PACS IMPAX**	**Visage PACS 4.0 / 4.2**
WHERE MARKETED		Worldwide	Worldwide
SYSTEM CONFIGURATION			
Architecture	Single server cluster	Centralized server	Centralised server
Hardware	Hardware independent	Hardware independent Dell, IBM, HP, Sun (servers)	HP/Compaq/Dell
OPERATING SYSTEMS			
Image server	Windows or UNIX	UNIX (Solaris), Windows 2003	Windows 2003 server
Web server	Windows or UNIX	Windows 2003	Windows 2003 server
Security	128-bit SSL	128-bit SSL/TLS (configurable cipher),[1]	128-bit SSL
Database server	Windows or UNIX	UNIX (Solaris), Windows 2003	Windows 2003 server
Management	Experienced database company	Oracle 10g, SQL2000	Microsoft SQL server
LONG-TERM STORAGE			
Media	Hardware independent	Tape, DVD, spinning disc, MOD, UDO, etc	HD-RAID/DVD Central Storage (RAID/Tape...)
Max capacity, TB	Unlimited	Unlimited	Unlimited
ON-DEMAND STORAGE			
Hardware	RAID (SAN)	RAID (SAN/NAS) with support of many vendors	RAID (DAS/SAN/NAS)
Max capacity, TB	Unlimited	Unlimited	Unlimited
Multiple remote servers capable	Yes	Yes	Fail-over-server-capable
DIAGNOSTIC WORKSTATION			
Independent log-in	Yes	Yes	Yes
Admin-controlled worklist	Yes	Yes (standard, scheduled, sign off worklists)	Yes
Ad hoc patient search capability	Yes	Yes (simple and advanced search)	Yes
Auto-notification of prior exams	Yes	Yes	Yes
Prior reports (without images)	Yes	Yes	Yes
User-defined hanging protocols	Yes	Yes	Yes
Session interruption function	Yes	Yes	Yes
Color and grayscale display	Yes	Yes	Yes
Key image select	Yes	Yes	Yes
3-D image processing	Yes	Yes (Voxar, and other 3D workstations)	Yes
Specialist physician tools	Orthopedics, cardiology	Cardiology, Orthopedics, Mammography, Nuclear Medicine, Virtual Colonoscopy, Decision Support (StatDX™) optional	Orthopedics, cardiology
Integrated report dictation	Yes	Yes	No (RIS functionality)
Voice recognition	Yes	Yes (optional)	No (RIS functionality)
WEB IMAGE ACCESS			
Radiologist-specific web app	Yes	Yes, incl. remote access, [2]	Yes
Max # monitors supported	2	Unlimited, only depends on PC used	2
TOOLS			
Patient search	Name or MRN	Name, ID, location, accession #, doctor, modality, body part, study status, sex , [3]	Elaborate filtering grid
Image compression	Automatic based connection bandwidth	User can choose between traditional JPEG or progressive Image display	2 independent levels adjustable
Image manipulation	Identical to diagnostic workstation, except 3-D	W/L, rotate, invert, magnify, zoom, others In Impax 6 all the tools for radiologist at home are the same as in hospital	All, limited 3D functionality
Image selection	Thumbnails	Thumbnails, selectable display formats	Thumbnails, series overview
Auto remote software update	Yes	Yes	Yes
IMAGE SHARING			
Printing support	Yes	Yes	Yes
Produce self-executing CD-ROM	Yes	Yes, autorouting or via Dicom Send or Dicom Q/R	Yes
SYS. ADMIN. GUI TOOLS			
Patient manage	Yes	Yes	Yes but limited to PACS-typical requirements
Hardware manage	Yes	Yes	Yes
Auto fail-over of critical comps.	Yes	Optional	Yes
BACK-UP			
Power	UPS standard	UPS	UPS
Dbase frequency	Every hour	User configurable	Administrator definable
AUTO DUPLICATION OF LONG-TERM			
Archive	Yes	Optional	Optional
Remote system monitoring	Yes	Yes	Yes
Auto alert of system failure	Yes	Yes, via SMMS	Yes
Test server	Yes	Optional at only cost of HW	Optional
INTERFACES			
IHE conformance	Year 4	Year 5	Brokerbased
RIS	Brokerless, bidirectional	Bidirectional using HL7, also via desktop integration	Brokerless, URL based, bidirectional
Electronic patient record	Yes	Via URL, .Net, Java	Via URL
Report dictation	Yes	Yes	No (RIS functionality)
Other		Desktop integration with 3rd party applications	Report storage and correcture
DICOM 3.0			
Query/ retrieve SCP	Yes	Yes	Yes
Query/ retrieve SCU	Yes	Yes	Yes
Worklist management	Yes	Yes	Yes
Performed procedure step	Yes	Yes	Yes
DICOM JPEG2000	Yes	Future release	No

[1] user authentication & authorization using LDAP, authenticated transactions (requires valid ticket), auditing, armored hosts
[2] all the tools for radiologist at home are the same as in hospital (Impax 6)
[3] Patient Age, date of birth, etc.

PHILIPS	*RASNA*	*SECTRA IMTEC*	*SIEMENS*
iSite PACS 3.5	**Perceptive**	**Sectra PACS**	**KinetDX**
Worldwide (selected countries)	Worldwide	Worldwide	Worldwide
Single database server model, cluster	Centralised server	Centralised database distributed storage	Client/server
Hardware independent for client work-stations, IBM for servers and storage	Hardware independent	Windows or HP-UX servers, windows clients	Micron NetFrame 600 (entry level); HP/Compaq ML370 (large)
Windows	Linux ES	Windows 2000, Windows Server 2003, HP-UX	Win 2000 server
Windows	Linux ES	Windows 2000, Windows Server 2003	MS IIS (Win 2000)
128-bit SSL	Not specified	128-bit SSL	SSL
Windows	Linux ES	Windows 2000, Windows Server 2003, HP-UX	Windows 2000
Microsoft SQL server	Informix	SQL server, Oracle	Microsoft SQL
RAID 5 NAS; tape	CD, DVD, SAN, NAS	NAS, SAN, DICOM archive	DVD, DLT, HSM, PACS
Unlimited	Unlimited	Unlimited	Unlimited
RAID 5 NAS	RAID (SAN/NAS)	RAID (SAN)	RAID
Unlimited	Unlimited	Unlimited	2.2
Yes	Yes	Optional	No
Yes	Yes	Yes	Yes and user
Yes	Yes	Administrator/user	Yes
Yes	No	Yes	Yes
Yes	No	Yes	Yes
Yes	Only DICOM SRs	Optional	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes (can be mixed)	Yes
Yes	No	Yes	
Yes, MPR & MIP, other 3D via 3rd party	Optional, third party	Optional	No
Orthopedics, 3-D, PET/CT	Not specified	Orthopedics, cardio, (QCA/LVA), others	Yes
3rd party dictation apps. via API	Optional, third party	Yes	No
3rd party speech rec. apps. via API	Optional, third party	Optional	No
Yes	No	Optional	Yes
2 (or more)	NA	3	Unlimited
Name, MRN, and other attributtes	Name, patient ID, date of birth	Name, MRN, referring unit/physician, others	Name, MRN, user defined
iSyntax compression	Yes	User-selectable compression ratio	Proprietary
Identical to diagnostic workstation	fir-to-view, arrang, cine-loop	All except 3-D	Gamma correction
Resizeable thumbnails, can manipulate	Thumbnails	Thumbnails	Multiple image formats
Yes	NA	Yes	Yes
Yes	Yes	Yes	Paper, DICOM
Yes	Yes	Yes	Optional
Yes	Yes	Yes	Yes
Yes, by remote iSite tech support center	Yes	Yes	Yes
Yes	Optional	Optional (in all)	Yes
UPS standard	UPS	Optional	Yes
Daily & weekly, with off-site copies	Configurable	Configurable	Daily
Yes	Optional	Configurable	Yes
Yes	Yes	Yes	Yes
Yes	Optional	Yes	Yes
Yes	No	Optional	Optional
Not specified	Latest	Yes	No
Brokerless, unidirectional	Brokerless, bidirectional	Brokerless, bidirectional, desktop synch, HL7	Bidirectional
Yes, via API	Via IHE-ITI profiles	Via URL	Broker or interface
3rd party dictation apps. via API	Optional, third party	Yes	No
	Not specified	Sectra API for integrating 3rd party clinical app.	Not specified
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Optional	Yes	Yes
Yes	Yes	Stores and manages	Yes
Yes	Yes	Yes	No

As healthcare organisations begin to concentrate on improving efficiency and quality, the optimal cooperation of all involved parties becomes paramount. To reach this goal, computers are being increasingly employed in all areas. One of the essential components of their use is in the realm of communication within and between healthcare institutions.

The Health Level 7 (HL7) communication standards were developed essentially for healthcare systems, enabling electronic communication between nearly all involved institutions and fields. To date, extensive experience is available due to its use in hospitals; with the introduction of the new HL7 Version 3 (V3), all healthcare areas are covered. Current developments show that HL7 has not only become an important communication standard in healthcare, but also delivers impulses for the worldwide standardisation of communication.

HEALTH LEVEL 7 VERSION 3 – A HEALTHCARE STANDARD IN USE

By: Dr. Kai U. Heitmann

Why Communication Standards?

In order to reduce costs and improve the quality of healthcare, computer-based information systems are increasingly being used. Obviously, there is no comprehensive information system that can completely cover *all* of the needs of hospitals and other areas of the healthcare system. As a result, it is necessary to employ information systems from various suppliers. However, these systems must be functionally coupled with each other for cooperative data processing - communication is essential!

In the past, we were faced with the problem that with each application of a new system the "Tower of Babel" became even higher and today, like then, language diversity is expanded by yet another dialect. Each new system has to be adjusted to the existing dialects of the individual institution, leading to

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high personnel costs for both the supplier and the user. As a consequence of the expanding financial burden of this, both suppliers and users have tended to shy away from integrating their systems.

In addition, new challenges of collaboration and new medical and financial policies enforce electronic communication. How can this be done efficiently?

Interconnecting is Not the Same as Understanding!

If patient information such as name, date of birth, maiden name, gender, etc. needs to be exchanged electronically, one of the easiest ways to do this would be to send an e-mail. The only requirement is that a network connects the computer systems with each other, allowing for text messages to be exchanged using simple programs.

With e-mail, information is usually transmitted without a formal structure. The problem in the exchange of patient information is that the message is easy to read and grasp by humans, but requires additional interpretation (parsing) for computers to understand because it is unstructured. Due to this unstructured nature of the sent data, the system receiving the data is unable react appropriately, - e. g. to re-use the data in another context, thus enabling interoperability - and this is an essential requirement of a comprehensive information system.

In order to transmit data in a structured form, an agreement has to precede the exchange between the communication partners. The sequence in which the individual items are transmitted, the exchange format and especially the meaning (semantics) must therefore be defined unambiguously.

In the simplest case, one establishes an interface between each pair of systems that exchange data. This procedure has considerable disadvantages: there is higher expenditure for detailed arrangements between the communication partners concerning the kind and content of the data to be exchanged and numerous complicated communication relationships must be established. For example, for five systems up to 20 different interfaces are, at times, necessary. This causes higher expenditure for maintaining the interface and when replacing a system, multiple interfaces must be redefined.

HL7 – a Communication Standard in Healthcare

Established in the USA in 1987 to pursue the standardisation of communication in hospitals and the entire healthcare system, HL7 provides valuable assistance in the standardisation of the necessary interfaces between systems. HL7 is one of several American National Standards Institute (ANSI) accredited Standards Developing Organisations (SDOs) operating in the healthcare arena. Most SDOs produce standards (sometimes called specifications or protocols) for a particular healthcare domain such as pharmacy, medical devices, imaging or insurance (claims processing) transactions. HL7's domain is clinical, financial and administrative data. The HL7 community also coordinates its efforts with other standardisation bodies such as the International Organisation for Standardisation (ISO) Technical Committee (TC) 215, the European Committee for Standardisation (CEN) TC251 and W3C, and other organisations that make use of existing standards, such as Integrating the Healthcare Enterprise (IHE).

Similar to most other SDOs, HL7 is a not-for-profit volunteer organisation. Its members – providers, vendors, payers, consultants, government groups and others who have an interest in the development and advancement of clinical and administrative standards for healthcare – develop the standards. Like all ANSI-accredited SDOs, HL7 adheres to a strict and well-defined set of operating procedures that ensures consensus, openness and balance of interest. A frequent misconception about HL7 (and other SDOs) is that it develops software. In reality, HL7 develops specifications, the most widely used being a messaging standard that enables disparate healthcare applications to exchange keys sets of clinical and administrative data.

Members of HL7 are known collectively as "the Working Group", which is organised into technical committees and special interest groups. The technical committees are directly responsible for the content of the standards. Special interest groups serve as a test bed for exploring new areas that may need coverage in HL7's published standards. A list of the technical committees and special interest groups as well as their missions, scopes and current leadership is available on this web site.

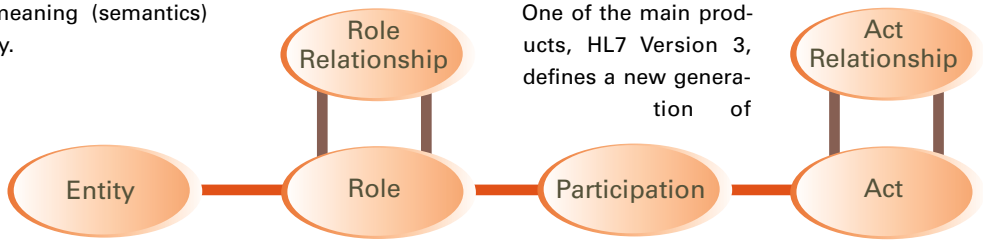

Figure 1: RIM Core Classes

One of the main products, HL7 Version 3, defines a new generation of communication standards for the specification, development and maintenance of messages and documents for an entire healthcare system. This is reached by a mature methodology for model-based and tool-supported development of messages.

Numerous projects in many European countries (amongst others the Netherlands, the United Kingdom and Germany) have already started using HL7 Version 3, with some using it as part of their strategy to build a national infrastructure.

HL7 Version 3

HL7 is the world's leading standard for the electronic interchange of healthcare information. Version 2 of the HL7 standard (HL7 V2) has been widely implemented in over 20 countries, mainly in hospitals. In recent years, Version 3 of the standard (HL7 V3) was developed to address the communication needs of the whole healthcare system, including hospitals and also the outpatient area, and to meet the requirements of today's healthcare IT systems.

No Software Change Necessary:

Secure Data Exchange between Hospitals with the Virtual Patient Record

More and more hospitals are forming alliances for the joint use of synergies. An essential factor in this respect is the efficient exchange of medical data between the individual hospitals in an association: all information collected on a patient in a hospital in the association should be available to all other connected clinics. This speeds up treatment, increases the quality and results in cost advantages.

But this idea is tied to a lot of efforts. Often, the IT systems of the incorporated hospitals have to be exchanged to enable communication with the other hospitals in the association. In addition to the costs for the new software and its adaptation, the hospitals are also faced with expenditures for data migration and employee training for the new programs. Heinz Falszewski, in charge of IT at Rhön-Klinikum, one of the leading German hospital operators, complained in the Financial Times Deutschland: "To standardize IT systems, we have to spend a six-digit amount every time we take over a clinic – up to 500,000 €."

It would be easier and cheaper to combine the available hospital information systems with each other without having to exchange the software. This is the solution, which the e-health specialist InterComponentWare (ICW) opted for with its novel hospital networking solution ICW ProfessionalGate: physicians, nursing staff and members of the management continue using their accustomed software and additionally have the possibility to access inter-facility information about their patients in an intuitive user environment.

Virtual Patient Record

The core of the new solution is a virtual patient record (ICW VPR). It enables the physicians and nursing staff authorized via Single Sign-On the consolidated viewing of all patient data available in the hospital association. The record provides information about the treatments and diagnoses collected for every current and former patient.

Documents like physician's letters, image or laboratory data obtained from the connected hospital information systems can be displayed via a document management adapter. In order to prevent data redundancy and always keep the virtual record up to date, only the links to original documents are saved in the VPR. Then, at each access, the information is newly copied from the primary systems to the record. The original data remains unchanged in the systems in which they were originally generated. Sophisticated pre-loading and caching functions guarantee short access times. Even DICOM image data like computer tomographies, x-ray and ultrasound images but also digital images and videos taken e.g. during an endoscopy or with a microscope can be directly displayed in the record.

Existing Infrastructure sufficient

In order to generate the virtual patient record, ICW ProfessionalGate engages in the communication between the available information systems via a so-called Medical Service Bus (ICW MSB). The MSB is simply installed on present communication servers like eGate or Cloverleaf, which enable the communication between heterogeneous primary systems at a single hospital location. It then evaluates the HL7 messages of the various systems, e.g. from patient admission, the laboratories or radiology, converts them to HL7 V3 messages and allocates them to the corresponding virtual patient record.

Safe Patient Allocation

For smooth functioning, it must be possible to clearly allocate the different treatment cases in different hospitals in different periods to a single patient. For this purpose, the ICW Master Patient Index (ICW MPI) matches the patient master data from the connected hospitals and assigns it to the corresponding reference patient if it coincides. If an allocation is not possible with adequate certainty because of deviations between the master data records, the MPI activates a clearing point in the hospital.

Referral Continuity

Additional patient data recorded outside of the clinic is incorporated in the virtual patient record via the so-called LifeSensor Adapter (ICW LSA). The adapter enables the data exchange with the web-based personal health record LifeSensor, in which patients can collect copies of their own health data. When the referring physician copies his examination results in the record, this information is immediately available in digital form upon admission to the hospital and prevents unnecessary and costly double examinations.

Upon discharge, information can flow into the patient's personal health record the same way. If requested, examination results, diagnoses, therapy plans or discharge letters can be copied fully automatic to the record. This provides the GP with optimum information about his patient's treatment in the hospital and enables him to start his follow-up treatment immediately. This special service for referring physicians contributes to reinforcing the relations with this hospital.

As a special service offer for patients, it is also possible to create a new personal health record fully automatic and fill this with the data available at the hospital.

Ready for Electronic Health Card

ICW ProfessionalGate principally works with all primary systems in hospitals exchanging data via HL7. At present, systems by General Electric, TietoEnator, Chili and SAP are already integrated. Additional systems are to follow in the near future. As ICW also develops components for electronic health cards, this hospital networking function is ready for health card solutions as well.

icw® Technology for Health

The HL7 V3 development methodology represents a significant step forward from previous ways of developing healthcare messages. However, the benefits arising from using a more sophisticated methodology also bring with them the need to understand a more extensive set of terms and processes.

Reference Models

The Reference Information Model (RIM) is the cornerstone of the HL7 V3 development process. An object model created as part of the Version 3 methodology, the RIM is a large pictorial representation of the clinical data (domains) and identifies the life cycle of events that a message, or groups of related messages, will carry. It is a shared model between all the domains and as such, is the model from which all domains create their messages. Explicitly representing the connections that exist between the information carried in the fields of HL7 messages, the RIM is essential to our ongoing mission of increasing precision and reducing implementation costs.

The four RIM core classes (see Figure 1) are an Act, representing any healthcare activity, in which Entities (for example people) participate in certain roles. Act Relationships can connect activities to each other, for example a lab order is related to the lab result. In the following figure, the core classes are shown. The RIM contains many specialisations of these classes, amongst others an observation that is a specialisation of an Act.

Modeling in HL7 V3

To come from "reality" in healthcare to models reflecting this reality (and then to messages and documents for electronic information exchange), HL7 uses the HL7 development framework (HDF). This methodology, meanwhile a proposal to become an ISO standard, starts with narrative descriptions (story boards) and use cases. These are considered as snapshots of a communication scenario and describe dynamic aspects, i.e. all parties involved and their interactions, and also static aspects, i.e. what data is to be exchanged. The later is documented in a so-called Domain Message Information Model (D-MIM), reflecting the data sets and their relationships in a specific domain. A domain in HL7 is defined, for example, by medical means, e.g. laboratory, patient care, pharmacy.

From the D-MIMs, Refined Models (R-MIMs) are derived. R-MIMs are subsets of the whole model, as an example a laboratory, and aimed at one specific communication aspect, for example a lab order or a lab result. Dynamic and static aspects together form an interaction, the reason and required actions for the message, a description of sender and receiver responsibilities (application roles), and a complete structure of what is to be sent.

This kind of consequent modeling seeks compatibility throughout all messages and documents defined in HL7 V3. As a result, communication is made simpler between partners on a functional level. The generic approach also ensures that there is no need to develop messages for every single aspect of communication needs. While commonly defined structures are used in many messages, their dynamic implications may vary. Frequently used building blocks like "patient" or "provider", part of almost every message, are defined as consistent and re-usable structures ("mini"-models).

The more generic a model is defined, the more terminology comes into play in order to refine the generic model towards a specific use. As an example, systolic and diastolic blood pressures are – from an HL7 perspective – observations, a specialisation of an activity (see Figure 1). A generic observation can be considered as a "value container" from a modeling perspective and is "classified" by a code, saying that this observation carries a blood pressure measurement. The time of measurement, and especially the value itself, is conveyed in a value attribute of the respective class and is therefore also in the representation that is actually exchanged between two systems. HL7 V3 uses the Extensible Markup Language (XML) as an exchange format.

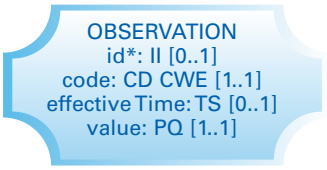

Figure 2: Example of an "observation" class from the HL7 models with their properties (names of attributes, data types and cardinalities), below a fragment of an HL7 V3 message, with an identification, classification and the actual value, 120 mmHg.

```
<Observation>
 <id extension="38e4748"
     root="1.2.276.0.76.3.67.982"/>
 <code
   code="8459-0"
   codeSystem="2.16.840.1.113883.6.1"/>
 <effectiveTime value="20060214"/>
 <value value="120" unit="mm[Hg]"/>
</Observation>
```

The example shown in Figure 2 is only a fragment of a whole HL7 V3 message or document. It is obvious that when it comes to real communication, the data is accompanied by other activities and entities etc., especially the patient.

A Standard in Use

After about ten years of development, HL7 V3 has reached the necessary maturity to be used in routine environments. In early 2000, several countries already started adopting the HL7 V3 Clinical Document Architecture, a "member" of the HL7 family of V3 standards. Finland and Germany, for example, have undertaken projects utilising HL7 V3, partially in the context of governmental-driven healthcare infrastructure programs. Subsequently, HL7 V3 has received international endorsement. The following examples highlight some of the implementations of HL7 V3:

- In the United Kingdom, the National Health System (NHS) Information Standards Board recognises HL7 V3 as the strategic direction for NHS standards. The National Program for IT is a 10-year program to build an information infrastructure to improve patient care in England. HL7 v3 was chosen to deliver the messaging requirements, with the National Program working as an early adopter developing message specifications where needed,
- The National IT Institute for Health (NICTIZ) in the Netherlands has chosen HL7 V3 as the strategic core standard

to implement the National Infrastructure (AORTA),
• In Canada, the national Infoway initiative has endorsed HL7 V3,
• The concept for the Lithuanian healthcare system considers HL7 V3 as the main standard for clinical, administrative and financial data exchange,
• In Croatia, the national health system includes central databases and connects general practitioners and hospitals using HL7 V3, and
• Several countries in the Asian area are using the Clinical Document Architecture on their way to an individual Electronic Health Record. For example in Japan, CDA R2 is used for referral documents and a new patient data CD-ROM, with pointers to the clinical contents.

Amongst national involvement, the first HL7 V3 communication has been planned across countries. This demonstrates new challenges in terms of different legislations and policies in the countries involved.

As an example, the European Renal Association - European Dialysis and Transplant Association (ERA-EDTA) is broadening the set of data collected about patients on renal replacement therapy. HL7 V3 will be used to exchange data between renal centers and regional / national registries, and between these registries and the European registry. Clinical experts have defined the data set, and the definition of HL7 V3 models and messages is currently in progress.

This, of course, is only a fragment of all of the projects around the world dealing with HL7 V3 implementations. Most recent results were, for example, presented at the International HL7 Interoperability Conference (IHIC). This annual conference shows results of HL7 implementations; information and presentations can be downloaded at http://ihic.hl7.de. At HL7 Working Group Meetings, held three times a year for a week each, not only the standards themselves are brought forward in work groups but experiences are also reported.

HL7 V3: Meeting Today's Challenges

The HL7 family of standards is no longer just a definition, but is implemented in many countries. Issues from practical implementations that came up will be addressed in the following refinement steps. HL7 V3, in particular, is a consistent and comprehensive way of modelling healthcare communication requirements covering almost all aspects of the challenges faced by today's healthcare IT systems.

SNOMED Clinical Terms (SNOMED CT):

Clinical Terminology Standards and the Electronic Health Record

By: John Van Beek

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Clinicians and information technology experts have made steady progress towards developing fully electronic health information systems where technical standards, such as HL7 and DICOM, are essential. As Electronic Health Record (EHR) systems continue to develop and evolve, a standard clinical terminology is a necessary component to support clinical documentation, decision support and workflow.

Standardised terminology is not used uniformly in medicine. Clinicians often use different terms to mean the same thing or the same term to mean different things. Myocardial infarction may be used interchangeably with heart attack, cardiac infarction and infarction of the heart. Standardisation using concept-based clinical terminology resolves this situation by creating a common platform for clinicians to render care while allowing a basis for comparison and communication.

::: What is SNOMED CT?

SNOMED Clinical Terms (SNOMED CT) provides standard terminology for the EHR. When implemented into software applications, SNOMED CT provides clinically relevant information to populate an EHR's drop-down menus, templates, etc., that drive the user interface.

SNOMED CT offers clarity and precision in conveying what is meant. For example, in radiology, an upper GI series can be performed using a contrast medium (oral administration) or a nasogastric tube to administer the contrast medium. Using a comprehensive standard terminology to describe these procedures allows radiologists to explicitly and accurately express the care needed for both oral and intubated studies. Employing standardised terminology also helps define and thus identify patients at risk, such as those who might have allergies, and allows for the retrieval and aggregation of more complete and useful data for analysis of patients, disease states, treatments, and outcomes - something conventional paper records make difficult at best.

Consider this scenario: research indicates that women with a genetic predisposition for breast cancer benefit from additional screening with ultrasound, regardless of their breast density. Using an information system that incorporates standardised clinical terminology, a radiologist or other clinician could more readily review the medical records of patients who have a genetic predisposition for breast cancer and recommend an additional ultrasound

screening. As this example attempts to illustrate, the electronic format helps to improve the quality of care by giving radiologists the capability to search for, and act upon, risk factors that could lead to a more timely and accurate diagnosis.

::: Use of SNOMED CT Within the EHR

Coordination and continuity of care typically necessitate that relevant information about a patient be integrated from several different clinicians and settings of care. The divergent health information technology employed within and across settings, however, presents an added hurdle that must be cleared before accurate and reliable electronic communication of medical information can occur.

SNOMED CT makes this possible by enabling system interoperability, that is, the ability for data to be exchanged between systems and to be interpreted automatically according to the meaning of the encoded clinical data, regardless of the technology used. Without standardisation, custom interfaces and other work-arounds become necessary. Even more of a barrier, the clinical information remains locked within textual statements that cannot be fully interpreted by computer. This makes sharing, comparing, and retrieving patient or population-based data within and among different settings and information systems difficult at best, error prone at worst.

For more information about SNOMED CT, please visit www.snomed.org.

Furthermore, an EHR with standardised terminology facilitates effective communication within and across health care settings and organisations. It enables data to be entered in a consistent and more complete manner, which, in turn, enables it to be retrieved in a consistent manner and used over and over again. For example, EHR systems are often typically designed with built-in prompts to remind users to enter required information. Moreover, these systems typically will not allow users to proceed unless the required information is provided.

An EHR also allows for more efficient and efficacious care delivery between a team of primary care providers, specialists, nurses, pharmacists and others involved in a patient's care. Having a digitised record at your fingertips helps avoid duplicate tests and procedures, saving time and healthcare expense. Other advantages include:

- More rapid information retrieval-depending, of course, on timely, complete, and accurate data entry,
- Enhanced readability,
- Reduced record keeping costs,
- Reduced or eliminated duplicate records,
- Reduced storage costs, and
- Continuity of record-keeping.

An EHR also helps create and support much-needed research databases within a healthcare enterprise. Researchers can draw upon de-identified patient data from such a database for a wide range of health care quality and safety-related efforts, including:

- Quality management, such as preventing complications through more complete and more accurate pre-procedural patient histories,
- Outcomes studies,
- Quality improvement projects,
- Benchmarking and the identification of best practices, and
- Patient safety efforts.

Eventual world-wide application of standardised EHRs would enable immediate and fast retrieval and preservation of medical files in emergency situations. Also, new threats, such as anthrax, can be communicated and contained in standardised medical records' environments.

Finally, common language would enhance academic studies over large populations tremendously.

::: International Adoption of SNOMED CT

SNOMED International, a division of the College of American Pathologists (CAP), currently owns and maintains SNOMED CT. As more countries begin to establish national health information networks, they rely on SNOMED International for its terminology standards. Three countries license SNOMED nationally:

- The United States Department of Health and Human Service (DHHS) signed an agreement in July 2003,
- The United Kingdom's National Health Service (NHS) in April 1999, and

- Australia's National E-Health Transition Authority (NEHTA) in July 2006.

The most recent agreement in Australia will give the country national access to SNOMED CT and allows NEHTA to pursue its national health information management projects utilising SNOMED CT. The agreement will terminate upon the establishment of the SNOMED Standards Development Organisation (SNOMED SDO), that will then provide Australia and other countries who join the SNOMED SDO access to SNOMED CT.

In November 2005, CAP and the NHS Connecting for Health, an executive agency of the Department of Health in England, began working together to launch an international SDO to offer countries the opportunity to take a leading role in the development, ownership and maintenance of SNOMED CT. Ownership of SNOMED CT would then transfer to the SDO.

"The agreement with NEHTA and the imminent creation of the SDO are further evidence of the value of SNOMED CT as the most powerful clinical terminology for building electronic health records," said Franklin A. Elevitch, MD, FCAP, Chair of the SNOMED International Authority, the CAP committee that oversees SNOMED International and its business on behalf of the CAP Board of Governors and the UK's NHS.

::: Conclusion

Efforts to internationalise the use and implementation of SNOMED CT in the EHR along with technical standards will move us toward achieving better patient care while optimising the use of information technologies that employ internationally recognised standards such as SNOMED CT

Integrating Imaging with Information Systems

By: Fred M. Behlen, Ph.D. and Helmut Koenig, M.D.

Diagnostic and interventional imaging plays an increasingly large role in any hospital or healthcare provider organisation. Digital images and associated data will constitute an integral part of the electronic patient record and enter into new application fields such as molecular imaging. In addition to representing a significant share of costs and revenues, imaging is intricately integrated into the clinical workflows of patient assessment, admission and care. Consideration of imaging results is essential for clinical decision making. Accordingly, the integration of imaging and information systems plays a key role in the optimisation of patient care processes and the utilisation of costly imaging assets.

Standards for Imaging Integration

Achieving this integration in the complex multi-vendor settings of modern healthcare requires standards. Indeed, the prime function of standards is to foster interoperability and facilitate interconnection across proprietary boundaries for the exchange of relevant healthcare data (see Figure 1).

DICOM-HL7 Collaboration

The DICOM Standards Committee and HL7 created a common DICOM-HL7 working group in 1999. DICOM Working Group 20 (Integration of Imaging and Information Systems) and the HL7 Imaging Integration Special Interest Group (IISIG) have common membership and always meet jointly. Based on the memorandum of agreement between HL7 and the DICOM Standards Committee, the standards developing organisations work together in a very constructive way. For standardisation efforts in the intersection of their domains, DICOM and HL7 harmonise concepts to promote interoperation between the imaging and healthcare enterprise domains. Thus the same group of people is recognised by both organisations and has standing to propose changes or extensions to either standard as appropriate.

Completed and ongoing projects of the HL7 IISIG / DICOM Working Group 20 expand opportunities for standards-based connectivity:

The main standards that are in use in imaging enterprises are:

- DICOM (Digital Imaging and Communications in Medicine)[1] - defines protocols and data formats for communication and storage of biomedical diagnostic and therapeutic images and image-related data. DICOM is recognised as an International Organisation for Standardisation (ISO) standard and maintained by the DICOM Standards Committee, an independent international standards development organisation. DICOM is mainly used within imaging departments for communications between imaging devices, Picture Archiving and Communications Systems (PACS) and imaging department information systems, such as Radiology and Cardiology Information Systems. The DICOM standard is universally accepted for the transport of image data between imaging device and image management systems. Since its introduction in 1993, DICOM connectivity has grown from an extra cost option to a standard equipment function on nearly all diagnostic imaging devices.

- HL7 (Health Level Seven)[2] - defines messages, services and document formats for communication of clinical patient care information across and between healthcare enterprises for the delivery and evaluation of healthcare services. HL7 is an ANSI (American National Standards Institute) accredited standard supported outside the USA by 27 national affiliate organisations. In imaging, HL7 standards are mainly used to communicate patient demographic and clinical information, orders, results, and billing information between imaging departments and their parent enterprises.

- Terminologies - terminology standards such as the Systematised Nomenclature of Medicine (SNOMED)[3], Logical Observation Identifiers Names and Codes (LOINC)[4] and the Unified Code for Units of Measure (UCUM)[5] are used in both DICOM and HL7 implementations to represent anatomical sites, clinical findings, measurements and observations.

- IHE (Integrating the Healthcare Enterprise)[6]. While not technically a standard, IHE defines, in its published Technical Frameworks, a set of Implementation Profiles specifying standards-based solutions for common interface and integration problems. For example, IHE Scheduled Workflow profiles describe in detail the combination of HL7 and DICOM interfaces necessary to support the worklist-based tracking of scheduled and performed imaging procedure steps.

- HL7 Version 2.5:

Order Message for Imaging (OMI) Message

Status: Approved ANSI Standard

In HL7 Version 2.5 II SIG / WG20 has specified an imaging order message used for internal scheduling of imaging procedures. This order message contains information for imaging devices on the tasks and steps that are required to fulfill the imaging service request.

- HL7 V3:

Imaging Order and Results Messages based on Generic Order and Results Model

Status: Work in progress

Similar efforts are under way for HL7 Version 3. IISIG / DICOM WG20 is working on imaging-specific order and results messages. The new messages will allow better communication of imaging department medication and contrast administration to the enterprise, and support more detailed enterprise workflow management.

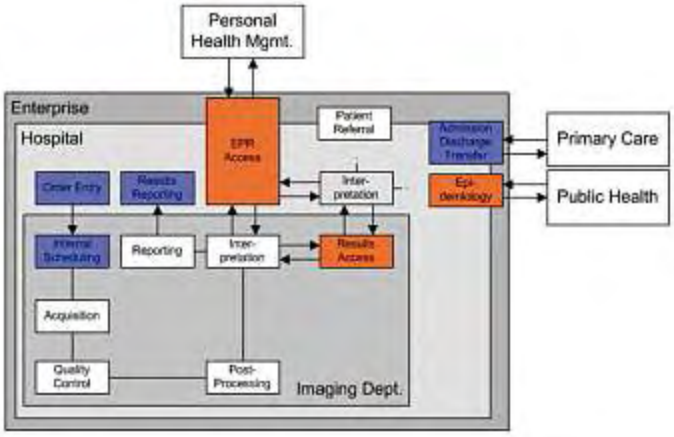

Figure 1: The importance of imaging integration. A typical patient care episode starts and ends outside the imaging department (admission and discharge). Order entry and results reporting are traditionally the main interfaces of the imaging department to the hospital and healthcare enterprise environment. Access to clinical information (Electronic Patient Record (EPR), EPR Access), imaging results and public health epidemiological data facilitate the flow of information in the entire healthcare enterprise.

- DICOM Supplement 101 "HL7 Structured Document Object References"

Status: Approved DICOM Standard

In order to facilitate access to clinical documents outside the imaging domain, this supplement specifies extensions to the DICOM standards that allow to reference relevant HL7 Clinical Document Architecture (CDA) documents and to store CDA documents on DICOM removable media. Supplement 101 also describes methods for referencing and using DICOM annotation in HL7 reports.

- HL7 V3 Message and Report Patterns

Status: HL7 Committee Ballot

HL7 V3 Common Message Element Types (CMET) are used to specify the patterns that are needed to reference and retrieve DICOM objects such as relevant images within CDA documents and V3 messages.

- CDA Diagnostic Imaging Report Implementation Guide

Status: Work in progress

A CDA implementation guide adds explanations and constraints that specialise CDA for particular clinical uses. IISIG/ WG20 is developing such a guide that describes diagnostic imaging reports encoded as CDA documents. The implementation guide also specifies the transformation of DICOM SR simple image and numeric reports into CDA documents.

- Mapping of DICOM Structured Reports to the HL7 CDA Documents

Status: Work in Progress

The goal of this effort is to facilitate the exchange of imaging report contents within and beyond the healthcare enterprise. Members of DICOM WG20 / HL7 II SIG are actively participating in the DICOM reporting strategy discussion where future directions for the use of DICOM SR and the CDA are determined.

- Workflow model for cross-departmental communication of task information

Status: Work in progress

Most diagnostic imaging equipment today supports DICOM Modality Worklist, a service that eliminates manual entry of patient and order data into imaging devices. Standards are mature for DICOM Performed Procedure Step functions, which imaging devices may use to report procedure status and completion to departmental information systems, and systems with these features are appearing in the market. There is a lack of standards that support the communication of task information between imaging and clinical domains. In order to address enterprise workflow management support II SIG / WG20 has proposed a common DICOM / HL7 workflow model.

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Ready For Integration

DICOM and HL7 standards are ready for today's challenges in imaging integration. Current work in progress will enable more effective connectivity and efficient operations in the future.

- For image communications with mainstream radiology and cardiology modalities, DICOM standards are so universally accepted as to be inescapable. Other medical imaging applications such as ophthalmology and pathology are now seeing the benefits of DICOM standard image communications,
- Modality Worklist is widely available and enhances productivity and reduces data entry errors, and should be adopted now wherever available,
- Modality Performed Procedure Step closes the loop of interaction between imaging devices and information systems, allowing exam completion information to be recorded without extra process steps on information system terminals. Providers should demand and adopt these features when procuring systems,
- DICOM Supplement 101 now enables reporting integration that records radiologist annotation in standard DICOM Key Image Note (KO) and optional Gray Scale Presentation State (GSPS) objects that can be communicated to other vendors' systems,
- HL7 V3 standards now in development will enable more efficient and reliable communication of medication and contrast agent administration information, and
- Version 3 standards will also support detailed enterprise workflow management that tracks progress of imaging procedure steps, enabling more efficient coordination of activities and resources.

For a complete list of references contained in this article, please contact k.ruocco.me@eahitm.org.

INTEGRATING YOUR SYSTEMS: A PRIMER ON RIS-PACS-VR-DMS INTEGRATION

By: John Griffith

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THE PAST, PRESENT AND FUTURE OF SYSTEMS INTEGRATION

When approaching the topic of interfacing with most radiology IT professionals, one hears many tales about integration nightmares within the industry. However, with a better understanding of how integration typically works and the roles of the actors involved, it becomes easier to achieve successful integration between systems.

In the early days of healthcare IT, many free-standing facilities would simply purchase a complete radiology information system with built-in billing – and no need to provide integration with any other device. Subsequently, additional technologies such as Picture Archiving and Communications Systems (PACS), Mammography Information Systems (MIS), Voice Recognition Dictation Systems (VR), and Enterprise Document Management systems (DMS) arrived with the need to create interfaces for the entire IT infrastructure.

In the future, as PACS, which has been the primary domain of radiology, begins to dominate the healthcare scene for storage of all images created by all of the "-ologies" in healthcare, integration is going to be of the utmost importance. Let us begin by discussing the key players involved in integration.

The Main Standards Bodies

The main standards bodies involved in successful integration are Digital Imaging and Communications in Medicine (DICOM), Health Level 7 (HL7) and Integrating the Healthcare Enterprise (IHE) . They all share important roles in the process of different systems working together. DICOM is the standard for digital images, and covers areas such as transfer syntax, storage requirements, modality worklist compliance, modality performed procedure step (MPPS), storage commit, etc. HL7 is used for messaging between systems such as RIS and PACS using various message formats. Lastly, IHE is not a standard in itself, but is a set of structured rules that define how HL7 and DICOM will properly interact.

IDEAL VS. COMMON INTEGRATION SCENARIOS

The ideal integration scenario would consist of a system that utilises components that could easily "plug-in" and have access to a single relational database containing all of the necessary tables for the healthcare enterprise. In this way, one would just purchase the modules needed to expand the system as the enterprise grows. To the end-user, it would appear as a single application with a single-user interface.

Ultimately, this creates the tightest integration possible and allows for the fewest headaches and integration problems during implementation. If one is dealing with a true open architecture, one would then be able to plug-in the best of breed technology from different vendors. Presently, the only way to begin acquiring this type of tight integration is to go with a single vendor, which may leave one with making compromises with certain components of the system. Depending on the requirements, it may or may not be possible to find a vendor that can provide everything needed in one integrated product. Because most enterprises do not have the time to wait for the availability of a plug-in infrastructure, or the luxury of completely replacing their healthcare IT infrastructure when one does become available, the only option left is to integrate using the standards that are currently available.

The most common integration scenario involves separate products that utilise HL7 messaging for interfacing. Properly done, results closely resembling a single database product can be achieved. These systems can then reside on the same server or may reside on separate servers, depending on the particular application.

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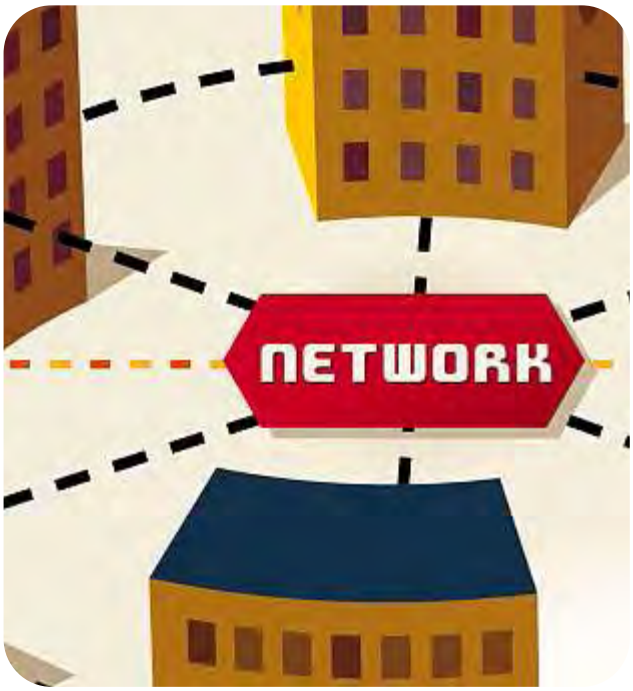
Common Message Types Used in Integrating Radiology Systems

One of the common HL7 message types utilsed in integrated radiology systems is Order Results Management (ORM), which is a general order message that contains all of the demographic information, procedure ordered, ordering physician, etc. There are hundreds of fields available in the ORM, with each one having a defined criterion for what is entered into those fields.

Resources On The Web
IHE: www.ihe.net
HL7: www.hl7.org
DICOM: http://medical.nema.org

Most vendors do not populate all of the fields, but it may be beneficial to have the HIS / RIS vendor populate all available fields for a particular message type if the data is available in the master database. This makes it easier to utilise a single interface for multiple uses, instead of having a separate interface for each system being integrated. Two main types of ORMs used in Radiology Information Systems (RIS) / PACS / VR and DMS integrations are new orders and cancelled orders.

The next message type commonly used is Admit / Discharge / Transfer (ADT). There are many types of ADT messaging defined in the HL7 standard. Within the radiology environment this message is used to provide demographic updates, medical record number changes, etc., but does not include any specific order information such as type of procedure, referring physician, etc.



The last message is the Observational Report Unsolicited (ORU). This message will contain the results of the radiologist's interpretation, lab results, pathology results, etc. and is typically passed from RIS to PACS, but may originate in a voice recognition program and traverse directly to the RIS and PACS, or just to the RIS (with the RIS being responsible for forwarding to the PACS).

Typical Message Flow in an Integrated RIS / PACS / Dictation System

In an integrated RIS / PACS / Dictation system utilising HL7 messaging, the typical message flow would go somewhat like this.

- ORM goes to PACS and dictation (new or cancelled),
- PACS sends accession number pass to dictation software,
- Dictation sends ORU (preliminary or final) to RIS,
- RIS send ORU (final) to PACS, and
- RIS sends ADT message for demographic changes, etc. to RIS, dictation, mammography information, and document management systems.

Of course, this is just one variation of many possible combinations of message flows. Ultimately, the method flow of choice is going to depend on the vendors and preferences for the workflow of the facility.

The Need for a Common Framework

IHE is becoming an important part of integrating systems. IHE uses DICOM and HL7 standards to define a framework for how these two standards will interact. The IHE committee has created integration profiles for radiology as well as other healthcare specialties that define actors and transactions within each profile. Current radiology profiles consist of multiple actors and transactions that include, but are not limited to: scheduled workflow, patient information reconciliation, consistent presentation of images, presentation of grouped procedures, access to radiology information, key image notes and simple image and numeric reports. Each of these profiles are responsible for defining the role of the actors and transactions within each one. The more a vendor complies with the different IHE profiles, the more likely it is that the integration project will be successful. When purchasing new equipment or systems, it is now important to have the vendor include their IHE integration statements with the completed RFP, in order to make a better informed decision as to which vendor will provide for the easiest integration.

Aside from using this information to help with integration, one of the most recommended investments would be in an HL7 interface engine to help solve integration issues and reduce the overall number of interfaces needing development by vendors or IT staff. Without an engine, the workflow for a typical radiology environment that has RIS, PACS, VR, Mammography Information Systems and enterprise document management would involve numerous bi-directional interfaces. In the previous scenario, bi-directional interfaces for the following would be required: RIS-VR, RIS-Mammography Information, RIS-Document Management, and unidirectional RIS-PACS.

Each vendor on each typically charges a fee in the range of US $10,000 to $25,000 (€ 8,000 – € 20,000) for each interface. All of these interfaces normally utilise similar messaging standards. With an interface engine, you may get by with a single bi-directional interface between the HIS / RIS and the interface engine. Then, the interface engine will be able to provide all of the other interfacing neces-

sary with all of the enterprises information systems. The interface engine allows IT staff to maintain and create additional interfaces, as needed and at a fraction of the cost of separate custom interfaces.In the beginning stages of the widespread adoption of Electronic Health Records by individual practices, requests to provide electronic results different departments such as lab, radiology, pathology, etc. is growing. This can be a daunting task if one does not employ the benefits of an HL7 interface engine.

FACILITATE THE PROCESS

Take time to be involved in the interfacing process, as it will make troubleshooting much easier in the long run. Insist on compliance from vendors to IHE standards when searching for new IT / modality products. Although radiology still has not reached the ultimate goal of "plug-and-play" among products, there have been enormous strides made in compatibility among products from various vendors.

A PROCESS APPROACH TO CARDIAC ULTRASOUND PACS AND REPORTING

Re-engineering the reporting process within the cardiology department and into the EMR

By: Erwin Bellon, Frank Rademakers, Bart Van den Bosch and Jens-Uwe Voigt

The conflict between economic viability and the desire to provide medical quality sets the scene for the introduction of a completely digital image-based echo-cardiography reporting system in the 1900-bed University Hospitals Leuven. The goal of this project was to increase efficiency so that state-of-the-art medical quality could be delivered daily bearing the economic constraints in mind.

Cardiac ultrasound imaging, in which the beating heart is visualised, has evolved quickly from being an experimental tool to an examination activity that is performed routinely on many patients. Ongoing improvements to this technique result in more options for measurements and quantitative analysis. But, while such analysis can dramatically improve the quality of the examination, it requires additional expertise and time of operators and cardiologists, which is usually not reflected in reimbursement.

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Incremental development

The first element in our approach is to re-engineer the process within Cardiology. We experiment with converting the reporting system from a simple text processor to a tool that guides operators and cardiologists. The second element is to integrate reporting into the hospital-wide Electronic Medical Record (EMR) to streamline the overall process. We opposed the traditional concept of the cardiology reporting system as a separate island with its own internal organisation. Instead, we radically delegated all organisation and workflow to the overall system by visually integrating the reporting module into our existing clinical workstation. The third element is consolidation of technology by integrating image handling into the existing hospital-wide PACS.

Using the electronic reporting tool to transform the diagnostic process

Typical cardiology reporting systems provide a structured layout that summarises measurements (performed on the images within the reporting tool or transmitted from the ultrasound machine), calculations, automatically derived interpretations, and free text for the conclusion. The reporting tool increases the efficiency of formulating the report, but not of the process of arriving at conclusions.

Our approach, in contrast, aims at exploiting the reporting tool as a guide for the execution and interpretation of the examination. Firstly, the structure of the report is tailored to the clinical request, rather than to the technicalities of the examination. This increases efficiency for the referring physician, who will ultimately have to translate findings in the report into therapeutic actions. Secondly, the system provides a structure that reflects which acquisitions and analyses must be performed. This ensures that time is spent mainly on the most relevant actions while overall quality improves by incorporating diagnostic guidelines from scientific evidence. Thirdly, we integrate previous knowledge into the system to improve the medical quality of the report without having to increase our effort in doing so. Patient measurements could be compared to normal values that are adapted to age, weight, gender and previous diagnosis (by means of the reference database generated from the specific patient population). Alternatively, the

system could automatically show previous data for the same patient to indicate trends.

This re-engineering effort takes the view that new technology should be exploited to optimise medical quality within economic constraints rather than the opposite. At a technical level, it requires the ability to adapt the commercial reporting system.

Figure 1: The echo-cardiography reporting tool (within the dotted rectangle) guides the process of generating a diagnostic report. By visually integrating this reporting window into the overall medical record, we attained complete integration into hospital-wide workflow without any compromise in organisation or in security policies. The existing PACS and technical infrastructure are leveraged to organize image flows.

Integration into hospital-wide workflow by visual integration as a slave component

Cardiology reporting is part of a hospital-wide process. Solution providers ensure that their reporting systems can be fed information from other parts of the process and can send results to the EMR. However, they still see the reporting system as the principal system in the department that provides all organisation and workflow. We believe that this "self-absorbed" approach – although aimed at improving workflow – actually counters hospital-wide workflow and organisation.

Our cardiologists do more than merely interact with the reporting system. They use the hospital-wide EMR to consult medical information from different departments. As part of their workflow, they not only approve a medical report, but also the billing of the complete examination, including administered medication – which the reporting sub-system is incapable of doing. Cooperation between physicians from different departments not only requires technical functions in the EMR but also global policies, and confidence in the measures for access control and authentication.

The traditional solution is to have the reporting sub-system provide more of these overall functions. This requires massive amounts of data transfer from the EMR to the reporting system, often just to have that system present the data to the user. Duplication of functions in the different systems is not only a waste of implementation effort, but often interferes with overall policies and security.

In our approach, the reporting system is visually integrated as a slave module in the user interface to the EMR (Figure 1). Information that does not strictly belong in the report will not be included in the reporting system but will be available in the EMR part of the user interface – as it has always been. All actions related to workflow are performed in the EMR, using concepts, policies and security that are in no way compromised by the reporting system. For example, signing off a report (or modifying its status in any other way) is done using buttons in the "outer" part of the user interface. During this action, the EMR pulls the report from the reporting window and manages that copy internally, in the same way as it would have pulled a traditional text out of a window that it had provided. Despite these advantages, little implementation effort was required: virtually no data needs to be exchanged, no excess functionality has to be duplicated in the reporting subsystem, and the processes in the EMR do not require any adaptation.

The success of this approach depends on the open-mindedness of the provider of the reporting system, and his understanding that this solution is not replacing but complementing the existing workflow. This has become a critical element in the selection of our commercial partners.

Integration into overall technical infrastructure and hospital PACS

This type of reporting system usually comes bundled with a dedicated, cardiology specific image management system. Bundling makes setting up the system easier for the provider. By contrast, we re-use the hospital PACS for long-term image storage and image distribution. This PACS, in turn, shares the 170 terabyte central disk storage system of the hospital with any other system that requires storage.

The advantages of this technology consolidation include economies of scale, concentration of know-how, hospital-wide flexibility in allocating resources, sharing of central solutions for tasks such as backup, and immediate availability of functionality such as image access over the Internet. It may cause concern that all image transfers use the existing PACS infrastructure, but it also enables the user to utilise the existing tools and procedures for correcting errors, and to share experiences in other image intensive departments such as radiology.

This kind of overall optimisation requires a perspective over various medical departments. A global vision by hospital management is more importe than introducing any amount of technology.

DESIGNING A HIGH-PERFORMANCE TELEMEDICINE SYSTEM

Part Three of a Three-Part Series

By: A.V. Bogdanov, A.B. Degtyarev, Yu.I. Nechaev & A.V. Valdenberg

In the first part of this series (published Spring 2006), the steps taken towards designing a telemedicine system based on high-performance computer technologies for the Institute of High Performance Computing and Information Systems in St. Petersburg, Russia were explained. In the second article (published Summer 2006), the concept proposal for a telemedicine Internet portal was presented. In the final article of the series,

Examples of Application – Complex Architecture

The conceptual basis for the creation of telemedicine intelligence complexes (IC) is based on the fundamental principles defining the architecture of a system and the levels of its management. Such technology effectively combines the stored system of knowledge with new approaches and paradigms of an artificial intellect. The practical application of ICs provides communication between remote patients and leading scientific centres, which in turn leads to a shift in diagnostic and advisory aid rendering.

The kernel of a telecommunication system represents the real-time expert system functioning on the basis of a multiprocessor cluster under the control of the Linux operating system. Such systems prove to be efficient in resolving specialised problems, in particular, as a "hot cluster" providing fast access to great volumes of information from various remote sources during irregular time intervals. Functions of the system kernel include: information gathering, control of coded information from remote users and also the processing and formation of initial data for inference management.

Both methodological and methodical principles applied towards problems of medical diagnostics are based on the multiple parameter analysis of symptoms which, in various situations, do not have identical differential-diagnostic values, i.e. semantic information density.

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Integrated knowledge system

The concept of IC design determines the development of data and knowledge assimilation technology. As such, ontology and data mining widely utilise new generations of IC technology. The result is the creation of features that have generated a new paradigm of computer data and knowledge processing, subsequently finding a niche within developing telemedicine intelligence technologies.

The mechanism of knowledge-based functioning realisation utilises various strategies of inference. These are improved during the accumulation and use of actual medical information during the system engineering process. During the research stage, the greatest interest is represented with the strategy of a stage-by-stage conclusion. Such a strategy minimises the amount of time spent on diagnostics. Consequently, diagnosis accuracy is maintained (and in some cases even increases) and the influence of a potentially less qualified attending physician on the conclusions decreases.

The diagnosis represents a four-rank assessment:

- Suspicions are not present,
- Conditions are satisfactory,
- Consultation of an expert is necessary, and
- Consultation of the expert is urgent.

The probability estimation of each diagnosed illness is found in the logic rules based on criteria convolution. In this case, a set of estimations (including negative) is attributed to each separate feature (symptom) in the structure of the concrete logic rule. The estimation is then characterised with a point, which is attributed by the expert to each symptom.

Diagnosing has three stages: the automatic processing of results measurements, preliminary diagnostics on the basis of a case history and interrogation of the patient. Corresponding simple symptoms measuring the current rank of the illness are subsequently used in each stage. The threshold value in points is then put in conformity to each rank. The result of this inference work is an expert diagnosis, conclusion of the examination report and a record of statistical estimations in the system database.

Self-training of the system's adaptive components are carried out by an estimation of the specificity and sensitivity of concrete attrib-

utes. Given characteristics are objective and do not depend on the competence of experts. Such a process permits the monitoring of inference results during the pre-production operation of the system in comparison to expert assessments made during postponed consultations.

Foundations of Information Processing

An increase in the reliability of estimations and forecasts for clinical situations is achieved with the use of this new approach, based on the development of the "soft computing" concept[6], to information processing. This approach foresees the use of two theoretical principles (see Figure 1) and provides a rational organisation of computing technology for measurement data processing in relation to the forecast and analysis of extreme situational developments. It also makes it possible to formalise the information stream at the point of realisation of 'fuzzy' inference within a multiprocessor computing environment[4].

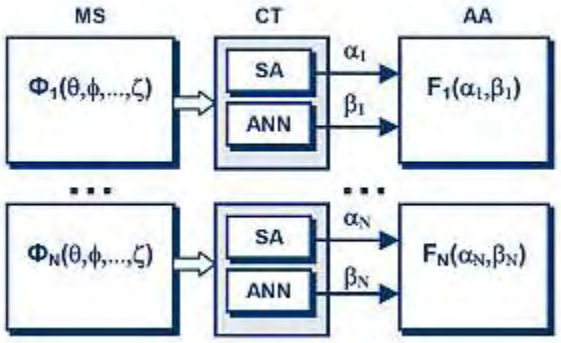

Figure 1. Information flow in multiprocessor computing environment: MS – measurement system; CT – competitive technologies; AA – alternatives analysis; Φ1(◊) ,..., Φ(·α) – measurement data giving to standard (SA) and neural network (ANN) algorithms; $\alpha_1\beta_1$,...,$\alpha_N\beta_N$ – output data for SA and ANN; F1(·),...,FN(·) – situations determinate in result of alternatives analysis

The competition principle provides a comparative analysis of situation estimation results by using traditional algorithms and neural network models. The principle of fuzzy information formalisation within a multiprocessor computing environment permits the realisation of parallel chains of crisp and fuzzy inference.

Complicated Situational Modelling

Let us consider the characteristics of the construction of a cardiac activity model and the methods of its identification with the help of probabilistic approach. Spatial and temporal variability of cardiac human activity (EMF) written in an electrocardiogram (EKG) form is the subject of probabilistic modelling. Usually, during EKG imaging, the EMF field is registered in 8 plates. Therefore, let us pass from a model of a spatially temporal field $\zeta(\vec{r},t)$ to an affined vector $\zeta = \{\zeta_i(t)\}_{i=1}^{8}$

A detailed analysis of the EKG form shows that it is necessary to take into account the following characteristics in a probabilistic model:

- The synchronous variability of all EKG leads,
- The cyclostationarity of cardiac activity processes,
- Characteristic geometrical peculiarities of EKG elements, and
- The variability of R-R intervals.

The final property is determinant as it characterises the modulation process with higher scales of variability. It is a parameter of difference to the property of periodic non-stationarity.

Next, let us present an EKG model as system of consistently incorporating impulses of various length RR:

$$\zeta(t) = \sum_i W_i(RR_i, \Xi(t)) .$$

Here $\Xi(t)$ is a set of parameters changing from impulse to impulse.

The consequence of random impulses $W_k(\tau), \quad 0 \le \tau \le 1$ is presented here in the form of factorial decomposition.

$$W_i(t) = \begin{cases} m\left(\frac{t-Q_i}{RR_i}\right) + \sum_{k=1}^{L} a_{ki}\Phi_k\left(\frac{t-Q_i}{RR_i}\right) + \varepsilon\left(\frac{t-Q_i}{RR_i}\right), & Q_{i-1} \le t \le Q_{i-1}+RR_i \\ 0, & (t < Q_{i-1}) \vee (t > Q_i) \end{cases}$$

The identification of a probabilistic model is carried out with use of a standard approach to the determination of factorial model characteristics. In this case, the identification algorithm is the following:

- Values of RR-intervals are calculated on the basis of the measured initial realisation of an 8-leads EKG,
- EKG cycles are normalized to RR-intervals . $\tau = t / RR$

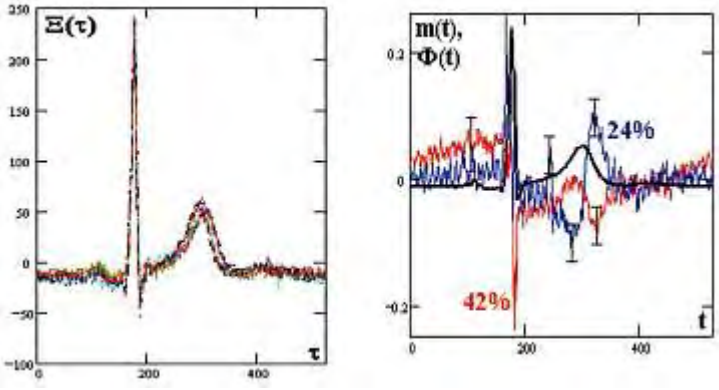

Figure 2: EKG of a somatically healthy man.
(a) – result of normalization on the values of RR intervals, (b) – average value of normalized impulse and estimations of the first and second NOF.

The results of this normalization for the EKG of a somatically healthy man are shown in Figure 2a,

- The matrix (for 8 leads) covariance function $K(\tau_1,\tau_2) = \langle \zeta(\tau_1) \otimes \zeta(\tau_2) \rangle_T$ is calculated.

Averaging is then carried out on cycle numbers, and

- Natural orthogonal functions (NOF) are determined via the solution of an incomplete problem of eigen values for a matrix integral of the first kind in the Fredholm equation.

$$\int_0^1 K(\tau_1,\tau_2)\Phi(\tau_2)d\tau_2 = \lambda\Phi(\tau_1)$$

The average value of normalised impulse and assessments for the first and second NOF for a somatically healthy man are shown in Figure 2b. Further analysis is related in conducting the following steps:

- Analysis of main components is carried out,
- Realisation of coefficients on NOF expansion is calculated, and
- Matrix covariance functions of expansion coefficients and RR intervals are estimated. They take possibility to reproduce model ensemble of EKG with the help of multidimensional autoregressive model for parameters[2].

High-performance computing

Let us consider mapping a probabilistic model of cluster architecture. The synthesis of an EKG ensemble by means of a probabilistic model (1-2) could be reduced to a numerical realisation of an autoregressive model of order "R" describing a system of "L" stationary time series. A general parallel algorithm could be described by the following sequence[7]:

- Obtaining model parameters on the main parallel branch (MPB) - operation "A", and passing to another PB, in accordance with the communication graph of a specific algorithm – operation "B".
- Calculation of time series realisations fragments of the length of n on p PB (including MPB) – operation "C", and
- Exchange of the calculated fragments between PB (in accor dance with the communication graph) - operation "D" and the pair unification – operation "E".

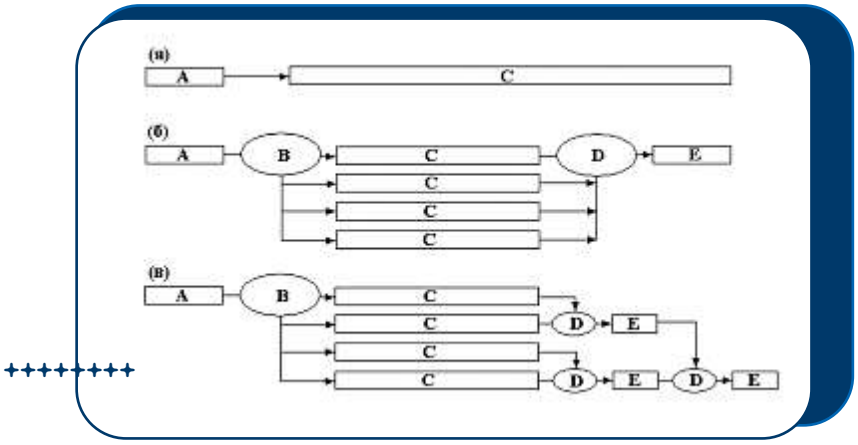

Figure 3: Communication graphs of algorithms for modelling EKG ensembles: consecutive (I), centralized (II), fun-in algorithm (III)

In the presentation of the communication graph of the described algorithm, it is possible to realise the following two variants (Figure 3):

- A centralised algorithm in the framework of a BSP-model effecting on parallel branches only operation "C". Unification of all calculated fragments is realised only on MPB, and
- An algorithm such as "divide-and-rule" (fun-in graph), which unites fragments from PB, with the final transmission of the result to MPB.

Benchmarking shows that, for cardiac activity modelling irrespective of model parameters R, L for supercomputers of "SKIF" row algorithms based on the fun-in graph is more effective. Results of testing show satisfactory speed-ups that allow conclusions about good enough coordination of obtained results with theoretical assumptions.

Results of benchmarking show that, for achieving a suitable performance level, it is required that there should not be less than 16 processors in the system.

EXPECTED RESULTS

As discussed in part two of this series (published Summer 2006), concerning the distributed hardware-software complex installed in the peripheral clinic prophylactic organisations (CPOs) of the Leningrad region, CRCH and JI&RC are planned. The hardware and software will consist of computer and specialised medical equipment connected either by a high-speed telecommunications network, or by standard links. In the framework of a uniform telemedicine complex (development will mainly be devoted to cardiology) software supporting the following systems be included:

- A system of gathering and assimilating medical information,
- A multi-agent system of medical and statistical information gathering,
- A uniform database of the patients of the Leningrad region (electronic case history),
- A database on medicines,
- A database on preferential categories of citizens,
- A database on medical experts,
- Specialised medical systems of mathematical modelling,
- Specialised expert systems and decision support systems,
- Visualisation system and a system of virtual reality,
- A system of situational modelling,
- Information services and systems on directions necessary for medical workers and patients of the Leningrad region, and
- Complex for tele and videoconferences.

The majority of the listed services will be realised by means of a telemedicine Internet portal or alternatively, they will be connected with the Centre directly.

As a result of work the prototype of global telemedicine network (medical GRID) will be developed.

For a copy of the references contained in this article, please contact k.ruocco.me@eahitm.org

SERIES ON DEVELOPING A HIGH-PERFORMANCE TELEMEDICINE SYSTEM

Spring 2006: Designing the system
Summer 2006: Building the Internet portal & functional prototype for the system
This issue: Creating the system architecture

Cost benefit analysis (CBA), return on investment (ROI), or both?

By: Tom Jones

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eHealth Decisions Can Be Tricky

Taking decisions can be tough. Taking complex decisions is even tougher. Most eHealth decisions are probably at the tougher end of the complex. They can affect the performance of healthcare resources, impact patients, and are often linked to changes to clinical and working practices of highly trained, highly aware healthcare professionals. It can also take several years for eHealth to come to fruition, if it ever reaches this stage. In this setting, rigour in decision-taking is critical - so which techniques are helpful?

In business settings, return on investment (ROI) can be used to test the financial benefits of investment options. In services where some of the impacts on citizens can be intangible, cost benefit analysis (CBA) is often seen as more appropriate. A third approach is to use both - CBA + ROI.

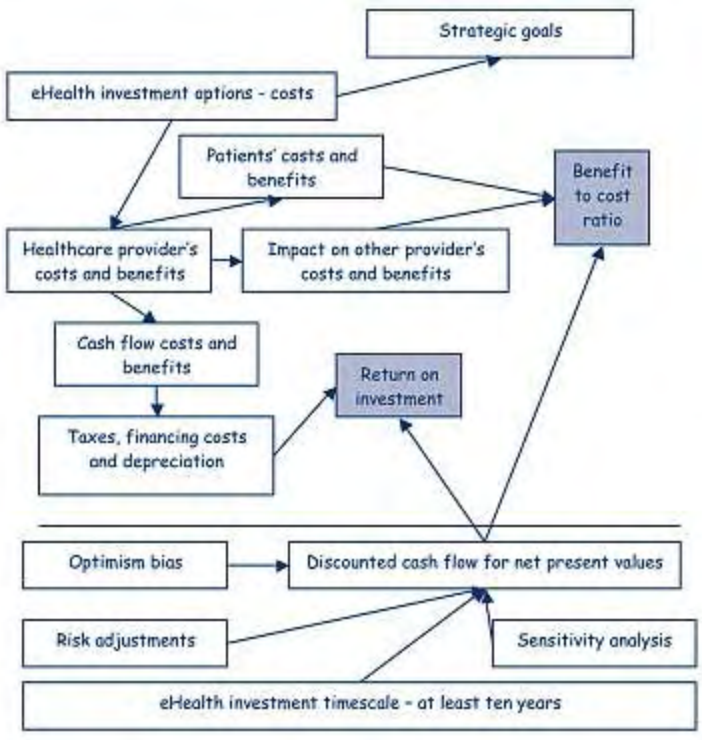

Figure 1 - Illustrative linkages between CBA and ROI

ROI can be seen as an accounting model, and applied within the boundaries of the investing entity. It takes the cash generated by a proposed investment over time, and divides it by a value of the investment. This gives the ROI. The option with the best ROI is the one to pick. An obvious criticism of this approach for eHealth is that it omits the costs and benefits to patients, carers, healthcare providers and third-party payers.

CBA is an economic model, and enables the costs and benefits of all groups affected by the proposed investment over time to be valued and a benefit-to-cost ratio to be produced. The option with the best ratio is the one to pick. An obvious limitation of this approach is that the investing entity may not be able to afford the option with the best ratio.

One way to overcome these two limitations, and avoid the choice of CBA or ROI, is to use both. Unfortunately, this makes an already complex decision more complex. A significant advantage is that it reflects the reality of eHealth investment decisions; they need to seek an optimal position between the economically advantageous and the affordable

to achieve strategic goals. This has two main themes, iterating the relationship and the technicalities.

Combining CBA and ROI for a More Informed Decision

The technicalities of using CBA + ROI are no more complicated than using just one of them. Much of the data is common. CBA includes tangible and intangible costs and benefits. For patients, these can include changes to travel costs, waiting times and service quality and safety. For providers, they can include the cost of the eHealth investment, implementation, change management, improved risk management changes in productivity, costs and income. Where new services are created, they can include new types of income. For CBA, taxes such as VAT are excluded because they are transfer payments, and depreciation is excluded; the cash flow of the eHealth investment is used instead. For ROI, estimates of tangible income and expenditure changes are needed. Some of these can be copied from the CBA data, then unrecoverable VAT added and, where capital expenditure is needed, an adjustment can be made to convert the capital outlay into annual depreciation and capital finance.

For an investment decision into the future, both CBA and ROI can use discounted cash flow to produce net present values. This reflects the time value of money, and is important for eHealth investment decisions. The European Commission's eHealth Impact (eHI) Study, available in the autumn at www.ehealth-impact.org, showed that the average time scale to reach a cumulative net benefit for its ten sites was about five years, with a maximum of about eight years. These timescales reinforce the need to us net present values, and so adjust estimates for the different time values of money created by the opportunity to earn interest with the money available.

Three other standard adjustments are needed to the estimated values used for eHealth investment options:

- Optimism bias, where people tend to overstate benefits and understate costs,
- Risk adjustment, to assess the impact of arrangements faltering, such as cost and time overruns, and

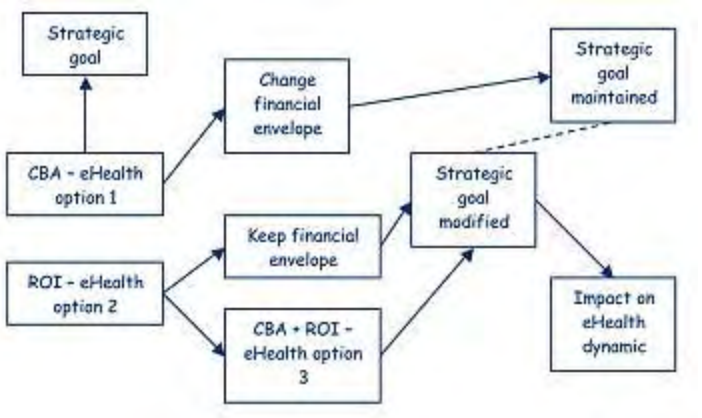

Figure 2: eHealth Decision Choices with CBA + ROI

- Sensitivity analysis, to test the rigour of estimating; an essential feature of investment decisions.

All three should be used with CBA and ROI, and so can be used with the CBA + ROI model. The linkages are summarised in figure 1.

There are several related techniques to CBA and ROI, such as cost-effectiveness analysis, internal rates of return and payback periods. If eHealth decision-takers prefer to use these, they can be accommodated into the linked model, because they have the similar data and technical overlaps.

Considering the Options

The crunch comes when the linked CBA + ROI model produces data about options. This is when eHealth investment decisions become more complicated, and more realistic. Variables that have to be in place for an eHealth investment decision to have a chance of success must be identified. The eHI study shows the importance of the economic impact of eHealth on citizens, with an average of some 43% of benefits allocated to them. This shows the critical investment feature of eHealth: it is usually an investment where a significant proportion of the returns are for patients, and so is beyond the boundaries of healthcare providers. This is consistent with other investment decisions in healthcare, such as new drugs and new medical and surgical techniques. It shows the value of CBA and the limitations of using ROI alone, which excludes a significant eHealth impact. This points to the limited strategic fit of ROI in eHealth investment decisions.

Conversely, CBA does not deal with the impact on the income, expenditure and balance sheet of the eHealth investor, often a healthcare provider, and so does not deal with affordability - another critical investment theme. The eHI study also reveals the need to increase expenditure for an eHealth investment to succeed. It can include extra resources needed for out-sourced ICT services from suppliers, ICT maintenance, internal ICT teams, project management, change management, training, ICT obsolescence and a continuing investment in an eHealth dynamic. Using ROI can combine these to identify the best, and most affordable, return, and so help to focus on avoiding, or minimising, financial risk, or disaster, from eHealth investments.

One of the outputs from this analysis is often the affordability gap. Additional costs of an eHealth investment may not always be met in full by additional income streams, and so create an affordability gap. This leads to the search for other sources of finance, including reducing costs, liberating cash from improvements in productivity and realigning the entity's overall investment plan to redeploy additional finance from other projects to the eHealth project. These are very tough decisions, often needing medium-term solutions. Ignoring them will only defer the problem, so they must be linked to a CBA perspective.

Continued on page 48

A Network for all Applications

Patient monitoring in Heidelberg University Hospital: Creating customised access to information by developing a hospital-wide, standardised communication platform

By: Björn Bergh

Hospital networks must perform a range of diverse tasks. They must provide management with the necessary data and information. Nursing and medical personnel should be able to access all patient information and images, preferably at the bedside. They must safely transmit "life-critical" information from the patient monitoring system in, say, the intensive care unit in order to safeguard patients against harm both in the ward and during transport. To this end, hospitals need to have access to wired and wireless networks. Finally, networks must provide patients with Internet access, which becomes an indispensable convenience during their hospital stay.

Historically, meeting all four challenges at the same time proved an insurmountable challenge for hospital infrastructures. As a result, hospitals frequently created a separate network for their patient monitoring systems dedicated exclusively to managing the flow of vital patient data. This approach ensured that staff monitoring a heart patient, for example, would immediately learn of any deterioration in the patient's cardiovascular condition. Establishing separate networks comes at a cost because as well as the existing hospital network, a separate network infrastructure, including telemetry radio antennae that have to be built into walls, must be purchased, installed and maintained. Clearly, therefore, the use of parallel systems

generates significant additional costs.

In 2003, when Heidelberg University Hospital commissioned a new 300-bed internal medicine facility, it decided to seek an alternative to the traditional approach of installing separate telemetry-based networks for monitoring acute patients. Plans were drawn up to develop a shared wired and wireless network infrastructure supported by standard components, which would be used as a common platform for all applications.

Realisation

In order to realise the objectives of the plan, the monitoring system used in Heidelberg University Hospital was integrated into the hospital-wide IP network. In physical terms, this meant using the hospital's existing data network infrastructure, which consisted of both passive components – the fibre optic routes and copper cables – and active components. In contrast to conventional solutions which rely on physically separate networks, the solution adopted in Heidelberg involved logical separation of the monitoring system from the hospital's other data traffic. This was achieved by developing Virtual Local Area Networks (VLAN).

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The patient monitoring system was also selected with a view to eventually integrating it in the hospital's DV network. So-called gateways were installed to connect the two separate networks: the monitoring VLAN and the hospital VLAN. A wide range of data can thus flow into the monitoring VLAN through these gateways (patient master and movement data, laboratory results, etc.), while information from the monitoring VLAN can be transmitted to systems within the hospital VLAN (e.g. monitoring and breathing parameters for immediate display or for use in an intensive system).

A similar approach was adopted regarding the use of bedside PC workstations (POC PC = Point of Care PC). Each workstation PC was fitted with two network cards, one for the monitoring VLAN and the other for the hospital VLAN. This allowed staff to continue to access systems on the hospital network (for instance, the hospital information system, labs, PACS and so forth) while patient monitoring data was displayed on the POC PC. A terminal server device (supplied by Citrix) was selected to provide maximum security, minimise maintenance requirements and protect the medical product character of the POC PC. Only the Citrix server's client device is installed on the POC PC and all hospital applications can run on this system without having an impact on the monitoring system.

In the mobile area, using standardised Wireless Local Area Network (WLAN) transmission technology made parallel use of the WLAN across a range of applications possible. Dual band access points are used for radio transmission in the 2.4 GHz and 5 GHz bands, which allows various applications to be distributed across different frequencies. The 802.11a/h network is available for use throughout the Heidelberg University Hospital, whereas the 54 MBit/s network is reserved for hospital applications only. The 802.11b/g network is used by the monitoring system and to give patients Internet access. Roughly two-thirds of the hospital's wards currently have this type of WLAN coverage.

Guaranteeing secure transmission of vital patient monitoring data through the shared WLAN infrastructure proved a particularly difficult technical challenge. Given the bandwidth limits of the WLAN system, it was of critical importance to guarantee the necessary bandwidth for monitoring to ensure there was no disruption in traffic and to prevent the loss of data.

The following solution, developed in partnership with industry, proved useful. Devices connected to the system via a WLAN card are assigned a specific access point which, in turn, is connected with a layer two switch. The data from this switched infrastructure then flow through a PacketShaper before being routed into the general hospital network. The PacketShaper then assigns specific bandwidth to each of the various traffic categories (life-critical information, clinical applications and non-critical data). This ensures that vital patient data can traverse the network securely and reach their monitoring destination at all times. The VLANs must then ensure logical separation of the various data. All data traffic is routed via an SSL gateway and transmitted in encrypted form, thus further enhancing WLAN security for clinical applications.

Applications

In Heidelberg the same infrastructure currently supports monitoring, clinical applications and Internet access for patients.

Monitoring

A mobile patient monitor with docking station and a POC PC are located at each bedside in the intensive care and intermediate care units. The wired network is used when the patient is in bed and the monitor is in the docking station. In this case, the patient information is routed via the monitoring VLAN to central monitoring and, simultaneously, to the POC PC at the bedside. From here, it is possible to display all relevant information available on the hospital information system (HIS), using the terminal server.

If the patient is mobile – being transported within the hospital – vital data and alarms will be transmitted by mobile monitoring device to the central monitoring unit throughout the period of mobility. This enables patients to be continuously monitored while in transit. Viewed from the other opposite angle, monitoring data can also be retrieved at every PC in the hospital via the gateway (WebView).

Specialist units such as the chest pain team can clarify specific diagnoses in other areas without impacting on the number of treatment places available. Furthermore, it becomes possible to respond flexibly to structural changes under way in areas where monitoring is obligatory, thereby avoiding additional costs.

Mobile visits

One of the overriding objectives of the process was to support mobile patient visits by providing access to all available hospital data at a single location. In a "standard workplace" this information includes the following applications: the hospital information system, patient data management systems (PDMS) for intensive care, PACS and archiving systems, all of which are available on the Citrix platform.

The advantage of the new system is self-evident: all necessary information is available directly at the bedside. This has proven extremely important in the cases of X-rays, heart catheter imaging and scanned patient

records. The simultaneous blanket introduction of a PACS or document management system (DMS) in internal medicine significantly reduced paper use and made the development of online records of all data held on file an urgent priority. To ensure greater clarity, Heidelberg University Hospital has introduced a pilot project in which mobile trolleys fitted with a laptop and a 20 centimetre monitor are available via WLAN to support the mobile patient visits.
Not only does the link between the HIS and WLAN benefit medical personnel, but it also simplifies work for nursing and care staff. For example, meals are now ordered using the WLAN system. Nurses equipped with a laptop visit each bed and enter the patient's preferred options, which are then transmitted directly to the kitchen.

Internet access for patients

The third application supported by the new system is access to the Internet for patients. As is the case in other public institutions, patients may surf the Internet for a small fee and those availing of this option are supplied with a personal notebook. A separate 6 MBit/s DSL connection is used to give patients Internet access, whereas hospital staff communicate with the outside world using the broadband scientific network (known as BelWü), access to which is restricted to specific user groups. Payment and access procedures are integrated into the existing patient telephone system.

Synergies and outlook

As well as being cost efficient due to the shared infrastructure, the new system offers a further important benefit in that it provides access to a shared network environment and utilises existing institutional structures and resources. For example, all communications systems in Heidelberg University Hospital – access points, switches and routers – are integrated in a network management system and the various components can be monitored by hospital staff at a central location. As such, the hospital is able to avoid the additional operational expenditures which would be required if it had introduced a separate, dedicated network for monitoring.

Discussions are under way at the hospital on the feasibility of integrating new applications into the standardised WLAN infrastructure. The main items being considered are RFID (radio frequency ID) for secure patient and equipment identification and the replacement of proprietary telephone and internal paging systems with standardised mobile voice communication systems using Voice Over IP technology (VOIP). In this respect, the goal of the Heidelberg University Hospital is to continue to introduce innovative concepts in its information and medical technologies and, in so doing, further enhance the standard of patient care.

Rectification

In the previous issue of *Healthcare IT Management*, the email address for Kevin Gillick (Looking to the Future: How to Ensure the Healthcare Sector Achieves Long-term Stability in its Smart Card Programmes, page 28) was incorrect. The correct address is: kevin_gillick@globalplatform.org.

Facts and Figures: The German Healthcare System

By: Karmin Ruocco

Healthcare System & Administration

Germany has a state health insurance plan, which covers 92% of the population. Another 7.5% are covered either by employers or by private insurance companies, whose use is regulated by the government. The final 0.5% of the population has no healthcare coverage.

The German public healthcare system is highly decentralized, with 16 municipalities (called Länder) sharing responsibility with the government for hospital planning, building and the upkeep of technical facilities. State-regulated health insurance providers and patients then fund the operating costs.

Healthcare Facilities, Services & Staff

Throughout Germany, there are public hospitals, private non-profit hospitals and private for-profit hospitals. Of these, there are two categories: general hospitals and psychiatric hospitals.

Public hospitals belong to the Länder and are managed through a public or private law structure, and may also be established as limited liability companies. Regardless of the hospital type, hospital investments are financed by the Länder through hospital plans.

In the German system, doctors strictly control access to hospital care and generally work either in hospitals or in private practices. Those working in the hospitals are employed by the hospitals (i.e. generally salaried but bill private patients for services provided) and those working outside the hospitals are self-employed.

However some physicians and specialists working in private practices opt to pay hospitals for use of their facilities for treating their own private patients.

The Role of IT

IT expenditure in the German healthcare system represents 0.5% of the total amount spent on healthcare. However, the system is undergoing a major reform, with the implementation of a telematics infrastructure as a cornerstone of the project. This reform aims to spark an increase in the demand for healthcare IT solutions, which will in turn create strong growth potential and investment opportunities in clinical systems. The Health Ministry's master plan for this project, known as "Information Technology Society Germany", targets healthcare IT at a national (rather than Länder) level.

The first test implementations of the new eHealth infrastructure began this year (see the preceding article on page 41). By 2007, the goal is to link together the German eHealth system of patients, dentists, pharmacies, hospitals and insurance funds with the most up-to-date eHealth technologies available. By 2008, the range of products and services that are estimated to be required include those necessary for systems integration, products to support the new IT infrastructure (such as IT security, data storage and management, reliable networks, etc.), training and support systems, and eHealth consulting services. Segments targeted with the highest potential for growth include Picture Archiving and Communications Systems (PACS), Radiology Information Systems (RIS), Electronic Health Records (EHRs), decision support tools and management systems.

For more information on the German healthcare system, please consult www.bmg.bund.de.

Germany at a Glance

Population:	82.5 million
Live births:	9.3%
Death rate:	10.1%
Life expectancy:	75 years for men / 81 years for women
GDP:	€ 2,130 billion
GDP per capita:	€ 25,800
Total healthcare expenditure:	10.9% of GDP
Healthcare expenditure per capita:	€ 2,770 PPP
Inpatient care expenditure per capita:	€ 1,100 (36% of healthcare expenditure)
% of healthcare system financed by public funds:	78%
Number of equipment & scanners per million population:	6.2 MRI 4.6 radiology equipment 17.1 scanners
Number of hospitals:	3,600 hospitals, including 2,000 acute care hospitals
Number of beds:	516,200 acute care beds (public beds 77%, private beds 23% of all beds)
Number of beds per 1,000 population:	6.3%
Rate of occupancy:	80%
Length of stay:	9.3 days
Number of acute care hospital admissions:	205 admissions % population
Waiting list:	Negligible

The German Association of Hospital IT Managers:

Celebrating Ten Years of Success

By: Bernd Behrend

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On 20 – 21 September 2006, the 10th Anniversary of the foundation of the German Association of Hospital IT Managers (KH-IT) was celebrated with a special anniversary meeting in Kassel, Germany. Initiated by Professor Dr. Peter Haas, this working community of IT Managers from German hospitals was created 11th December 1996 in Kassel by a group of 70 interested IT Managers. The primary goal was to share the common experiences and themes about information technology and to improve the organisation of IT in healthcare facilities. In doing this, it was believed that the interests of IT Managers in German hospitals would have a common exchange throughout Germany.

The Enlarged Board of Directors, German Association of Hospital IT Managers, at their 10th Anniversary Congres, 20-21 September, 2006

In the German market, the cooperation with and between both product-orientated and scientific healthcare communities has had a high priority. In the beginning of its formation, the KH-IT initiated workgroups to work out a general concept for the personal structures of IT Departments in hospitals. At the same time, another workgroup created proposals for achieving a better exchange of information between German Hospital IT Managers.

In the past ten years, German hospital IT Managers have come together in KH-IT at some 28 meetings and other special events, many of which were also organised in cooperation with other healthcare organisations. Beneath the intensive exchange of experiences about the major themes of IT, the organisation of KH-IT has been focused on responding to the requirements of rapidly-changing IT structures in healthcare institutions and the resulting developments in healthcare software. It was difficult to harmonise those needs with the need for professional IT project management without complications. Nevertheless, this experience combined with the introduction of diagnostic-related groups for billing became the basis to form the KH-IT as the official voice of German hospital IT Managers against the interests of the software industry and government. Hence, on 3rd March 2003, the Association of German Hospital IT Managers was founded from this working community. After just a short period of time, KH-IT signed up over 100 members. Since then, it has continued to grow to more than 250 members.

With the initiation of the new German smartcard for assurance members, KH-IT began a dialog with the German government about health telematics in Germany, in conjunction with other relevant healthcare IT communities. The KH-IT follows the aim of "Better IT for Health", prompting requests to improve German healthcare telematics for optimal practical use.

Quickly changing healthcare laws combined with rapid developments in information technologies and their introduction into hospital organisations has led to questions about what direction the healthcare IT sector is heading in, what new technologies are being developed and what impact these changes will have on healthcare institutions and IT Managers, amongst others. With the anniversary meeting of KH-IT, future developments in information technology were explored, as well as other related discussions with a presentation of honours of distinguished industry and science leaders. A highlight of the event were the discussions between KH-IT members, who were asked to prepare statements about trends and the future needs of IT in healthcare.

For more information on the German Association of Hospital IT Managers, please consult: www.kh-it.de.

KH iT
Bundesverband der
Krankenhaus-IT- Leiterinnen/ Leiter

Start of the Test Phase for the Health Card in Germany

By: Norbert Olsacher

"It was a good idea, perfectly clear and so obvious. Many dangerous side effects could be prevented if each physician knew all of the drugs his patients were currently taking. So many unnecessary examinations could be avoided if physicians could inform themselves about all the examination results their colleagues obtained before them. These are the arguments of the electronic health card's advocates, and they are right. If this health care data were collected and transmitted electronically and in a standardised way, millions of people could receive better and less expensive treatment"[1], is what the Financial Times Deutschland wrote in an otherwise critical comment on the introduction of the electronic health card in Germany.

Even the biggest critics therefore do not doubt the aims of the health card. The project's technical feasibility – after all, one of the largest IT projects worldwide – is undisputed. The technologies used for this purpose have already been successfully applied in other areas. Rather, at the center of criticism was the political dispute about the responsibilities and overall conditions for the card and the required healthcare IT infrastructure, which is supposed to network around 300 health insurance companies, 2,200 hospitals, 21,000 pharmacies, 188,000 physicians and dentists, as well as 80 million patients. Back in 1999, the founding of the "Action Forum for Telematics in the Health System (ATG)" was an initial step towards a uniform IT infrastructure in the German healthcare system. Four years later, the German Statutory Health Insurance Modernization Act (GMG) was passed, which defined the precise requirements made on the card and its infrastructure.

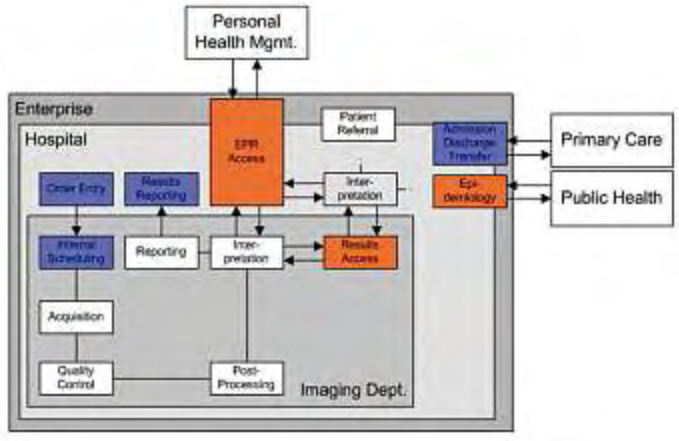

Figure 1 - source: Gematik

Step-by-Step Introduction

Since then, heavy political disputes delayed the project several times, but one thing is now generally accepted as a fact: the card and its infrastructure will be introduced in several steps starting in 2007. At the beginning of the introduction phase, the old health insurance card will be valid parallel to the new electronic health card for a certain period.

The individual functions of the card will also be introduced in several steps (see Figure 1). The administrative functions will be implemented first. In an initial step, the patient data saved on the card will be activated and can then be updated at any time when the patients use the card at their physician's office or in a pharmacy. A reduction of the potential for misuse of the card is expected because the card features a photo of the patient and can be blocked online in case it is lost or stolen. According to experts, the misuse potential is estimated to be between one or two million Euros annually. In addition, the card will feature the European Health Insurance Card (EHIC) on the back upon its introduction, which replaces the health insurance document for citizens traveling abroad.

The electronic prescription application will be introduced in the second stage. This will make it possible to transmit and settle the around 700 million prescriptions each year completely electronically, which prevents expensive information media switches and creates the basis for further drug safety improvements in step three.

While only applications that are mandatory for all citizens will have been introduced until then, step three sees the introduction of the first voluntary medical applications.

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These include the emergency data set and medication documentation based on e-prescriptions. They are the basis for improving emergency treatment and increasing drug safety.

Further voluntary applications will then be introduced in the fourth step - the bill receipt for patients gives them an overview of the prices of services rendered by their physicians, and the electronic physician's letter speeds up the treatment of intersectoral or interdisciplinary cases. Finally, the improvement of medical care quality, which is the aim of the health card project, will become a reality with the introduction of the personal health record. The record contains all relevant medical data of a patient in a clearly structured form. With the patient's consent, physicians can access this information, edit it and add new data. This expanded information basis enables better treatment decisions, which also consider diagnoses, therapies and the results obtained by other physicians.

The current legislative demands on the card and its infrastructure will be fulfilled with the introduction of the fourth stage. However, the health card has an open infrastructure so that new added-value applications can be integrated at any time later on to contribute to a more efficient health care system.

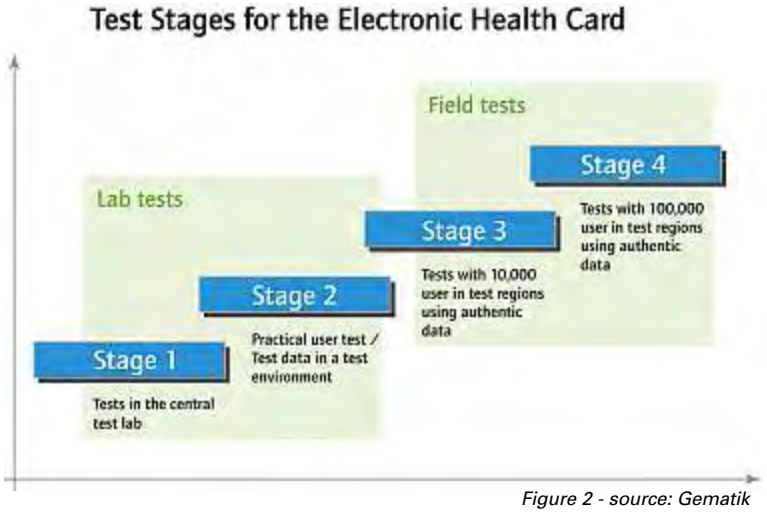

Figure 2 - source: Gematik

Test Phase Started

As many basic decisions were finally made after long discussions, the health card project has become more dynamic. The specifications for the first elements of the health care IT infrastructure, e.g. for the electronic health card and the required card readers, are now available. First invitations to tender for the required components were issued and additional specifications and invitations to tender will soon follow. The long-awaited test phase started at the end of 2005, with the commissioning of a test lab at Gematik, which is in charge of the introduction, maintenance and advance development of the electronic health card and its infrastructure. It was decided to perform the tests in four subsequent stages (see Figure 2).

In the first test stage, the individual components of the new healthcare IT infrastructure will be tested in the central test lab and released for application in the field tests. For this purpose, the individual components, e.g. the electronic health card or card readers, are tested under lab conditions with test data. The components are then checked for their function

and their technical attributes, amongst other things. So-called integration tests are performed alongside these component tests and serve to examine the technical compatibility and interaction of the different components in the overall system. A material test is also performed to check the electrical, physical and mechanical properties and ensure user security. In addition, the German Federal Office for Information Security (BSI) performs an IT safety certification and confirms the compliance with the regulations of the German Signature Act (SigG).

The lab phase is a continuous process, which serves to test the additional applications such as patient data and e-prescriptions, in addition to the basic functions of the electronic health card. Among these are: the emergency data set, the medication documentation, the bill receipt for patients, personal health records and the electronic physician's letter.

Initial practice tests in test offices, pharmacies and hospitals follow in the second test stage, in which the released devices are deployed in a test environment. For security reasons, these tests are only performed with test data.

Field Tests in Eight Regions

After the successful conclusion of the practice tests, the components will be applied in field tests, which will take place in eight test regions in various German federal states (see Figure 3). In the selected test regions, the involved health insurance companies, medical service providers and further partners can look back on long-standing experience in the establishment of healthcare IT infrastructures. Up to 10,000 citizens, 15 to 25 physicians, three to five pharmacists and one to two hospitals are registered for practical testing per test region. The payers in charge (health insurance companies) are also integrated in the tests.

All regions test the mandatory applications of the electronic health card. In addition to the mandatory applications, e-prescription and patient master data, they each have different test focuses: Wolfsburg will concentrate on the emergency data set, Trier on the electronic health professional card (HPC) and Bremen will focus on medication documentation.

Financing Secured

The service providers participating in the tests will receive a flat fee from Gematik for equipment costs for the initial purchase of components like card terminals or connectors to the health care IT infrastructure. Another budget is available for covering extra personnel and operational expenditures resulting from the test. This amount is supposed to finance the additional consultancy services for patients as well as personnel training.

Figure 3 - source: Gematik

The following fees have been agreed:
- **Physicians**: € 3,000 flat fee / € 3,200 for additional expenses
- **Pharmacies**: € 3,000 flat fee / € 2,750 for additional expenses
- **Hospitals**: € 28,000 flat fee / € 28,000 for additional expenses

After completion of the tests with 10,000 patients, two test regions will be expanded to up to 100,000 citizens and the payers and service providers in charge of them. At the same time, the remaining regions will continue their tests until the general introduction of the electronic health card, which is supposed to take place after the completion of the tests with 100,000 patients.

Additional field tests are performed for the electronic health card parallel to the official test regions, sponsored by companies or public-private partnerships. In these regions, the focus is above all on innovative added-value applications for the card. In addition, the card's technology and its infrastructure are to be developed further to such an extent that it can be optimally integrated into the workflows of the service providers. Besides this, these field tests are to contribute to the card's acceptance among the population.

The European View

Other European states are also working on the introduction of health care IT infrastructures and / or electronic health cards. The European Union is therefore striving for standardisation to ensure the transnational interoperability of the proposed solutions.

The European Health Insurance Card (EHIC) was introduced as a first step towards achieving this aim, and is already available in many countries these days as an additional card to the health insurance ID. It replaces the health insurance document for abroad so far required in case of illness or accidents and enables non-bureaucratic medical treatment in Europe. Right from the start, the EHIC will be featured on the back of the German electronic health card.

Based on this, health data sets like emergency data or medication documentation will also be made available Europe-wide as voluntary health card applications.

This way, patients who agree to have their medical data saved in a personal health record via the health card can also receive better treatment abroad in Europe, because physicians can quickly access emergency data or other important information such as drug documentation.

In the "Action Plan for a European e-Health Area", the European Commission postulated the aim to make electronic health care services a matter of everyday life for medical personnel as well as for patients and citizens in Europe until the year 2010 – an aim that is ambitious but achievable. This is what the successful rollout of the eCard in Austria as well as the meanwhile advancing German health card project have shown so far.

Movers & Shakers: Industry Interview

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Nicole Denjoy, Secretary-General, COCIR and Kees Smedema, Chair, Healthcare IT Committee, COCIR

Please tell us a little bit about COCIR – when was it founded, who it represents and key areas of focus / activity in the European healthcare IT sector.

Founded as a non-profit trade association in 1959, COCIR represents the medical technology industry in Europe. As such, our members play a driving role in developing the future of healthcare both in Europe and worldwide.


Nicole Denjoy

COCIR moved to Brussels in January 2006, establishing a permanent office in Brussels to better represent the interests and activities of its members act as a communications channel between its members and the EU institutions and other regulatory bodies.

COCIR is committed to supporting its members and communicating with its partners in Europe and beyond on issues which affect the medical technology sector and the health of EU citizens. It also cooperates with other organisations on issues of common interest.

As well as communicating with EU policy-makers on economic, regulatory and technical issues related to healthcare, COCIR works with various organisations promoting harmonised international standards and fair regulatory control that respects the quality and effectiveness of medical devices and healthcare IT systems without compromising the safety of patients and users.

We encourage the use of advanced technology to support healthcare delivery worldwide.

COCIR's key objectives include promoting free worldwide trade of medical devices and maintaining the competitiveness of the European sector.

In terms of research & development and gaining market access, what do you consider to be the biggest challenges facing corporations involved in European healthcare IT?

Assuming that Healthcare IT and eHealth are about the same, the challenges in general terms (i.e., not specific to the industry) are formulated regarding barriers:

Organisational fragmentation within and between healthcare organisations
Different organisational settings and responsibilities make it difficult to agree on solutions that encompass the complete care cycle and cut through organisations. For example, it may not be in the interest of one care provider that information will become available to another care provider.

Misalignment between investments and benefits
This is also a result of the 1st barrier. Often, infrastructure investments are needed (e.g. country-wide secure network, patient id, practitioner's id, etc.) but

the benefits are in the improved decisions at the point-of-encounter between the healthcare provider and patient. Getting all parties aligned is a major challenge, and it may require a reorganisation of the healthcare system.

In the end, there should be a sound "business case" for every eHealth solution. Note that quite often the so-called "pilot projects" done with funding from the Commission fail after the pilot phase because no sustainable business model is available.

Reimbursement does not reward the use of eHealth

Current reimbursement schemes are often based on the acute care model and the primary care physician model. This does not provide the right incentives to develop preventive schemes, or provide specific care paths for chronic diseases, where eHealth solutions are particularly useful.

Privacy and Security regulation

For patients, the privacy of their medical information is important. Because eHealth solutions often address cross-institutional healthcare in non-traditional ways, privacy and security regulations present a huge challenge. However, they are also often used as an excuse not to invest time and effort to find solutions that work within and across member states.

Interoperability between different healthcare systems

Entering information once, using it many times across the healthcare system: this is the dream of patients and providers. However this requires that terminology and information can be exchanged and understood between different systems. Many standards exist, some need to be developed. But we should be careful in narrowing the barriers to eHealth to just technical interoperability. If there is a sound business case, interoperability will be developed. If there is no business case, the development of interoperability standards does not help.

Fragmentation of the market

There are different visions, roadmaps and specifications for eHealth solutions between EU Members States and even within Members States. In this way, we will not get the necessary economy of scale to provide cost-effective solutions.

Absence of cross-border legal frameworks for healthcare

Even if the privacy and security regulations are aligned between the Member States, a proper legal framework for cross-border healthcare, such as the

recognition of accreditation of healthcare professionals in cross-border eHealth solutions (e.g. tele-consultation or radiology reporting) does not exist.

What do you consider to be the greatest eHealth opportunities in Europe?

Quality increase, cost reduction, citizen empowerment (to include the following):

- Reduction of errors,
- Improve disease management of chronic diseases,
- More efficient workflow,
- Accessibility and availability of information improves clinical decisions,
- Decision support,
- Home/remote care in an aging society,
- Seamless information transfer between healthcare providers, and
- New clinical applications.

What role does COCIR play in fostering the harmonisation of European and global healthcare IT regulatory standards?

COCIR, in the area of Healthcare IT, supports effective worldwide consortium standards; often these consortia have vendors and healthcare providers as members. COCIR companies participate in these standards and guidelines. Positions are also often prepared in COCIR. Examples are Digital Imaging and Communications In Medicine (DICOM) for medical imaging and Integrating the Healthcare Enterprise (IHE), which develops profiles for seamless integration based on existing standards in many clinical areas including: radiology, cardiology, oncology, laboratory information, IT infrastructure and patient coordination. IHE is a worldwide organisation. IHE-Europe was started by COCIR, and its secretariat is still managed by COCIR.

In what ways is COCIR actively involved in promoting & supporting sustainable investment in healthcare IT across Europe?

In many ways, because a large and homogeneous European healthcare IT market is a key objective for COCIR, in a way all our activities contribute to that goal. Examples are:

- Since this year, it has been possible for the new EU Member States to get so-called structural funds not only for the traditional infrastructure, but also for the healthcare infrastructure. COCIR is actively involved in supporting governments to prepare proposals. COCIR also sponsors the European Health Forum in Bad Gastein, especially in a session on structural funds for healthcare.
- By contributing to harmonisation in standards for interoperability and EHR - COCIR is member of the so-called "eHealth Stakeholders Group" (and is a Co-Chair on behalf of the industry) which is initiated by the EU Commission to advise on interoperability between patient summaries, patient id's, practitioner's id's and emergency data sets of Member States. In this, and in other groups, COCIR promotes similar roadmaps and harmo--nised stan dards for EHRs in order to support a European market with a sufficient scale to develop effective solutions.
- By supporting one European-level healthcare IT conference and exhibition (the World of Health IT), which for the 1st time will take place in Geneva from 10-13 October 2006. Such a conference should stress European-wide solutions.
- By promoting the use of worldwide standards, rather than standards that were developed specifically for Europe.
- By engaging, through IHE, with health care providers and clinicians in order to ensure that healthcare IT solutions are exactly fitting with the requirements in care settings.
- By influencing EU institutions and other governments to remove obstacles for the introduction of eHealth solutions (see previous comments on the eHealth Stakeholders Group).
- By supporting initiatives that improve the quality of vendor's products in an effective way. An example is the IHE Connect-a-thon, where new interoperability profiles are tested. COCIR supports caution with external certification, because this has not yet proven successful. COCIR companies have extensive experience with self-testing in IHE and DICOM. The DICOM standard for application-level interoperability of medical images is one of the, if not the most, successful medical standard and its functionality belongs to the most complex standards in the world.

Kees Smedema

What do you consider to be the most important factors in bringing unity to the fragmented European healthcare IT sector?

As with the comments made in question 2, we should support a European-wide market in order to achieve an economy of scale. This is only possible with similar roadmaps for similar EHRs with similar purpose. I use "similar" because "the same" is virtually impossible. The health systems themselves may differ in reimbursement, public / private and regional / national aspects. Therefore, the industry itself can do little, and what can be done is done. The context in which the industry operates needs to change in order to obtain a mature European IT industry. This does not mean that COCIR is only for the big, European-wide players - COCIR also very much supports the SMEs in this healthcare IT field, through its non-corporate members: the national associations.

For more information about COCIR, please consult www.cocir.org.

advanced telemedicine
medmatic@2006

the "Soft Touch Medicine" scenario

From 28th to 30th September in Vicenza, the second edition of Medmatic@ will take place with the national Exhibition/ Conference dedicated to Telemedicine and Medical Computing. This second edition is designed to concentrate mainly on the applicational aspects of telemedicine and digital research in order to provide health service staff with proof that information technology, and advanced telecommunications applied to health services more generally, is now a concrete reality that can improve the quality of health care and management of the territory and at the same time bring considerable reductions in running costs.

As Giampaolo Stopazzolo, chairman of Medmatic@ puts it, "Basically, this was the challenge for Medmatic@ two years ago, to believe in the necessity to organise a trade fair that would bring together all the companies that have been working on Telemedicine and Medical Computing for years, in order to demonstrate and verify the advantages offered by telecommunications applied to Health Services." Dr Stopazzolo goes on, "From this point of view in Italy advanced know-how has been built up over the years, and not only at the local level. Many of the businesses that took part in Medmatic@ last year, and have confirmed their return this year, along with newcomers, have years of excellent experience behind them, using applications in the world of medicine and working with health service institutions over the whole country, which presents a whole range of differing needs and measures to be taken.

Giampaolo Stopazzolo, chairman of Medmatic@

The innovation represented by Medmatic@ has been immediately appreciated. Proof of this is the attention awarded by health service institutions such as the Regions. Indeed, this year all the regions from North-east Italy and the Lombardy region, places of excellence for digital applications to the Health Service, will be represented, being well aware of the importance of business and institutions coming face to face as an engine of development. What is more, during "T-day" on 30th September there will be presentations of all the projects that are in an advanced state of realisation and application nationally and convey the message that the challenge set by telecommunications has borne fruit in Health Service System."

Dr Stopazzolo continues, "The field of applications and the range of technologies is certainly vast and there are still new services and new systems needing implementation, but this is the stimulus of innovation and research. An important area at Medmatic@, deserving particular attention, is surely the "Smart Hospital", which will demonstrate the interoperability of information systems for health services, using IHE protocols. All medical staff know how much information a hospital structure is capable of producing during a patient's journey from admission to discharge. The IHE Smart Hospital is a concrete example of how medical information about a patient is able to converge in real time, in an organised manner, and be consulted by all those concerned with the patient's care. This means efficiency, security, quality and transparency towards the patient.

Transparency that is accompanied by the greater autonomy allowed by digital health technologies. Applications of information teletransmission, whether radiological records, laboratory records, or electrocardiographs, simplify routine tests in the surgery, for example, relieving congestion in the hospital and freeing useful resources." Dr Stopazzolo concludes, "Medmatic@ will be the showcase for all these proposals and an important opportunity for discussion, the only one in Italy tackling such a variety of topics and with such high quality proposals for applications and services to provide management and digital innovations in the Health Service. The three days of conferences with CME recognition that have been organised by our Scientific Board will cover the whole range of cutting edge digital applications to describe the "Soft Touch Medicine" scenario that brings medicine closer to and is modelled on the needs of the patient".

Medmatic@
Exhibition conference
on Telemedicine
and computers in Medicine

28-30 September 2006
Vicenza Fair - Italy

www.medmatica.it

Industry Events

October

The World of Health IT
Conference & Exhibition
10 – 13 October
Geneva, Switzerland
http://www.worldofhealthit.org

MedNet 2006
11th World Congress on Internet in Medicine
13 – 20 October 2006
Toronto, Canada
www.mednetcongress.com

November

MEDICA 2006
World Forum for Medicine
15 – 18 November 2006
Dusseldorf, Germany
www.medica.de

IST 2006:
Strategies for Leadership
European Commission's Annual IST Event
22 – 24 November 2006
Helsinki, Finland
www.ist2006.fi

TeleMed & eHealth '06
Royal Society of Medicine Telemedicine and eHealth Forum
20 - 21 November 2006
London, England
www.rsm.ac.uk/telemedicine

11th Annual ISfTeH
International Conference International Society for Telemedicine & eHealth Annual Conference
26 - 29 November 2006
Cape Town, South Africa
www.mrc.ac.za/conference/satelemedicine/index.htm

RSNA 2006
Radiological Society of North America
26 November - 1 December 2006
Chicago, USA
http://rsna2006.rsna.org

2007

February

HIMSS
HIMSS Annual Conference & Exhibition
Healthcare Information and Management Systems Society
25 February – 1 March 2007
New Orleans, USA
www.himss.org

April

Med-e-Tel
International Education and Networking Forum for eHealth, Telemedicine and Health ICT
18 - 20 April 2007
Luxembourg
www.medetel.lu

ITeG 2007
IT Messe & Dialog in Gesundheitswesen
18 - 20 April 2007
Berlin, Germany
www.mesago.de/de/ITeG/main.htm

May

Cross Border eHealth in the Baltic Sea Region
Health Care Delivery for the Patients Today and Tomorrow
21 - 22 May 2007
Stockholm, Sweden
www.ehealthconference.info

June

TteC 07
Tromsø Telemedicine and eHealth Conference
11 - 13 June 2007
Tromsø, Norway
www.telemed.no/ttec2007

continued from page 35

Cost benefit analysis (CBA), return on investment (ROI), or both?

Often in eHealth investment decisions, CBA models show preferred options which have a good strategic fit, but are different to the options identified by ROI; this is where eHealth decision-takers add value. An optimal match has to be found. The steps are summarised in Figure 2.

Making It All Add Up

Squaring circles has to be achieved. At its simplest, investing in eHealth and failing to achieve strategic goals is not a good idea. An unaffordable eHealth investment with an unacceptable ROI is not a good idea either. The goal for eHealth decision-takers is to keep all the themes linked and to iterate, test and find the scope for an optimal fit. The CBA or ROI choice is not relevant in this setting. Finding an eHealth investment that meets strategic goals over time, will be economically successful, is affordable, and can contribute to the future eHealth dynamic of the organisation is the preferred outcome.

Another important feature of CBA + ROI is the scope to include the resources and steps needed to realise the benefits. CBA and ROI can be used to identify preferred options for eHealth investment. On its own, this is limited. The CBA + ROI options must include the resources, activities and timing needed to realise the benefits. Another feature of the eHI study is that benefits from eHealth are not always realised just by using the eHealth application. Other factors have to change too, often clinical and working practices. In these cases, these changes have to be managed over realistic timescales.

Using CBA + ROI offers a more balanced diet for eHealth decision-takers, and avoids indigestion from over-indulgence in a single theme. It also avoids overemphasising the techniques over the decisions.

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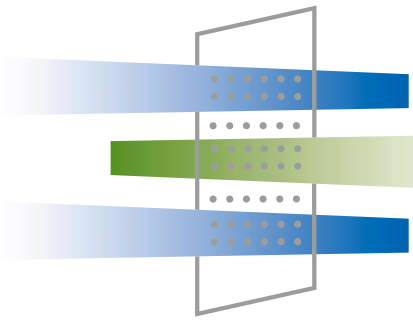

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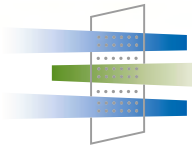

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