HEALTHCARE IT MANAGEMENT

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THE OFFICIAL JOURNAL OF THE EUROPEAN ASSOCIATION OF HEALTHCARE IT MANAGERS

IT @ NETWORKING AWARDS 2011: WINNERS AND FINALISTS

- Advanced PACS Applications
- The Integrated OR
- Computer Surveillance and Antimicrobial Resistance
- Country Focus: Cyprus

Volume 6 / Issue 1-2 / 2011 / € 22

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Let your reports and images go mobile.

Let Your Reports and Images Go Mobile

syngo®.via Web Options from Siemens make it easy to view reports and images on the go. Access is immediate and safe, anywhere[1].

syngo.via Web Options present the mobile solution for image and report viewing from Siemens Healthcare. With _syngo_.via Web Options, physicians and referrers within and outside the hospital can securely access images and reports for viewing in a standard Web browser or on an Apple mobile device[2]. Patient involvement becomes effortless and access to images and reports is faster and easier with _syngo_.via than ever before. In short, this allows better collaboration within and beyond the hospital. All tailored to your needs with the flexibility and the freedom to have images and reports at your fingertips.

Tailored solutions depending on your needs

Siemens offers two _syngo_.via Web Options solutions: _syngo_.via WebViewer[3] and _syngo_.via WebReport[4]. The solution that is best suited for your site depends on the specific requirements toward the collaboration within the hospital and with referrers.

For fast reading and viewing of images within the hospital network, _syngo_.via WebViewer is the ideal solution. This is especially true in larger hospital settings where examination rooms, reading rooms, treatment rooms, and patients are all located in different parts of the hospital campus.

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Share reports and clinical images with referring physicians

External access to clinical images and diagnostic reports is included in _syngo_.via WebReport. The benefit of letting a referrer receive access to reports and images of examinations is tremendous. Access to relevant patient data helps minimize the risk of errors in the future course of treatment. Clinical images can be viewed as 2D or 3D images, such as VRT and MPR. External access is facilitated over a secure Internet connection and is available with a Web browser on a normal personal computer or by using the _syngo_.via WebReport application on Apple mobile devices.

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With both _syngo_.via WebViewer and _syngo_.via WebReport, patient involvement is easier, too. Instead of bringing stationary patients back into an office or reading room to explain the diagnosis or the future treatment plan, this can be done where the patient is located. With _syngo_.via WebReport and an Apple mobile device, for example, general practitioners can show 3D images and explain the diagnosis even at home visits. This is the beginning of true patient centric care.

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Since _syngo_.via WebViewer can be accessed from a standard Web browser or on an Apple mobile device, sharing information with fellow physicians is fast and easy. Even colleagues without access to a reading station can view images. With _syngo_.via WebViewer and a diagnostic grade monitor, examinations such as Computed Tomography or Magnetic Resonance can be read on a normal personal computer and viewed as 2D, MIP/MPR or 3D images.

www.siemens.com/_syngo_.via-weboptions

[1] Prerequisites include: Internet connection to clinical network, meeting of minimum hardware requirements, and adherence to local data security regulations.
[2] Apple®, the iPhone™, the iPad™, iPod Touch™ are trademarks of Apple Inc., registered in the U.S. and other countries.
[3] The application is not for diagnostic viewing/reading on mobile devices. In the U.S., only CT images are approved with _syngo_.via WebViewer. The information about this product is preliminary, as it is under development and does not have the necessary clearances in all countries. Its future availability cannot be ensured. It is not available for sale in e.g. China or Brazil. Diagnostic reading of images with a Web browser requires a medical grade monitor.
[4] The product does not have the necessary clearances in all countries. It is not available for sale in China or Brazil. The application is not for Diagnostic Use

For iPhone and iPad country-specific laws may apply. Please refer to these laws before using for diagnostic reading/viewing.

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Dear Reader,

2011 has already brought some exciting developments within the European Association of Healthcare IT Managers (HITM), which recently elected both Dr. Josep M. Picas i Vidal, CIO from the University Clinic Sant Pau in Barcelona, Spain as President and Mr. Miroslav Madjaric, CIO from the University Hospital Centre in Zagreb, Croatia as Vice President.

Furthermore, we are pleased to welcome new Editorial Board Members, elected for the 2011 – 2015 term, namely Jacob Hofdijk, Vice President EFMI-IMIA, Dr. Andrea Kdolski, former Minister of Health of Austria and Managing Director of PWC Healthcare, Prof. Rudi Van de Velde, CIO of the University Hospital Brussels, and Prof. Jana Zvárová, Director of EUROMICE and Editor-in-Chief of the European Journal for Biomedical Informatics.

This year's *IT @ Networking Awards* was again a display of practical, hands-on innovative IT and medical technology installations with proven results. An impressive 81 percent of participants rated the quality of the first day MINDBYTE presentations better or much better in comparison to other events, an overwhelming 93 percent did so for the next day's WORKBENCH presentation. Indeed, the competitive element sparked lively and interesting discussions, facilitating an exceptional level of learning. We ask presenters to structure their presentations according to the six submission criteria. This creates a universal template to enhance the understanding of all stakeholders within medical professions. In particular, criteria number four, which focuses on the "difficulty" element, was very well received with over 30 percent impact of the total vote. It is vital to discuss the challenges and problems of each solution openly.

This issue of Healthcare IT Management presents the contestants in detail. Our audience voted the "Healthcare for the Rural Poor" project from India as first prize winner. Presenter Prachi Shukla's statement that "The biggest challenge we face is that we never know how many hours electricity we have during a day. Sometimes it is only two hours" gave the audience a reality check, reflecting the somewhat different criteria for evaluating problems experienced in poverty-stricken regions.

Abstract submission for the *IT @ Networking Awards 2012*, which will be held in Brussels from 18 – 19 January 2012, is already open. Inspired by this year's winners, submit your project before 17 June 2011. To ensure the highest level of cross-departmental understanding, we ask that each abstract will follow the 'six criteria' framework. This common structure allows comparison between the varied and different solutions based on the same parameters of understanding.

Europe and the US recently signed a memorandum of understanding in respect to a "cooperation surrounding health related information and communication technologies". In the past the Commission too often surrendered the interests of European citizens to the US administration (take personal data protection or environment issues, for example). Once again, I feared the worst. Fortunately, this memorandum is different and it will be up to the European IT community to keep the lead in this process, in particular as the Obama health plan will generate a much higher commercial impact than many of the European framework programmes have ever done. Commission ICT guru Ilias Iakovidis made it clear, that from now on we need to put pilot programmes into real-life action. HITM has been calling for a change in this direction since 2007. We have always held the belief that a practical approach is the way forward.

Our features cover advances in the integrated OR, have a look into highly developed GRID PACS applications and assess computer surveillance of antimicrobial resistance. The country focus features Cyprus and we examine a unique project that used robots to perform remote ultrasound on ambulatory patients, to stream emergency cases.

Finally, I wish to draw your attention to the e-health week, 10–12 May in the SYMA Center Budapest. This year's event will again host the European Commission's High Level Ministerial Conference and the World of Health IT Congress. HITM is a supporting partner. Please come to see us at booth 131 in the Partner Pavilion.

Enjoy reading this latest issue of Healthcare IT Management. For comments, suggestions and criticism, please contact me at any time.

Best Regards,

Christian Marolt

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HEALTHCARE IT MANAGEMENT

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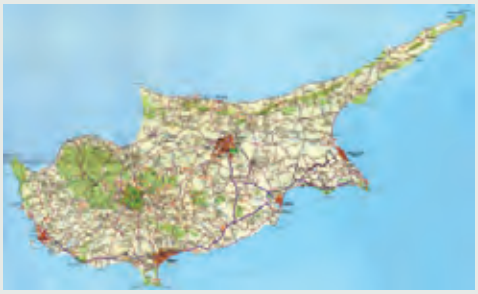
IT @ NETWORKING AWARDS 2011: WINNERS AND FINALISTS
Our cover story presents the winners and finalists from this year's competition. Winner Prachi Shukla presents her telemedicine project for the rural poor in India and the dramatic results they have achieved. Second and third place winners Rudi Van de Velde and Carl Dujat also tell us more about their innovative IT solutions. The cover story also features articles from each of the finalists.



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COUNTRY FOCUS: CYPRUS

Cyprus may be a relatively small Mediterranean island but it is making strides in healthcare IT. Telemedicine is evolving in Cyprus, with some forms of telemedicine in common practice in many fields of medicine throughout the country.

THE EUROPEAN ASSOCIATION OF HEALTHCARE IT MANAGERS (HITM)

The European Association of Healthcare IT Managers

The European Association of Healthcare IT Managers (HITM) is a non-profit 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.

HITM is strategically based in Brussels, for easy access to the European institutions and associations.

HITM's Mission

- To establish common healthcare IT standards; best practices, cross-border collaboration, unifying policies and strategies at EU and international levels;
- To increase the visibility, role and importance of IT management in healthcare facilities;
- To educate key policy-makers, industry players and the general public about the benefits of healthcare IT;
- To promote cross-collaboration in different healthcare sectors, and
- To promote the efficient, cost effective use of IT.

For more on HITM and information about membership, please contact: **Aleksandra Kolodziejska, office@hitm.eu**

HITM MEMBERS

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Tthe Austrian Society for Biomedical Engineering (AK-MI)

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Society for Medical Informatics of Bosnia & Herzegovina (HSMI)

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PORTUGAL
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Turkish Medical Informatics Association

UKRAINE
The Ukrainian Association for Computer Medicine

Association for Ukrainian Telemedicine and e-health Development (AfUTeHD)

The European Association of Healthcare IT Managers (HITM) Announces President and Vice President

Dr. Josep M. Picas (Spain) and Mr. Miroslav Madjaric (Croatia) were named President and Vice President of HITM at the annual board meeting of HITM on January 21, 2011 in Brussels, Belgium.

Dr. Josep M. Picas is the Chief Information Officer (CIO) of the Hospital de St. Pau in Barcelona, Spain. He began his career in 1974 as a medical doctor, was appointed Director of the Hospital de l'Esperança in 1979 and Director of the Barcelona Town Council Primary Health Care Services in the C.Q. Peracamps in 1984. He served as Medical Director of Municipal Institute of Healthcare Services from 1985 to 2004 and General Manager of the Primary Care of Barcelona city at the Catalan Institute of Health from 2004 to 2007. Dr. Picas was also CIO of Hospital del Mar in Barcelona; a position he held until his current appointment in 2008. In addition, he is an Associate Professor at a number of institutions, including the Barcelona Nurses University School Sta. Madrona, the Barcelona Business School, and the Barcelona University. He has worked actively on the development of disease management programmes, computerised information health systems and medical documentation and participates on numerous boards and steering committees.

Mr. Miroslav Madjaric, B.Sc.E.E, Ph.D. is the CIO of the University Hospital Centre in Zagreb, Croatia. He graduated from the Faculty of Electrical Engineering / Computer Science at the University of Zagreb in Croatia. He started his career as a computer operator and programmer, later as a systems analyst and the manager of the IT department in KBC-Zagreb, the biggest hospital organisation in Croatia. He joined the biggest hospital organisation in Europe (Krankenanstaltenges.m.b.H)in Graz, Austria in 1990, contributing substantially to the implementation of a Hospital Information System (HIS). In 2002, Mr. Madjaric lead the IT department in one of the largest Croatian companies INA, d.d. (Oil&Gas), before rejoining KBC-Zagreb in 2008, as VP & CIO. He has published more than 80 professional and scientific papers, mainly related to health IT, and is a regular presenter and participant in all major IT related conferences in Croatia and abroad. The focus of his professional interests is IT management in hospitals, project management and innovation.

Dr. Josep M. Picas and Mr. Miroslav Madjaric will both utilise their new positions within the European Association of Healthcare IT Managers to further bolster HITM's mission to establish common healthcare IT standards and policies and promote cross-border collaboration in different healthcare sectors.

WHP Initiative: Healthcare for the Rural Poor Takes Top Prize at *IT @ NETWORKING 2011*

Prachi Shukla from World Health Partners in India fought off fierce competition to take home the coveted *IT @ 2011* Trophy and a record 5,000 Euro cash prize at the *IT @ Networking Awards 2011*.

The winning solution, Healthcare for the Rural Poor, combines technology with village entrepreneurs acting as facilitators to connect rural communities with formally qualified urban doctors. Using remote medical diagnostics integrated with audio-video conferencing software this project enables patients from villages to access efficient and specialised healthcare in their areas.

Second place was awarded to "Clinical Workstation (CWS), the GPS of Every Medical User" (presented by Rudi Van de Velde).

Third place went to "From 'Micro-' Towards 'Macro-' Mobility. Building Efficient Clinical Processes by Using a Hospital-Wide, Standardised and 'Near-' Patient Communication Platform" presented by Carl Dujat.

HITM was proud to collaborate with EAHM (European Association of Hospital Managers) for this two-day competition recognising innovators in healthcare IT and medical technology at the Théâtre du Vaudeville in Brussels, Belgium. A great learning opportunity, this original event promoted open discussion between competitors from across Europe and beyond. Presenters shared not only their successes but also the obstacles they encountered along the way.

The competition consists of two rounds of presentations. Day one, the 20 nominees took to the stage for their MindByte presentations (five minutes). After each presentation the audience and panel of expert judges had the opportunity to ask questions before voting. The top nine projects from day one progressed to the second round of competition: WorkBench presentations. Each finalist had 30 minutes to present their project in detail and prove why they deserved to win. This was followed with a 15 minute Q&A session before voting. A lively two days, the audience and panel of expert judges did not hold back in questioning each presenter before casting their votes!

This issue of HITM showcases the nine finalists from 2011 and their innovative IT solutions.

For more information, please visit:
www.itandnetworking.org

REWARDIN
EXCELLENC
AND INNOV

SUBMIT **YOUR PROJECT!**

The European Association of Hospital Managers (EAHM) is proud to invite you to the *IT @ Networking Awards 2012*, a global healthcare IT and medical technology competition.

IT @ 2012 will recognise and promote outstanding healthcare IT and medical technology projects. 25 nominees from across Europe and beyond will compete in the *IT @ Networking Awards 2012* on January 18 – 19 2012. This high-level competition will see candidates go through two rounds of presentations in an effort to convince the expert audience and panel of judges why their solution deserves to win. If last year is anything to go by, attendees will not hold back in cross-examination of each presenter during the Q&A sessions before placing their vote for their favourite solutions.

ORGANISERS

ASSOCIATION EUROPÉENNE DES DIRECTEURS D'HÔPITAUX
EUROPÄISCHE VEREINIGUNG DER KRANKENHAUSDIREKTOREN
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WHY ATTEND THE IT @ NETWORKING AWARDS 2012?

This event will give you the possibility to expand your general and in-depth knowledge on IT solutions. Every presentation is strictly structured according to our presentation criteria.

G
CE
VATION

ITa NETWORKING AWARDS2011

18 – 19
JANUARY 2012
THÉÂTRE DU VAUDEVILLE
BRUSSELS

WINNING PROJECT GETS € 50,000;
A € 2,500 CASH PRIZE AND MEDIA PROMOTION WORTH € 47,500

Such criteria allows for a cross-departmental understanding of each solution.

Uniquely, *IT @ 2012* requires all presenters to talk about the key problems they have encountered in creation or implementation. By highlighting honestly the problems and obstacles encountered, they provide the audience with an excellent tool for advancing similar issues in their own institutions.

IT and medical technology is of key importance to hospital management, especially considering the current financial constraints and increasing pressure our healthcare systems are faced with. Intelligent IT solutions increase cost-effectiveness, productivity and safety.

HOW IT WORKS

IT @ 2012 is a two-day event comprising two rounds of presentations. During the first day, 25 projects will be showcased in a Mindbyte presentation. Mindbytes are short and straight to the point. In just five minutes, each presenter will highlight the main advantages of their project and convince the audience they want to know more. After each presentation you, the expert audience, and our panel of judges will place their votes. The top nine presentations make it through to the second day of competition where they are given the opportunity to present their projects in detail. This Workbench presentation has an allocated time of 30 minutes followed by 15 minutes of cross-examination.

WHAT SETS US APART

What differentiates *IT @ 2012* from other congresses? The main difference lies in the element of competition. Yes, *IT @2012* features presentations from across the world. But these are presentations with a difference, competitors are presenting to win; they have a completely different mindset. Each presenter will do the best to secure the top prize, to persuade the audience and judges that their solution deserves to win. The Q&A sessions also take on a new dimension with presenters having the opportunity to cross-examine their competitors.

HOW TO REGISTER

EAHM members are eligible for a reduced rate. For this special fee you can enjoy two days of informative presentations of fully implemented and running IT and medical technology projects. Moreover, you will have a say in who will win the trophy. Refreshments, lunch and evening entertainment are also included, giving ample opportunity for networking.

To register, please visit:
https://www.conftool.net/itawards2012/

LOCATION

IT @ 2012 will take place in the famous Theatre de Vaudeville, a most stimulating environment in the Gallerie de la Reine, the centre of Brussels.

Hotel reservations can be obtained through www.booking.com.

For more information please visit our website www.itandnetworking.org or contact us on +32/2/2868501 or send an email to office@hitm.eu

We look forward to seeing you in Brussels in January!

DENMARK

HEART SURGERY AND E-HEALTH SERVICE FOR CITIZENS OF DENMARK

Citizens logged in with their digital signature to their personal page on the Danish portal for citizens Borger.dk can now access their patient records and make use of a full range of health-related e-services.

The 'My Health Summary' service allows them to have an overview of their health information prescriptions, hospital stays, electronic health records, status of test results, organ donation and living wills. Citizens can also order new health cards or change General Practitioners (GPs) online. Through the Health and illness section, users can also obtain answers any questions they may have about the Danish healthcare system.

This is the result of collaboration between Borger.dk and Sundhed.dk, the national e-health portal. Jimmy Kevin Pedersen, Head of the National IT and Telecom Agency, Citizen Communications Office said: "Borger.dk offers everything in one place. This means that citizens can find information, use self-service solutions…"

The 'Physician choice' section is also expected to become popular; it combines information about the doctors to choose from and makes it possible to have a change of GP recorded.

SWEDEN

NATIONAL IT TOOL TO REDUCE PATIENT INJURIES

The national IT support for event analysis was launched in March 2011, to facilitate the analysis of events which lead to serious patient injuries occurring in healthcare. The idea is that by centralising these event analyses, resources can be pooled, enabling the development of more effective ways to prevent patient injury in the future.

The aim of the NITHA project is to develop an IT support system to facilitate and streamline the process of event analysis carried out when a patient in healthcare has been seriously injured. The computer-based tool is based on a standardised approach to common terminology and concepts, and supports the methodology of the manual risk and event analysis.

The NITHA project was commissioned by the Centre for eHealth in Sweden and the work has been led by project manager Eva-Lena Ahlberg from Östergötland County Council and Steering Committee Chairman Marion Lindh from Stockholm County Council. NITHA consists of an operational part to which only analysing leaders, experts and team members with a special login have access. The second part facilitates various searches and can be accessed without a login.

NORWAY

NORTHERN NORWAY MAKES STRIDES IN E-HEALTH

It has been nearly ten years since GPs in Northern Norway first integrated telemedicine, making it possible to send referrals and receive discharge summaries electronically. Over the next three years this will be expanded with nursing and care services in all municipalities located in the northern region communicating electronically with GPs and health authorities.

Electronic message exchange (EME) will become the de facto way of communicating in the health services. Traditional mail and the telephone will be replaced by electronic means: Referrals, discharge summaries, laboratory results, discharge notes, queries and replies, among others, will all be sent using a secure email system. The interaction reform scheduled to enter into force in January 2012 is increasing the pressure on local authorities to introduce EME.

The Norwegian Centre for Integrated Care and Telemedicine (NST) has been dealing with telemedicine and e-health issues via the FUNNKe project, and has faced particular challenges related to financing activities in the municipalities. Over the next three years, FUNNKe will provide municipalities throughout the northern region free access to expertise and support for anchoring and motivation within municipalities; startup knowledge; technical expertise in EME; EMR and training methods, and access to professional networks.

PORTUGAL

HEALTH 2.0 PROJECT LAUNCHES ONLINE SURVEY ON HEALTH INNOVATION IN PORTUGAL

The Portuguese General Directorate of Health has created the 'Health 2.0: Quality and Innovation in the National Health Service' project aimed at identifying the main requirements in health innovation.The project is in the form of an online survey that seeks to identify strategic priorities for innovation in the health sector.The survey is open to all users of the National Health Service or health units, as well as those who go through civil society organisations.

Participants are asked to express via multiple-choice answer menus their opinion on the following questions, among others:

- In your view, what is health innovation?
- What are the essential characteristics and criteria of health innovation?
- How important is health innovation for your area of activity?
- What are the needs and strategic priorities for the dissemination, identification, analysis and promotion of health innovation in your area of activity?

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on our health and life sciences solutions visit:

hds.com/healthcare

SCM Microsystems Wins Further Orders For Overall 10,000 German e-health Terminals

SCM Microsystems, a leading provider of solutions for secure access, secure identity and secure exchange recently announced that it has received its first orders for 10,000 e-health terminals to support the relaunch of the electronic health card programme in Germany.

SCM has begun shipping both its e-health200 desktop and e-health 500 mobile health card terminals for the programme, which involves the deployment of more than 80 million electronic health insurance cards to German citizens.

The German e-health card programme began in 2009, and after being suspended in 2010, was relaunched in April 2011. To encourage participation in the programme, the German health insurance industry is subsidising the purchase and installation of e-health terminals for doctors and other healthcare professionals who order the devices between April 1 and September 30, 2011. SCM's e-health readers are certified by the German healthcare oversight organisation (gematik) and the Federal Office for Information Security (BSI) as meeting the strict security and performance requirements of the e-health programme. "From the beginning, SCM has worked closely with the German security and healthcare industries to develop e-health terminals that address the needs of doctors, patients and all others affected by the rollout of the electronic health card in Germany," said Dr. Manfred Mueller, chief executive officer of SCM Microsystems. "Now that the e-health programme is finally underway, we are ready to deliver products with state-of-the-art, certified technology."

For more information, please visit:
www.scmmicro.com

CSC Enters into Agreement to Acquire iSOFT's Global Operations

In April, CSC announced it has signed an agreement to acquire all of the outstanding equity of iSOFT Group Limited, one of the world's largest providers of advanced healthcare IT solutions, by way of a court-approved scheme of arrangement. The acquisition will complement and strengthen CSC's market-leading software products and healthcare integration and services portfolio, while enhancing its healthcare research and development capabilities. It will also accelerate CSC's strategic growth plan in the life sciences market and reinforce the company as a very strong player in healthcare information technology.

Closing of the transaction is expected during CSC's Q2FY12, and is subject to various conditions, including, among others, iSOFT shareholder approval and certain Australian and EU regulatory approvals.

Adding iSOFT's 3,300 global employees including those from major research and development centres in India, Spain, UK, Australia, New Zealand and Central Europe, will expand CSC's capability to support existing customers and develop more innovative solutions.

"The combination of these companies will further establish CSC as an innovative leader in global healthcare IT," said Michael W. Laphen, CSC chairman, president and chief executive officer. "Through our combined experience in global healthcare delivery, complementary world-class healthcare software solutions, and enhanced capabilities in system integration, outsourcing and process management, we are forming a compelling lifecycle of services to better serve our global clients and improve patient care."

More than 13,000 healthcare providers and governments in 40 countries use iSOFT's e-health software solutions to manage patient information and drive improvements in their core processes. With the expertise and experience of more than 1,300 development professionals and more than 200 clinicians, iSOFT solutions touch more than 200 million patients across five continents every day, and its systems are installed in more than 8,000 hospitals and clinics. This scale has allowed iSOFT to keep abreast of the latest trends in healthcare technology and practices and translate them into innovative and practical solutions.

"iSOFT's Electronic Health Record software and services, coupled with CSC's global healthcare expertise and delivery capabilities, will create a very powerful force in the global healthcare market to enhance the provision of integrated care," said Andrea Fiumicelli, chief executive officer of iSOFT. "This is a great development for iSOFT's employees as they will have the opportunity to continue their important work in healthcare IT whilst developing their careers across CSC's global business."

Philips Installs FlexMove Option for Hybrid OR

Philips Healthcare has announced the opening of the world's first hybrid OR with new FlexMove – a ceiling-mounted option for the Allura Xper x-ray system, designed to optimise workflow in hybrid ORs – at the University Hospital Zürich (UniversitätsSpital Zürich, USZ), Switzerland.

A hybrid OR is the integration of a surgical operating room with an advanced x-ray imaging system. This enables cardiovascular surgeons as well as interventionalists, to perform the most advanced minimally invasive procedures. FlexMove allows healthcare personnel to:

- Move the x-ray imaging system laterally and longitudinally to perform a wide range of procedures whilst causing hardly any interference in the provision of anesthesia or to staff. FlexMove's full body coverage at both sides of the table supports complex hybrid and endovascular procedures without the need to pan the table.
- Position the x-ray system in lateral stand-by position for optimal access to the patient and move the system quickly in place when needed, or park it out of the way when not needed to create more room for other procedures.
- Work within the rigorous sterility parameters of the hybrid OR as the ceiling rails of FlexMove fit around a laminar air flow system. In addition, the FlexMove system does not touch the floor, which simplifies room layout and facilitates cleaning.

The launch of the FlexMove system coincides with the 50th anniversary of the University Hospital Zürich's Scientific Meeting – a celebration of fifty years of excellence in cardiac surgery.

For more information, please visit:
www.philips.com

JUNE 27TH – 30TH,
University of the West of England,
Bristol, UK

The 24th IEEE International Symposium on Computer-Based Medical Systems (CBMS 2011)

This conference will provide an international forum for discussing the latest developments in the field of computational medicine, biomedical informatics and related fields. There will be regular and special track sessions with technical contributions reviewed and selected by an international programme committee, as well as keynote talks and tutorials given by leading experts in their fields.

The symposium is the premier conference for computational medicine, providing a mechanism for the exchange of ideas and technologies between academics and industrial scientists, and attracts a worldwide audience.

Regular and special track presentations will cover a broad range of issues in (but not limited to) the following areas:

- Software Systems in Medicine
- Computer-Aided Diagnosis
- Knowledge Discovery & Data Mining
- Knowledge-Based Systems and Techniques
- Decision Support Systems
- Medical Devices with Embedded Computers
- Signal and Image Processing in Medicine
- Medical Image Segmentation & Compression
- Machine Vision in Medicine
- Medical Robotics
- Network and Telemedicine Systems
- Medical Databases & Information Systems
- Web-Based Delivery of Medical Information
- Multimedia Biomedical Databases
- Content Analysis of Biomedical Image Data
- Handheld Computing Applications in Medicine
- Bioinformatics in Medicine
- Pervasive Health Systems and Services
- e-health

Special Tracks

The following special tracks have been organised:

- Computational Proteomics and Genomics
- Knowledge Discovery and Decision Systems in Biomedicine
- Technology Enhanced Learning in Medical Education
- Intelligent Patient Management
- Data Streams in Healthcare
- Supporting Collaboration in Healthcare
- Biomedical Image Processing and Informatics
- Medical Robotics
- Assistive Technologies
- Ontologies for Biomedical Systems

Workshops

Workshops will be held on a range of topics, including:

- Health Level Seven (HL7) and Related Standards
- Machine Vision in Medicine
- Ontologies in Biomedical Informatics

For more information, please visit:
www.cbms2011.org

DECEMBER 11 – 13TH,
ABU DHABI, UAE

The 2nd Annual World Health Care Congress Middle East (WHCC ME)

This is a global event in which over 600 healthcare, government and corporate leaders from over 25 countries come together to define objectives and frame solutions to the challenges of healthcare reform, cost, quality and delivery.

The 2011 WHCC ME Congress will feature the top thought leaders and industry influencers including health ministers, leading government officials, hospital directors, health system and hospital providers, chief financial leaders, IT innovators, decision makers from public and private insurance funds, investment and venture capital principals, pharmaceutical and biotech executives, and healthcare industry suppliers.

The WHCC ME agenda will feature debates, case studies and best practices from all industry sectors to identify innovative strategies to improve the overall delivery of healthcare. This unparalleled networking event puts together senior executives to meet and strategise on the crucial steps necessary to adapt their health systems to operate more efficiently to decrease the cost of care, enhance the delivery of service and improve the patient experience.

New in 2011

Key Topics and Markets Include:

- What Innovation Means to Healthcare
- Emerging Technologies for Patient Decision Making
- Patient Safety Innovation and Improvement
- Hospital/Health System CEO Debate on Global Healthcare Models
- Transfer of Healthcare Knowledge and Best Practices
- Achieving Healthcare Greatness
- Future Pharmaceutical Business Models
- Healthcare IT from Transaction to Communication
- How Provider Systems and Technology Companies are Responding to the Implementation of Electronic Health Records (EHR) systems
- Building Strategic Public Private Partnerships

For more information, please visit:
www.worldcongress.com

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STRONG RESEARCH AND INNOVATION FUELS ECONOMIC GROWTH IN EU

Providing easier access to funding is key for intensifying research and innovation in Europe, and in turn helps bolster participation, boosts value for money and makes a bigger impact on both the scientific and economic spheres. The European Commission on February 9 began a consultation on ways to revamp the EU's research funding schemes and to ensure a solid future for European research and innovation. Officials have proposed the 'Common Strategic Framework' that is set out in a Green Paper.

Two key frameworks are covered: the current Framework Programme for Research (FP7) and the Competitiveness and Innovation Framework Programme (CIP) as well as the European Institute of Innovation and Technology (EIT), which is designed to link up the three sides of the 'knowledge triangle', namely research, education and innovation. This framework targets three crucial objectives: Ensuring that the EU maintains a strong foothold on the scientific research world; that competitiveness increases; and that global challenges, including food security, resource efficiency and climate change, are resolved. The EU is mulling over various ways of making accessing EU funding much less troublesome for interested parties, including offering a single 'hub' for researchers who need advice, and providing a single entry point with common IT (information technology) tools. A simpler and more streamlined set of funding instruments covering the entire innovative chain is expected to materialise. Included in this chain are basic and applied researches, as well as partnerships between academia and industry and firm-level innovation.

Moreover, the framework places particular emphasis on making things more flexible, thus encouraging diversity and participation of business people. For example, the Commission believes applicants should be given the opportunity to apply for various projects without having to repeat information they have already submitted. Also under consideration is the use of lump sum payments in future funding to ensure complexity-free yet consistent accounting procedures for the funds obtained.

The European Commission hopes that overhauling the system will help the EU and citizens meet the goals of the European 2020 Strategy. The Commission is due to present by December a legislative proposal for research and innovation spending under the future EU budget after 2013.

Latest data show that more than 9,000 projects have been funded under FP7, and a study has estimated that projects selected for funding just in this year will result in 165,000 new jobs.

For more information, please visit:
Consultation on Green Paper:
http://ec.europa.eu/research/csfri/index_en.cfm
Innovation Union:
http://ec.europa.eu/research/innovation-union/index_en.cfm
European 2020 Strategy:
http://ec.europa.eu/europe2020/index_en.htm
Research & Innovation in FP7:
http://ec.europa.eu/research/fp7/index_en.cfm

COMMISSIONER DALI BELIEVES INNOVATION IS KEY FOR THE HOSPITALS OF TOMORROW

John Dalli, European Commissioner for Health and Consumer Policy spoke recently at a dinner debate hosted by COCIR, the European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry and HOPE, the European Hospital and Healthcare Federation.

The theme of the evening was "Hospitals of Tomorrow" and the discussion centred on how to develop efficient and sustainable hospitals in the future. Addressing the invitees, Dalli emphasised the current healthcare conundrum of the need for cost-effectiveness at a time when more health ser-

vices are needed with limited means. He believes that "rather than spending more, we need to spend better" and use innovative solutions to "deliver better healthcare, to more people, in a more efficient manner in the long term".

Innovation should come from how hospitals are designed, organised and managed. For the Commissioner, coordination is of upmost importance, whether this is the coordination of staff within hospitals or coordination with primary and tertiary care establishments.

Health technology is a key area where Dalli believes hospitals can become more efficient and he celebrates the fact that progress is being made with electronic health records and e-prescribing. However, he expressed concern over the limited use of telemedicine in European hospitals, "very few European Hospitals – not more than eight percent – exploit the potential of telemedicine and telemonitoring". The use of telemedicine can allow hospitals to pool vital resources and go some way into solving the escalating problem of staff shortages.

For Commissioner Dalli the time has come to "unlock the potential" of health technology and develop "intelligent hospitals". Intelligent hospitals are those where patients have access to their own medical data; where doctors and nurses can access medical data and work closely with colleagues and patients regardless of their location; and hospitals that use telemedicine to provide home care or connect to other hospitals.

But how do we create intelligent, innovative hospitals? Dalli recognises that although important, political will is not sufficient. Smart investments are also needed. He discussed the merits of public-private partnerships as innovative financing solutions and stressed that investment is not just a cost but also an investment in the future by investing in people's health today. He encouraged the use of EU structural funds in the reform of national health systems and recognised that there is no "one-size-fits-all" approach but that investments should respond to both national and local needs.

Full speech available at:
http://ec/europa.eu/dgs/health_consumer/dyna/dalli/speeches_en.cfm

E-HEALTH MOVES AHEAD IN EUROPE: REPORTS ON E-HEALTH STRATEGIES AND IMPLEMENTATIONS IN 30 COUNTRIES IN EUROPE AVAILABLE

Since the publication of the European Commission's (EC) e-health Action Plan in 2004, e-health has gained significant momentum across Europe. "European countries on their journey towards national e-health infrastructures - evidence of progress and recommendations for cooperative actions" is the title of a just released synthesis report on e-health in Europe. The EC sponsored e-health Strategies study has pre-published an online version of this report, which is available at the study website.

In addition, more than 30 individual reports detailing policy actions and deployment of e-health applications in Member States and other European countries are available there as well.

The summary report traces European countries' progress along the goals set out in the e-health Action Plan. It focuses on the core applications of EHR-like/patient summary and e-prescription systems. It also analyses governance, structural and legal issues as well as policy lifecycle aspects.

Study results show that in virtually all European countries surveyed, political as well as stakeholder interest in e-health policies, and the planning and implementation of national or regional infrastructures, has strengthened considerably. This concerns not so much the number of new priority objectives identified, infrastructure elements tackled or pilots run, but rather the overall level of awareness, activities and concrete undertakings. EC as well as Member State initiated activities and co-operations like epSOS or the e-health Governance Initiative have both significantly contributed to this state of affairs and are witness thereof.

As Peteris Zilgalvis, Head of the EC's ICT for Health Unit commented, "Europe is experiencing a strong political momentum to advance e-health solutions for the benefit of both its citizens and health systems. The recommendations for further actions submitted in this study are based on a thorough analysis of e-health strategies and implementation activities in European countries as well as the results of a validation workshop in September 2010 in Brussels. ... Now the challenge is to cooperatively address the issues identified."

Empirica Communication and Technology Research, with more than 20 years of experience in research on e-health and telemedicine topics, coordinated the study. The Finnish partner institute THL (National Institute for Health and Welfare), legal specialists from the law firm Time.lex and Professor Denis Protti (University of Victoria, Canada), contributed domain expertise. The study's communication efforts and final validation workshop were supported by the communication agency EMC Consulting Group.

A host of experts as well as reviewers from the i2010 Subgroup on e-health contributed their intimate knowledge of the e-health situation in their respective countries and validated the content of the country reports. This comprehensive collection of country information constitutes a unique resource and important database of up to date evidence on e-health progress across Europe, which updates and complements the results of the earlier e-health ERA study of 2007.

For more information, please visit:
www.e-health-strategies.eu

WORLD HEALTH PARTNERS: USING TECHNOLOGY ADVANCES to Deliver Health Services on Scale to Rural Clients Anywhere

1st

AUTHOR
Prachi Shukla
World Health Partners

A crucial challenge facing the development sector is the inability of communities living in rural and hinterland areas, which often account for 75 percent of the population in developing countries, to access vital health and reproductive health services. For over 60 years, the focus was on strengthening the public sector for this responsibility. In countries where this has worked – Iran, Cuba, Vietnam to name a few – the results were immediate and effective. Even in India, states like Himachal Pradesh, Goa, and Tamil Nadu have used the public sector effectively.

There are, however, many other areas where the public sector has not been successful. In India, states such as Bihar and Uttar Pradesh (UP) are prime examples – services and technologies which are more than two generations old do not reach the rural poor in these states. Immunisation coverage in UP, for example, is less than 30 percent even though other parts of the country benefited from these vaccines 30 years ago.

In 2008, World Health Partners (WHP) was founded to harness the growing dynamism and energy around entrepreneurship in our globalised world to provide health and family planning goods and services to the poor. Grounded in basic economic principles, WHP drew on private-sector capacity through social franchising, innovations in management of labour and low-cost technologies to develop a scalable and sustainable health service delivery model to bring the benefits of modern health and reproductive healthcare to those most in need.

Calibrated Resources Within an Operational Framework

The operational strategy of WHP divides skills, resources and competencies on the basis of location, and interconnects them to either provide care or facilitate care by a sister network provider. Both provision and facilitation entitle the provider to an income which ensures the sustainability of operations. Services delivered cover a whole range- curative care, which is favoured by private providers, gives financial viability and serves as the main commercial anchor- but the provision of a minimum level of preventive care provision is a non-negotiable part of the service package. The WHP

Figure 1. Rural providers receiving their training

model draws its lessons from Janani which organised skilled and semi-skilled providers into an operational framework for delivering family planning care. (Janani currently accounts for 20 percent of family planning across Bihar).

Female members drawn from the families of makeshift pharmacies, rural health practitioners or informal paramedics are the resource pool despite their educational qualifications often being far below par. However, they are effective managers and exhibit innate business and social skills which produce quick response from the community; training provided to these informal providers enhances their knowledge in technology and healthcare provision.

Local communities are mobilised through advocacy-building and other social mobilisation measures, word-of-mouth publicity, a responsible mix of mass-media and infotainment, and the social marketing of user-friendly health services.

The operational strategy of WHP divides skills, resources and competencies on the basis of location, and interconnects them to either provide care or facilitate care by a sister network provider.

Bundling of Preventative and Curative Services

Part of WHP's strategy is to bundle traditionally separate preventative and curative services and ensure both are provided at its centres. While most rural clinics earn profits from curative services and by referring more serious cases to high levels of care, WHP structures its network in a way that incentivises the incorporation of preventive services. The provision of curative services allows the rural provider to ensure a basis of profit. As a quid pro quo, however, a predetermined volume of preventive care has to be delivered if the providers want to continue in the networks.

Local communities are mobilised through advocacy-building and other social mobilisation measures, word-of-mouth publicity, a responsible mix of mass-media and infotainment, and the social marketing of user-friendly health services. This unique and innovative model is not only designed to serve those in need but also offers business opportunities to WHP's partners and stakeholders.

Uttar Pradesh Pilot Project

In late 2008, WHP launched a pilot project to provide services to over 1,000 villages in three underserved districts of Uttar Pradesh (UP), home to an estimated 3.6 million people, of whom more than three million live in rural villages.

The WHP provider network in UP included 1,100 rural providers linked to 102 telemedicine centres, 14 urban medical clinics and nine pathology labs (see figure 3, p.16). The telemedicine centres, branded Sky Health Centres, connect with general practitioners at a central facility through a closed telecommunication system called ReMeDi, developed by Neurosynaptic Communications (www.neurosynaptic.com). This comprehensive system allows doctors to examine patients visually, to perform sophisticated diagnostic tests, and to provide therapeutic recommendations. ReMeDi has been specifically designed for rural settings, keeping in mind problems posed by unreliable power supply and inaccessibility, on the one hand, and the need for durability and ease of use on the other hand. Many of the applications have also been customised specially for WHP to suit the service delivery network.

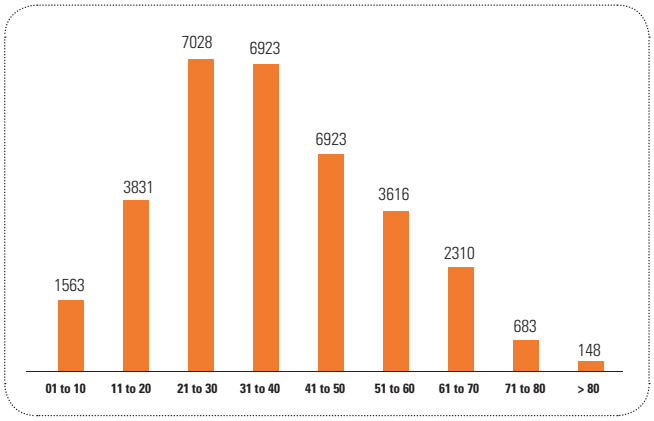


Figure 2. Clients age-wise

A supply chain that makes products, including medicines and contraceptives, available across the project area caters to all providers aside from 1,800 pharmacies. A nurse-midwife from the public sector also visits the rural centres once a month to provide paramedical contraceptive services (such as IUDs and DMPA) and, in tele-consultation with the doctors, gynaecological services.

A strong advertising campaign promotes the network provider and services. Clients are informed about quality benchmarks which force the providers to adhere to quality norms. While the project currently caters to the section immediately above the poverty line, the same infrastructure will be used to deliver services to the below poverty line sections. Financial instruments, including coupons, insurance and vouchers, with accreditation and validation processes on a biometric platform, will be integrated.

Impact

The WHP programme in Uttar Pradesh achieved instant and dramatic results. Within six months of its launch, the project started delivering family planning results which were a third of what the public sector provides in the project districts. The impact is equally high for healthcare delivery which is primarily to women and children (over 57 percent of healthcare clientele are women) and people of reproductive age. By providing preventive care such as family planning, antenatal care or immunisation with adjacent aspects of curative care, the impact is up to seven times the famous Janani

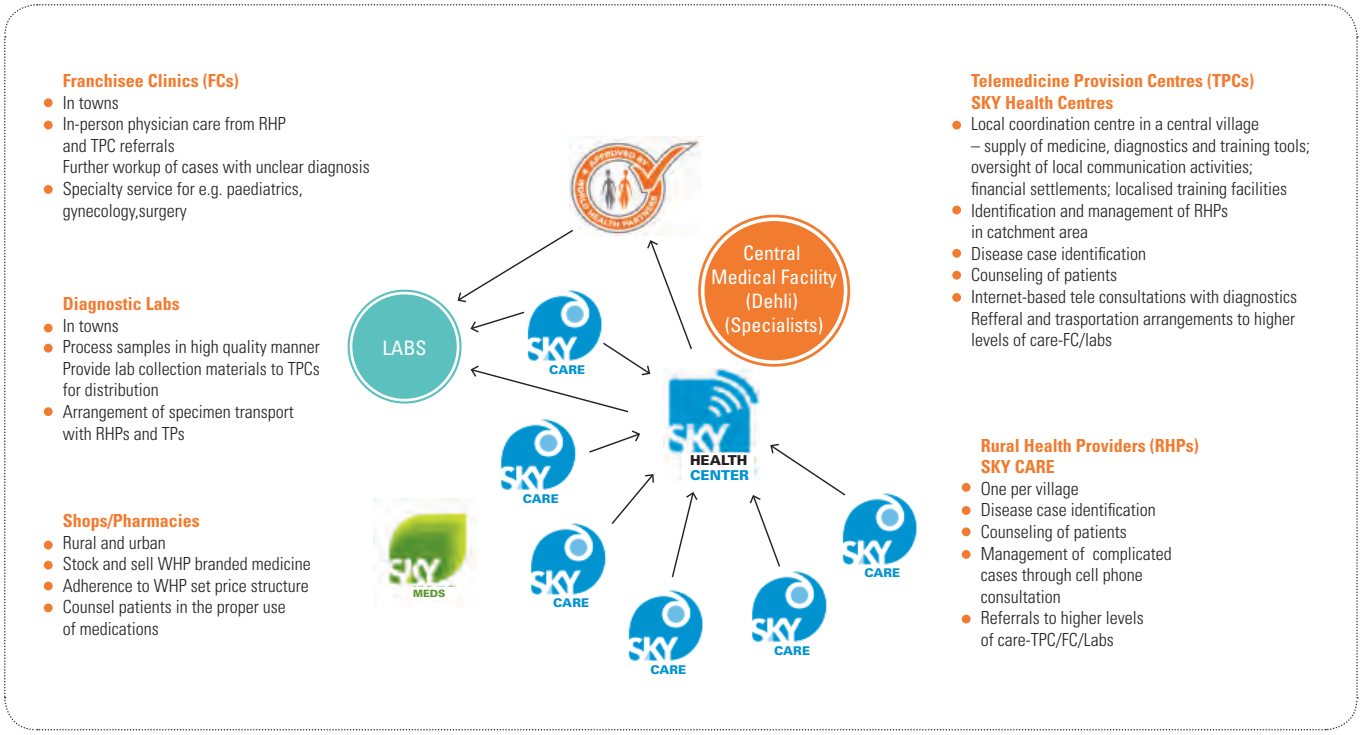


Figure 3: The WHP provider network in UP

programme in Bihar which the team members were administering before joining WHP.

Since inception, the project has provided over 31,000 tele-consultations with qualified physicians to villagers, in addition to 188,401 couple years of protection (CYP) through the project's family planning services, averting an estimated 107,650 unwanted pregnancies. This increased couple protection by 37 percent, from 28 to 38.3.

Moving Forward: Targeting the Poorest of the Poor, Expansion to Bihar and Incorporation of More Innovative Technologies

The current project structure provides care to clients who can pay; prices are kept low through high volumes and donor subsidies. The project will work towards the use of coupons, vouchers, insurance, and tap into government subsidies to deliver care to poor families living below the poverty line. WHP is also currently developing a telephone hotline as another avenue to increase clients' access to the WHP network while simultaneously giving providers in the network a way to reach out to the target population.

WHP sees its prime function as an integrator of a variety of skills and technologies available in various parts of the world. The project has benefited significantly through partnerships which are set up for long-term rather than on turnkey basis. Besides Neurosynaptic Communications (telemedicine), the project also partners with iWeb (financial and data warehousing systems), University of Berkeley, California (microscopy), University of Colorado (rural lighting), Intel (low energy laptops) and many others to help deliver quality health services to the rural poor. Additional point of care diagnostic devices currently in exploration includes the oximeter, otoscope, dermascope and ultrasound.

WHP has just began its expansion to Bihar, India, the third most populous state in India. Fifty-five percent of these 100 million people live below the poverty line and 85 percent live in rural communities. The project will focus on leveraging the WHP service delivery model to improving disease management of several infectious diseases: tuberculosis, visceral leishmaniasis, diarrhea and pneumonia. In addition to internet-based telemedicine, the project will also incorporate the use of mobile phones for collecting patient information, disseminating health information, streamlining financial transactions, and monitoring providers and patients.

Conclusion

The WHP model is designed to be implemented on a large scale, and to deliver a wide range of services. This approach not only allows us to reach a greater population and have a greater impact, but also leverages the economies of scale to increase bargaining power and to reduce costs. The model is designed not only to serve those in need but also to offer business opportunities to all partners and stakeholders, creating viability for providers in the network - a key to building sustainability. WHP has made enormous strides in remote rural healthcare provision over the past two years. With the integration of mHealth, mPayments and low cost point of care diagnostics, along with replication of the model in Bihar, the WHP model is moving closer towards becoming an efficient and powerful model for serving the rural poor in other parts of the world.

THE CLINICAL WORKSTATION: *A GPS for the Medical User*

2nd

Prof. Rudi Van de Velde
UZ Brussel
Belgium

UZ Brussel is the teaching hospital of the Free University of Brussels. With more than 3,200 staff and over 750 beds, it is now one of the larger hospitals in Belgium. The hospital admits more than 32,000 inpatients a year, receives over 300,000 visits to the outpatient clinic, and 155,000 in the emergency department. UZ Brussel is using an in-house developed clinical workstation (CWS).

Benefits for the Healthcare User

Most hospital systems have traditionally been "silo-based", expensive to maintain and inflexible. In contrast, all patient and hospital related information and processes are streamlined and integrated into one single clinical holistic system improving the quality of data. The focus of our approach was: Uniformity for the healthcare user by re-use hence minimising training, optimising navigation by avoiding the user having to spend a disproportionate amount of time switching from one application to another.

Originality

It was apparent, as the healthcare environment will become even more complex and more difficult to run, that a new state-of-the-art system was needed. We decided to move from a client server to a component-based, multi-tier J2EE architecture providing a clean separation between business and presentation logic. The application server embeds in the back-end the complex business logic of the medical environment. The CWS provides real-time holistic insight through five healthcare related core components:

1. Patient Identification: Used to issue and manage each patient's identification and location data.

2. Patient Activities: This manages the collaborative activity between different groups in the hospital and includes all kind of orders and prescriptions. It is one of the most important components to achieve integration within the patient's healthcare process. This component reflects and supports the medical organisation as a whole. The act component together with the workflow component governs the workflow (and information) between various healthcare actors based on output of the scheduling engine (as part of the resource component). The act component is the basis for CPOE (Computerised Physician Order Entry). The most important long-term benefit of CPOE results from the integration of clinical decision support systems into the order-entry process coupled with a hospital-wide resource scheduling system and with the EMR (Electronic Medical Record), so that orders can be tracked as part of a patient's EMR. The impact of clinical evidence on clinical practice by means of the creation of clinical protocols represents a major technical challenge and a promising opportunity in the field of medical informatics. Therefore the act component is an important fundament. Protocols are extensively used in the hospital's radiotherapy department of nowadays integrated with the CPOE and scheduling system.

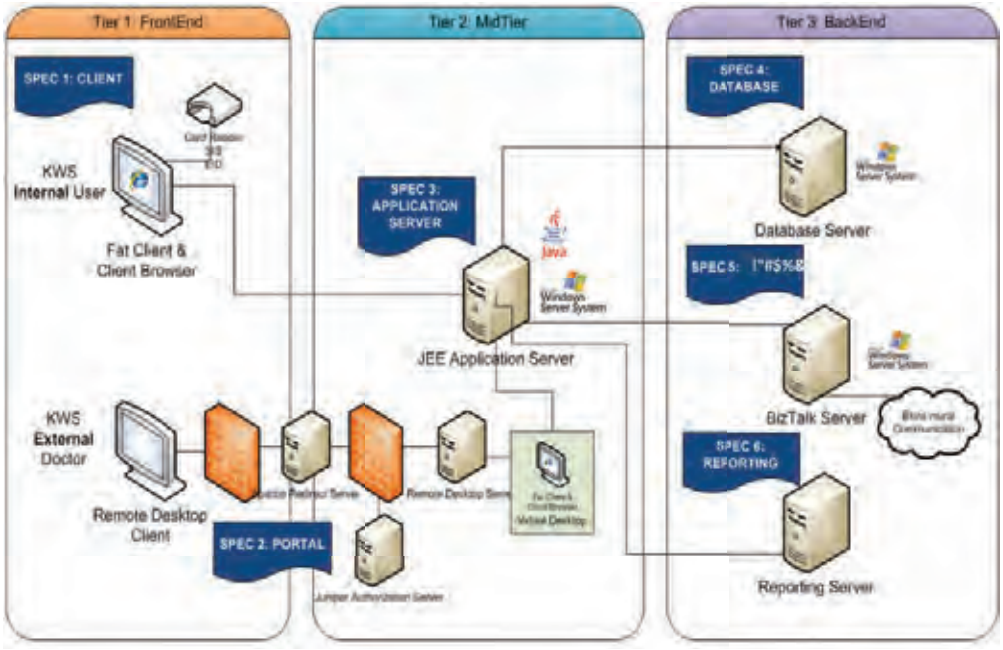


Figure 1: The layered IT architecture

3. Medical Record: A deletion-less central repository contains multimedia medical patient data (e.g. still images, video, alphanumerical data…) and incorporates all medical images collated from the various departments, including digitised scans, biopsies, and ultrasounds. These can be viewed in a clustered, aggregated environment, dependent upon the patient's needs. Data is gathered from various departmental/satellite feeder systems. Each year, the available medical data in the hospital ex-

plodes. Currently, UZ Brussels sits on 1.5 petabytes of data, with a yearly increase of 150 terabytes. The medical server provides tools for clustering and presenting medical data, aggregated in different structures according to user needs.

4. Scheduling: One of the main distinguishing features of the CWS is that the broad application of CPOE is integrated with a sophisticated appointment planning and activity scheduling system. This system is deployed hospital-wide, without loss of continuity across services and departments. This system also includes a care programme scheduling facility to execute and manage the planning of an ordered sequence of clinical activities that make up such a programme. It takes into account the set of temporal and physical constraints between the activities defined in the programme and merges those with the agenda preferences of the patient. Incremental versions of this system have been operational for more than 10 years now.

For example, the radiotherapy and oncology departments manage the complexity of cancer treatments using 300 different care programmes. The goal of this development was to extend this powerful automated care programme scheduling with an ICT infrastructure supporting clinical pathways (CP) while maintaining a tight integration within the hospital-based EPR system. This application supports the hospital's scheduling and appointment planning activities and includes OR management as well.

5. Knowledge Component: This can be regarded as a repository of business rules for concepts or acts and forms the underlying basis for medical decision support systems. As part of this ser

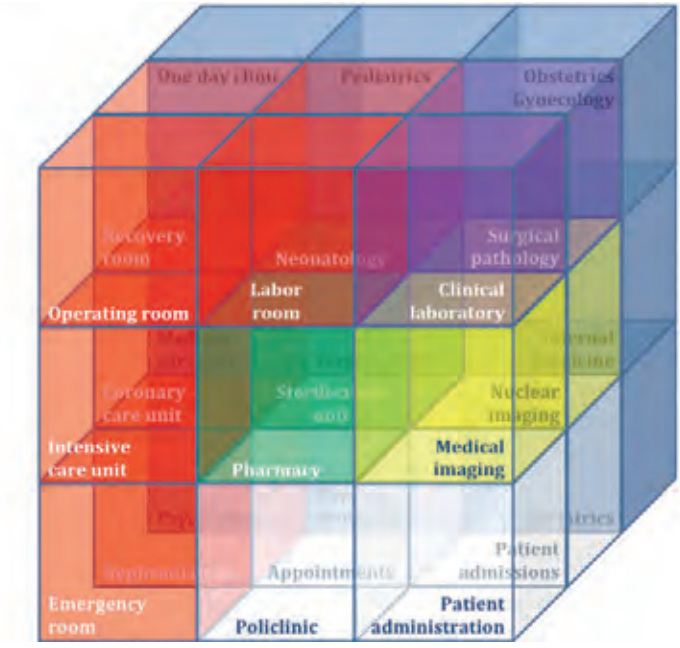


Figure 3: Components of the UZ Brussel Clinical Workstation

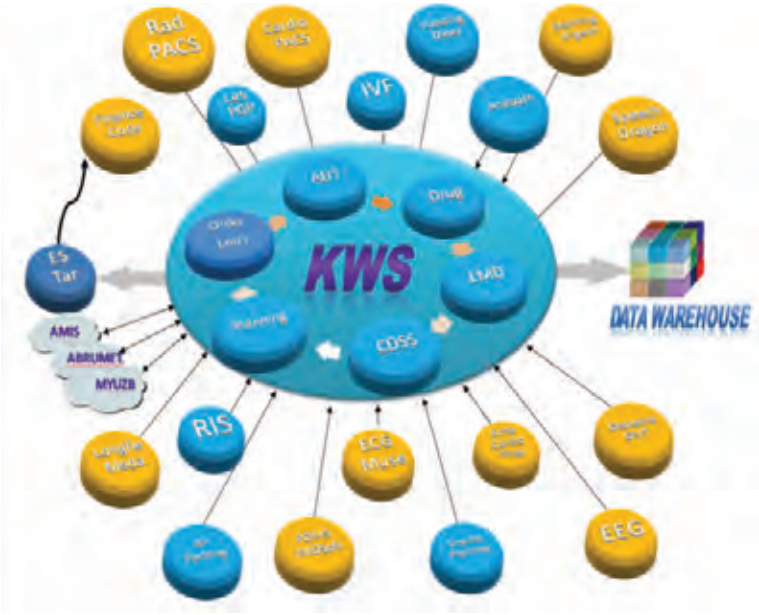


Figure 2: Anatomy of the UZ Brussel Clinical Workstation (CWS

vice we have developed a terminology server with already more than 40,000 medical concepts that bring structure to the data.

Examples:

- Does a drug interfere with other drugs?
- Is this act compatible with the patient's sex, age or condition?
- Are staff, equipment, etc. available to perform this act?
- Scheduling an act without fulfilling medical preconditions.
- Ordering tests that have already been ordered.
- Patient authorisation: Provides a unified system to manage secure access rights of individuals according to the hospital's, legal, medical, and organisational requirements.

Success

Physicians use the CWS for almost all their activities, including order entry, scheduling (radiology, pathology, surgical and other activities), reporting, medication, and admission. Physicians have a complete picture of the patient's medical history at their fingertips. We seamlessly integrate hospital applications, re-use many components, and effectively manage change more efficiently. On a daily basis physicians and nurses access patient records 25,000 times a day, schedule 4,000 appointments, capture >5,000 medical reports, process over 9,500 medical orders. 90 percent of interactions are completed in less than one second.

E-Health

This architecture paves the way for the future. Extended relationships means that GPs and patients effectively become part of the hospital network by a secure GP portal providing referral physicians access to their patients' records. They are able to follow the course of each patient's health status. A patient portal provides secure access to self-administer their profile, request appointments, and provide feedback.

The Value of the Enterprise Master Person Index (EMPI) in eHealth

Introduction

eHealth offers a potent means for health systems to tackle the growing challenges of managing increasing chronic disease and ageing populations with a limited number of healthcare resources. To achieve its potential, eHealth must facilitate the secure movement of patient data out of system silos and transform it into intelligence for improved patient administration and enablement of patient-centred, coordinated care.

An enterprise master person index (EMPI) can do much to help. The EMPI easily integrates with existing systems to provide a real-time way to locate, identify, match and cleanse information about a person from many sources to create a comprehensive view for authorised health service providers.

It is proven to reduce duplicate records within and across systems to facilitate trusted data exchange and protect patient privacy, resulting in improved patient administration and care delivery.

The IBM® Initiate® Patient EMPI has been proven in public and private healthcare organisations to help address the social, technical and economic issues that impact delivery of critical eHealth initiatives.

Overview

The Social Challenge: Protecting Patient Privacy

The most important issues that must be addressed for patient privacy include what type of information will be shared and with whom. For example, mental health records, certain test results or children's health records can be very sensitive and should only be shared with individuals during specific episodes of care.

The EMPI supports applications with a role based virtual patient record. For example, an EHR for a primary care physician may require only a view of a patient's demographic history whereas a Health Information System for an admissions or registration clerk may have access to a view of demographic information and health plan status.

The Technical Challenge: Managing Data Quality and Accurately Identifying the Patient

Two additional concerns that go hand in hand include, creating and maintaining a high data quality foundation and accurately identifying the patient at the point of care. The EMPI reconciles patient identities within and across systems to improve quality and reduce duplicate records. It can work independently in the eHealth architecture or augment the function of a national health identifier to associate the right records to the right patient.

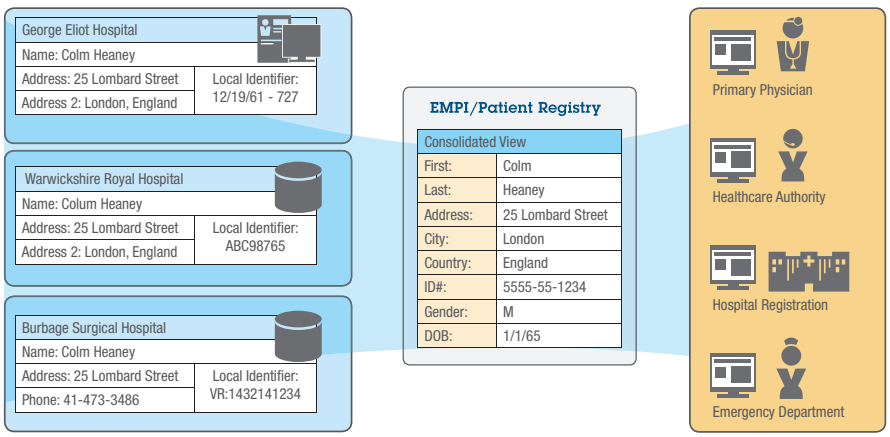
The Economic Challenge: Building the right architecture

There are many political and socio-economic roadblocks to building national, regional or private eHealth architectures, and each project has unique business objectives and expected return on investment. Many projects including ACT Health in Australia and all ten provinces in Canada rely on some form of EMPI or patient registry in conjunction with a national or provincial identifier to create a trusted and complete view of the patient for the electronic health record (EHR) or patient administration application.

Conclusion

To successfully build an eHealth architecture many social, technical and economic roadblocks must be overcome. The IBM Initiate Patient EMPI can do much to help. Because of its flexibility to integrate with existing systems and sophistication to match and link records using multiple data attributes, IBM Initiate Patient helps deliver three essentials to advance eHealth including protecting patient privacy, ensuring high data quality on the network and accurately identifying the patient at the point of registration or point of care.

To read more, visit EMPI in eHealth to access the complete paper, or contact pschlyer@us.ibm.com for more information.



An EMPI establishes linkages across disparate systems to create a single view of the patient. This helps identify the patient at the point of registration and ultimately facilitates information sharing for EHR and portal applications.

FROM MICRO- TOWARDS MACRO- MOBILITY –

Building Efficient Clinical Processes by Using a Hospital-Wide, Standardised and Near-Patient Communication Platform

3rd

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One of the main problems in the operation of complex hospital information systems (HIS) is a lack of functionality for the deep integration of administrative and clinical patient data, documents, reports, which are generated and stored in a variety of different software modules or specific clinical applications. These proprietary systems often use their own data models and storage routines. The customers are so dependent on these systems, that the systems are established over a long time. Thus, the implementation of hospital-wide electronic health records that allow a patient-centric view of all relevant administrative and clinical data is becoming more difficult.

The excerpt describes a project from the ENTSCHEIDERFABRIK* as a best practice approach with conditions for the following tasks: For two hospitas, solutions were designed implementing the IHE-MDES, TianiSPIRIT EHR. Each involved different system environments and had successful operation.

- Content migration and consolidation of proprietary clinical databases.
- Design of a hospital-wide Master Patient Index (MPI) including its benefits
- Implementation and usage of a standardised and IHE-based repository for patient and clinical data as a basis for consolidated systems and portal solutions.
- Usage of unique object identifiers (OIDs) for all administrative and clinical patient data.

Challenges and Tasks

At one of the workgroups at Summer-Camp 2010 the related topics below were developed for both hospitals (Fig. 1) and prioritised. The particular challenges in the two hospitals were:

- The consolidation of active and heterogeneous data resources; and
- The integration and usage of different technical and non-uniform system platforms.

There was also a major focus on functional and technical interoperability with the HIS. A question that came up with respect to consolidation was:

- "Could we get approval for the shutdown of the previously

Figure 1: Specific problems at the Hospital of Stuttgart and the University of Essen

*Initiative of German Decision maker Asso.s in Healthcare

		UH-E	HS
1	Delivering of an User-Interface (UI) with the following features:	X	X
1.1	- patient centric (History)	X	X
1.2	- case centric (DRG) clinical	X	X
1.3	- appropriate for clinical users	X	X
1.4	- possibilities to integrate the UI in the leading system, e.g. HIS or clinical wide Portal	X	X
1.5	- Google Functions for full text research	X	X
2	Transformation of old data in an IHE conform structure (IHE-Repository) Migration of old data and data-presentation out of the IHE-Repository with the above described UI / clinical wide portal	X	X
3	Delivering of the MPI Functionality	X	X
3.1	- Organisation – internal	-	X
3.2	- Organisation – external	X	X
4	Build-up an EHR	X	X
5	Compliance with data security regulatory by law	X	X
6	Delivering an intelligent image management system with respect to clinical content	-	X
7	Qualitative benefits	X	X

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active and proprietary legacy systems?"
- The implementation was done using the "Proof of Concept". project type

Pilot Projects for Implementation at the Hospital of Stuttgart and the University Hospital of Essen

Hospital of Stuttgart

The main aims were:
- The consolidation of three proprietary radiological (legacy) information systems (RIS) by a technical integration of different system platforms.
- The subsequent establishment of a retrieval based integration, both for radiological data in the HIS, as well as in the new central RIS.

To solve these challenges the hospital of Stuttgart implemented the IHE-MDES, TianiSPIRIT EHR.

The administrative and clinical data of 180,000 patients were migrated out of the old proprietary systems into the IHE-MDES, TianiSPIRIT EHR. All of the combined radiological data / findings were included. In addition a web front end for retrieval tasks is provided by the TianiSPIRIT EHR. In parallel the MPI for all administrative and clinical patient data was customised based on the IHE-Profiles PIX (Patient Identifier Cross Referencing) and PDQ (Patient Demographics Query).

University Hospital of Essen

In Essen, the university hospital has concentrated successfully for many years on three specific priorities in research, teaching and patient care: Cardiovascular, oncology and transplantation. For example, in July 2010 the hospital established a new subsidiary, with the Western German Heart Centre-thus expanding its capacity in cardiac surgery significantly. Since 2008, the visceral centre is the leader in the European transplant area. Oncology will also be strengthened with the construction of the Western German Proton Therapy Centre. With the establishment of the Centre for Terminal Heart- and Lung Diseases in 2009 and the Ruhrland Hospital 100 percent owned subsidiary it also built up a strategic business segment for all the seriously ill patients who often cannot be treated in other hospitals.

The aims of the central IT department of the University Hospital of Essen are:
- To gather all administrative and clinical data that arise during the patient treatment within the different clinics; and
- To provide administrative and clinical data to all the involved clinics / health professionals in a structured way with a common user interface, independent from the primary clinical systems.

The basis and first choice is a neutral portal, independent from the HIS. Standards like IHE are helpful for implementation. an overall MPI is needed.

The first goal was to make all required patient information available for all health professionals (users) in the University Hospital of Essen and the Ruhrland Hospital in one system – EHR (Project Type: Proof of Concept).

Results and Potential Benefits

Hospital of Stuttgart

The proof of concept to consolidate the RIS in the TianiSPIRIT EHR in late September was successfully completed in 2010. The following results and benefits were achieved:

Reduction of required IT resources for legacy systems, such as:
- Licenses;
- Infrastructure;
- Maintenance (care), and
- Staff and know-how.

With the TianiSPIRIT EHR users were provided with multidisciplinary access to clinical data out of the leading systems.

University Hospital of Essen

The design of the TianiSPIRT EHR, a portal solution between the University Hospital of Essen and the Ruhrland Hospital, began in October 2010. The following results and benefits are to be expected:
- A case-related and lifelong clinical centric view on each patient's EHR;
- Fast and convenient connection to external partners through the cross enterprise EHR (ceEHR)
- Ability to design standardised clinical pathways within the ceEHR;
- Benefits for health professionals by using this IT tool EHR by delivering the net new functionality "uniform view on clinical pathways and research aspects", and
- By using the EHR the restrictions of different IT systems and landscapes (internal HIS and RIS, external HIS and RIS, etc.) disappear.

Conclusion

At the end of this ENTSCHEIDERFABRIK it can be said that in the proof of concepts, the previous objectives were achieved and that the hospital management and the health professionals are satisfied with the IHE MDES, TianiSPIRIT EHR:
- Creation of a IHE conform centralised clinical archive by using the IHE-MDES, TianiSPIRIT HER;
- Former proprietary and duplicate-prone administrative and clinical data out of legacy systems are now available IHE conform and MPI sorted (unique);
- By having IHE conformed data, and
- A new kind of vendor independency is reached. The hospitals became independent from proprietary data bases, data, releases and versions (for HIS and portal solutions), the executive management / CIO achieved future and investment security out of this IT project.

User friendly portal functions are largely feasible:
- The solution design of the so called hospital enterprise bus (HEB), is open for the technical integration of further systems;
- Compliance with (inter)national projects and scenarios is realised (eFA, EGA, ePSOS, etc.), and
- The implementation of the IHE-MDES, TianiSPIRIT EHR makes a clear roadmap for upcoming system migrations possible, with respect being in *time*, in *line* and in *budget*.

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WEB 2.0 TO SHARE MEDICAL KNOWLEDGE AND IMPROVE CARE: *The Scientific Social Network for oncology clinical cases*

FINALIST

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Introduction

In 2010, the community of Madrid launched an e-health innovation project through the creation of a Scientific Social Network for professionals. The project was initially implemented at the University General Hospital Gregorio Marañón (HGUGM), starting as a tool to support the tumour committee.

For the implementation of the Scientific Social Network, the Community of Madrid decided to use MEDTING Enterprise. MEDTING is a collaborative web platform for the sharing of clinical cases that allows professionals to exchange knowledge, research and presentation of the organisation's relevant clinical cases to different medical committees. Madrid created its own private and enterprise MEDTING space.

The Scientific Social Network facilitates consistency in the information for presentation of clinical cases to the Tumour committee; anticipates and documents the views of specialists and keeps a record of tumours and statistical analysis of cancer epidemiology; it also standardises communications between hospitals and enhances scientific and research activities, as it enables the recording of cases treated in this committee as a source of teaching and research material.

The tumour committee is composed of specialists who provide multidisciplinary cancer care: medical oncologists, radiation therapists, surgeons, radiologists, etc., who make collective decisions about clinical cases evaluated to provide the best possible care to patients individually.

Characteristics of the MEDTING Scientific Social Network of the Hospital

Some of the main features of the Scientific Social Network:

- The contents stored are managed by the user community, privately;
- It is a Web 2.0 platform that enables sharing clinical cases (share, generate, comment ... information);
- Allows sharing private clinical cases (restricted access) or public (for all the community);
- Enables the creation of work groups;
- User profiles by specialty.
- Indexing and categorisation of content through SNOMED CT;
- Integration with PACS; and
- Carries out the identification of each clinical case and the possible interaction with the medical record.

One of the most valued features of MEDTING is its web viewer capable to display any type of multimedia information (image, video, documents, DICOM, ECGs, pathology, etc.) in a single web viewer.

Proof of Concept in the Community of Madrid

The proof of concept (PoC) involves a large number of clinical departments and units of the hospital: surgery and surgical specialties, internal medicine, medical specialties of gastro-

Figure 1: Screenshots of medting

enterology and pneumology, oncology (medical, radiation, palliative care), obstetrics and gynecology and central services (pathology, haematology and nuclear medicine and radiology).

With the use of this platform, an organisation of cases and a clinical repository, for teaching and research purposes for the medical community (doctors, students, residents, etc) has been created. This has brought about an improvement in medical education and quality of care focused on clinical cases.

The PoC at the HGUGM was planned for six months, fulfilling the targets set at four months since its initiation. The hospital has managed to establish MEDTING as the basic tool for the tumour committee, creating and dynamising a medical social network that covers diagnostic and treatment units that work with clinical cases / images / multimedia elements. In turn, a reference library and customised opinion with great value for clinical decision have been created, and also work groups based on functional units of oncology (breast, gastrointestinal, lung, genitourinary, etc.,).

The project has integrated images captured from medical devices through the tool MIO (Medical Images Organiser), which enables the integration of cameras, endoscopes, retinography, microscopes, ultrasound, CT and any other medical devices digitally and automated. Furthermore, MCA (Mobile Clinical Assistant) has been integrated into mobile environments, allowing the capture to occur during medical rounds.

In preliminary plans, an addition of 50 clinical cases was expected. After the PoC, the Scientific Social Network accommodated 90 clinical cases that have been treated in the various Tumour Committees. By the end of 2010, the platform involved 80 percent of patients going through the Tumor committee.

The use of the Scientific Social Network has favoured the transformation of care, management and transfer of knowledge through the use of social networking and has been a tool of innovation in the medical community that has optimised professional relationships within the organisation.

Project Objectives

The project objectives have been:

- Improved communication and exchange of clinical knowledge;
- Sharing of clinical cases, opinions and comments via the Internet;
- Facilitate research and education by providing the medical community a tool that can store a large volume of images and video;
- Motivation and empowerment of clinicians, and
- Helping patients and family to have a better understanding of the diseases affecting them.

Results at the University General Hospital Gregorio Marañón

Some remarks concerning results:

- Improving multidisciplinary communication among professionals;
- Capacity to collect any type of multimedia information associated with the case of any department or specialty, and
- Full use by diagnostic and treatment units, creating an early diagnosis through an interdisciplinary assessment.

We have created a registry of tumours that can be used for statistical analysis: Evaluation of cancer epidemiology, evolutionary oncology development and measurement of social and health impact of all phases of a tumour. The platform is also valuable to the medical education and for online collaboration in any specialty and has become a basis of motivation for professional clinicians.

The project has involved a change in the traditional manner of executing thetumour committee. Furthermore, in parallel to the clinical discussion, a repository of clinical knowledge relevant to the clinical community (residents) and continuing education is being created in parallel to an automated clinical pathway to procedure tasks.

An internal assessment process has been launched to measure the following results and impact:

- The organisation of tumour committees with MEDTING, described in the comprehensive cancer plan of the community of Madrid, helps manage 100% of patients;
- Avoids repetition of laboratory tests on patients referred from other departments or other hospitals;
- Helps to reduce waiting times. More focused on early treatment by sharing information on the same patient in real time;
- Facilitates the selection of patients for inclusion in clinical trials, saving costs for the hospital;
- Improves and encourages collaboration with industry (clinical research): It is the most powerful tool to promote clinical research in the hospital; and
- Improvement in management of workflows. Helps the tumour committee manage itself.

Expansion of the Social Scientific Network

The project initially defined constitutes the Scientific Social Network of the whole of the community of Madrid, which consists of 32 hospitals. The PoC and validation performed at the HGUGM not only reached the set goals and confirmed expectations, but the success among professionals has accelerated the expansion of the initiative (six hospitals in the next phase).

In addition to extending to other centres, the social network is being extended to other clinical settings in the HGUGM:

- Extension of the platform to all tumour committees of the oncology referral hospitals on HGUGM;
- Study and implementation of proposals for other services, outside of the field of oncology, who have detected opportunities for teaching, document repository, improved patient care, etc;
- Automatic transmission of studies and images from PACS to MEDTING;
- Development of application for mobile settings;
- Integration in areas of clinical decision support, and
- Assessment of the platform as a second opinion setting.
- Integration with EHR settings through semantic web.

IT MEETS MEDICAL ENGINEERING:

Effective and Integrated Process Optimisation

FINALIST

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Cost effectiveness and process optimisation by computer assisted structured medical documentation has been discussed for some time but has yet to be proven by code numbers. The article demonstrates the cost effectiveness of the medical documentation system MediColor for structured medical documentation by means of clear figures. This article uses a real example to prove which costs and process optimisation in a referral hospital have already been achieved, and potential for further optimisation is discussed.

Introduction

Optimising efficiency with regard to treatment processes in hospitals is of great importance. In times of cost-cutting measures it is essential for hospitals to improve processes, work out potentials for saving money and increasing efficiency and to systematically implement these.

It is commonly known that structured medical documentation is of great importance and a substantial part of the physician's everyday working life. The assumption that computer assisted systems are supposed to effectively organise treatment procedures in image and findings diagnostics and thus achieve savings is also known. However, so far there has not been a code number analysis regarding the assumption of cost savings and process optimisation by computer assisted medical documentation known to us.

Method

MEDNOVO Medical Software Solutions GmbH had the aim to carry out a cost-benefit analysis within the installation of its medical documentation system (MDS) in the endoscopy/ sonography department of a reference institution. The analysis aimed at evaluating the current introductory status of this MDS, whereby MEDNOVO focussed on the achieved increase in efficiency of the users of MediColor during the entire treatment process. Furthermore, more improvement potential regarding the endoscopic process in general as well as thanks to using MediColor was pointed out.

By integrating IT and medical engineering, no matter which and how many different interfaces are available, MediColor provides a gateway establishing an optimal communication flow between all systems in a hospital. Via the interface to the hospital information system (HIS) on the one hand, to the medical device on the other hand as well as to the Picture Archiving and Communication System (PACS), all data can be provided in digital form (complete and of high quality) at the required workstation when needed.

The intelligent and holistic integration of IT and medical engineering in medical documentation enables the elimination of workflow shortages that result in additional expenses, time pressure and additional pressure on staff. The following illustration shows exemplary shortages which often occur in endoscopy.

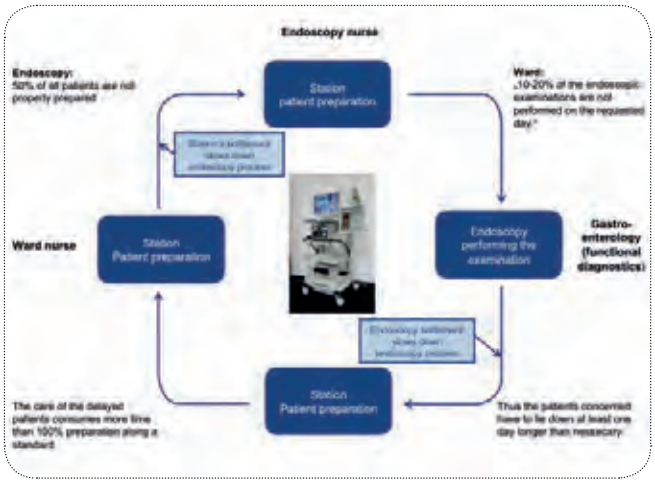
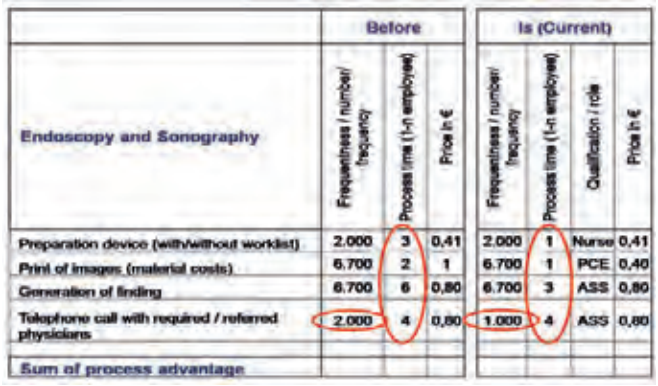


Fig 1. Blockades between ward and endoscopy results

The results of the study speak for themselves. Importing patient data and accessing pre-findings thanks to an interface to the HIS and PACS improves workflow and reduces the actual amount of time spent. The integration of data from modalities (image and measuring values) into medical findings, results in, findings and less repeated examinations. Due to more clearly elucitaded findings, there is no need for further explanations to the ward's staff and the referring physician. Also, the complete digital recording of performed examinations and diagnoses of each case guarantees correct invoicing.

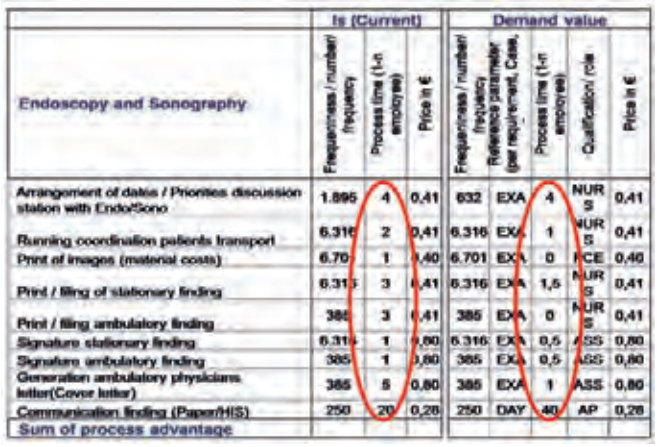
As illustrated, the time for all mentioned administrative tasks involved in the treatment process is reduced by more than 50 percent in some cases thanks to the introduction of MDS. Regarding telephone calls between the hospital and the referring physician, the processing time remains the same. However, the number of calls is reduced by half as the findings are more expressive. Result: Significant savings of time and costs that can now be invested elsewhere, creating new potential for optimisation.

Apart from evaluating the investment in MDS quantitatively and proving long-term savings, further optimisation opportunities within the treatment process, growth potential for coordinating processes and software as well as advantages in benefits have clearly been presented and proven.



Endoscopy and Sonography	Before			Is (Current)			
	Frequentness / number/ frequency	Process time (1-n employee)	Price in €	Frequentness / number/ frequency	Process time (1-n employee)	Qualification / role	Price in €
Preparation device (with/without worklist)	2.000	3	0,41	2.000	1	Nurse	0,41
Print of images (material costs)	6.700	2	1	6.700	1	PCE	0,40
Generation of finding	6.700	6	0,80	6.700	3	ASS	0,80
Telephone call with required / referred physicians	2.000	4	0,80	1.000	4	ASS	0,80
Sum of process advantage							

Fig 2. Results achieved by the documentation system MediColor



Endoscopy and Sonography	Is (Current)			Demand value				
	Frequentness / number/ frequency	Process time (1-n employee)	Price in €	Frequentness / number/ frequency Reference parameter (per requirement, Case,	Process time (1-n employee)	Qualification / role	Price in €
Arrangement of dates / Priorities discussion station with Endo/Sono	1.895	4	0,41	632	EXA	4	NURS	0,41
Running coordination patients transport	6.316	2	0,41	6.316	EXA	1	NURS	0,41
Print of images (material costs)	6.70	1	1,40	6.701	EXA	0	PCE	0,40
Print / filing of stationary finding	6.31	3	0,41	6.316	EXA	1,5	NURS	0,41
Print / filing ambulatory finding	38	3	0,41	385	EXA	0	NURS	0,41
Signature stationary finding	6.31	1	0,80	6.316	EXA	0,5	ASS	0,80
Signature ambulatory finding	385	1	0,80	385	EXA	0,5	ASS	0,80
Generation ambulatory physicians letter(Cover letter)	385	5	0,80	385	EXA	1	ASS	0,80
Communication finding (Paper/HIS)	250	20	0,26	250	DAY	40	AP	0,26
Sum of process advantage								

Fig. 3. Further potential for improvements

Due to digital data processing and their availability at all MediColor workstations, the number of appointments is reduced by 60 percent, even if the processing time for each case remains constant. Improved commissions of patient transportation, filing of inpatient findings and signing of outpatient findings by using batch processing system saves approximately 50 percent of processing time. Digital findings documentation in MediColor allows a reduction of four minutes, from five to one minute per case, when writing a discharge letter. Batch processing within this restructuring would reduce the distribution of findings to just once a day, which in turn would mean more time for processing.

Due to the positions of the people completing the work (medical assistants and nursing staff), savings in administrative processes, as described above (commissions of patient transportation, filing of inpatient and signing outpatient findings), are higher than the additional costs caused by additional processing time within the communication of findings. This cost-benefit analysis can easily be transferred to any other clinic and presents an increase in efficiency and in cost investments in a transparent and calculable way.

AN INFRASTRUCTURE FOR THE FUTURE

FINALIST

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What are the overriding requirements for a hospital ICT system? High capacity and reliability, for sure. Flexibility and future-proofed, maybe. Yet most hospitals spend management time and money on individual systems like a new PACS system or EMR customisation, ahead of sufficient investment into an efficient basis to satisfy the overriding requirements for all hospital systems. St. Olavs Hospital in Trondheim is an example of the opposite.

About the Project

The new St. Olav's Hospital is a publicly funded redevelopment of the existing regional hospital in Trondheim, Norway. Phase 1, comprising 100,000 m², began in 2006. In 2010, the hospital moved into another 100,000 m² and started the demolition of the last remains of the old hospital. In 2013, a total of 804 beds in single rooms will be completed, the first hospital in Norway with all single rooms. Capacity is planned with a 200 percent increase in day surgery and outpatient treatments, and a 10 percent reduction in beds and staff.

The new hospital is arranged in an urban block or campus style layout, with six clinical centres and several other buildings interconnected with bridges and tunnels and an extensive ICT network which connects the whole 25 Ha area with wired and wireless networks. The university's medical school is closely integrated within the hospital buildings, adding 700 employees and 1,250 students (and 50,000 m²) to the hospital.

A Converged IP Architecture

The old network at St. Olav's was, as in most hospitals, a collection of systems, each with its own wiring and structure. Even if these systems were IT based, there would be one PC controlling elevators, another controlling pocket paging, and small clusters of machines supporting MRs or other advanced equipment in silo structures.

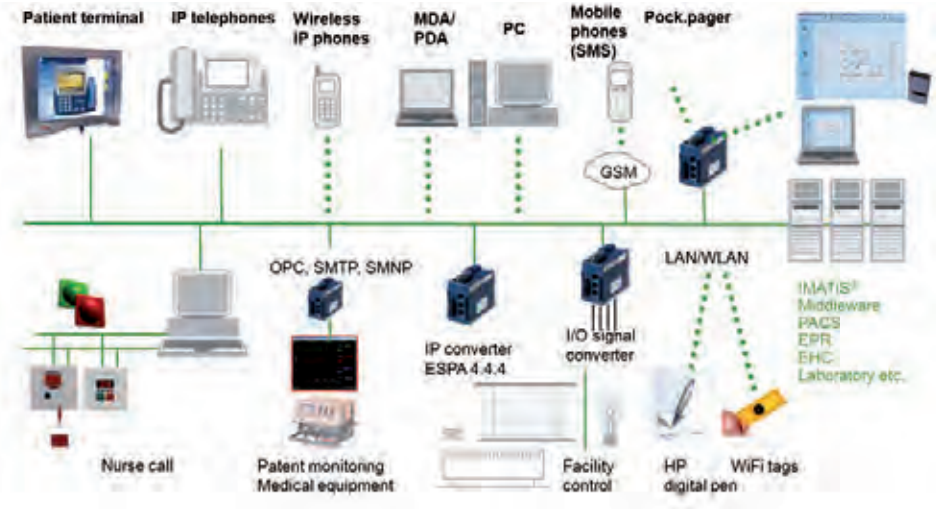

Figure 1. The new, converged infrastructure first realised at St. Olavs Hospital

During the initial design, a fundamental decision was made: that no one would be allowed to buy or specify any ICT equipment unless it also contributed to the total system, and that no IT equipment would be allowed unless subjected to common requirements for security, availability and mobility.

Hence, a new ICT infrastructure was built utilising a single converged IP network for the entire hospital. The goal was a hospital where both staff and technical systems were connected, mobile and flexible for optimal efficiency and adaptability.

In concrete terms, the solution encompasses about 5,000 PCs, 5500 IP phones (3,500 wireless), 150 servers and 1,100 wireless access points. The network uses more than 200 completely separate VLANs, each with its separate service level and separate rules for authorisation and access. Over 170 integrations between technical systems and the message server middleware have been made.

The mantra of "IP overall, all over IP" leads to the integration of several disparate networks (data, television, telephony, video and security as well as clinical systems like PACS and nurse calls) in one IP multiprotocol label switching (MPLS) converged network designed to a reliability of 99.999 percent.

Building Automation and ICT Working Together

The integrated infrastructure is built as an integral part of the buildings themselves. This gives immediate advantages in controlling the environment. Since all building automation is accessible via the infrastructure, it is easy to establish control room functions anywhere it is required. A supervisor can access a system from home and give advice and support when needed. ITV is fully accessible in the security office, but is also accessible for technical staff in case of situations like flooding or broken equipment.

There is only one source of identity in the network – the hospital's personnel system. From this initial identification that you are YOU, the systems determine what computer access, door access, software access, telephone number and even what work clothes YOU may be entitled to.

What Is a Phone?

Most people would say that a telephone is exactly that – an instrument to talk to people who are not nearby. Yet at St. Olav's, it is far more. It is the tool for receiving Nurse Call alerts. Every nurse logs on to his hand held phone when he comes to work, and then assigns himself e.g. the role of "nurse for room 414". From that moment, every nurse call from room 414 goes to this phone, and can be responded to (or transferred to another nurse). No displays or buzzers in the corridor - which makes for much calmer environment – which again makes for a more pleasant and shorter stay for the patient, but also less stress and a better work situation for the nurses.

It is the tool for receiving work orders. You can of course call an orderly or a cleaner directly, but you can also call, email or SMS to the dispatch centre. The centre sends out about 1,000 work orders for orderlies every day. The system can automatically detect the nearest orderly and also keeps track of workloads. The work orders pop up on the telephone just like an SMS, and go to a work-list when accepted – and out of the work list when they are marked as 'completed'.

The phones are also used to send technical alerts, report that an automatic guided vehicle has deposited goods, or to activate and receive medical assembly alarms. It is even possible to unlock doors and commandeer elevators as a part of a Code Blue call.

You do not have to remember names and phone numbers. The system only calls a doctor who is present, and display directories only of present staff. An anaesthesiologist can sign in and then assume the role "anaesthesiologist on duty", meaning that any call to this role will go to THIS phone – until somebody else assumes the role at the end of a shift.

Costs and Benefits

The hospital has over the last few years reduced the number of beds (by 170), reduced staff (by 450) and reduced length of stay (from 5.7 days to 4.6 days) while increasing production (in DRG) by three to four percent per year. The cost is of course substantial, more than five percent of the total construction costs. Yet it should be noted that the region spent more on software development alone during the same period.

The system has completely changed the basis for working at the hospital, more than changing the work itself. The digital EMR system is now augmented with speech recognition, which is used by doctors for their notes. A hospital-wide drug dispensing system with two automated pill pick machines is under implementation, where doctors prescribe at their PCs and drugs arrive in single dose packaging at the bedside. All this would not be possible unless there was a solid infrastructure to build on.

INFOBROKER – AN ICT HEALTHCARE SOLUTION

FINALIST

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Reflections and lessons based on a four year experience, building an enterprise infrastructure for image and text information in the Västra Götaland region, Sweden

The global demand for interoperability within healthcare is increasing in order to provide the services needed in healthcare today. This situation is also reflected in the Västra Götaland region (VGR) on the western coast of Sweden. Studies illustrate that relatively few healthcare organisations have developed sustainable interoperable solutions with an enterprise scope (Ebbert et al. 2007; Mendelson et al. 2008; Weinstein et al. 2008). Healthcare institutions are intrinsically slow to adopt innovations, especially when they lead to changes in workflow caused by the involvement of new actors in the process of care (McLean 2008 and Borland 2009).

To share information within an enterprise faces a number of challenges. Several central challenges are addressed towards management and their ability to identify how to harmonise information as well as how to focus on organisational issues and human factors in relation to the implementation of the new Infobroker solution. This is done by working with the ownership of information and by providing shared visions, strategies, goals and new technologies to healthcare professionals. Another challenge for management is to make room for negotiations at work that stimulate the development of a new enterprise workflow. Experience from the management in addressing these challenges can contribute to the development of enterprise solutions that offers interoperability between many different and heterogeneous healthcare organisations.

Background

Interoperability within the enterprise environment is maintained according to the IHE mission, i.e. the project is applying standards such as Digital Imaging and Communication in Medicine (DICOM) and Health Level 7 (HL7) (PS DICOM 2008, IHE 2009, HL7 2009) to address specific clinical communication needs and support optimal patient care. All information is stored as DICOM objects. In practice, this means that images are stored as their original SOP class e.g. DICOM MR, DICOM CT. Textual information is stored as DICOM Structured Report. Thus images and texts are combined into a holistic entity

Results

1. Importance of Technology

In the Västra Götaland region (VGR), Sweden, data is shared from 29 x-ray departments, 170 dental clinics, two clinical physiology departments and four cardiology departments through the Infobroker solution. Text from EPR systems are stored as DICOM-Structured Reports objects, together with the images. Interoperability is based on the IHE mission, e.g. XDS-I registry and repository.

2. Benefits

The reasons for using Infobroker are to:

- Reach improved treatments, diagnostic and clinical quality;
- Reach improved and more equal information quality
- Better plan for load balancing of clinical and diagnostic resources, resources allocation;
- Enable working in teams across traditional departmental boundaries, e.g. first and second opinion, and
- Improve the follow up ability and predict the outcome of changes (reports and simulations), and knowledge management.

3. Originality

Infobroker is the first enterprise data storage in Sweden and globally, to the best of our knowledge, centralising patient information regardless of different sites' local EPR, PACS and RIS systems. Information from different local systems are centrally stored and shared as if they had been produced from one system. Physicians access the information via the web.

4. Difficulties

Syntax from the producing systems, harmonisation of the syntax and support for enterprise sharing in healthcare standards is difficult. Today standards are built for interoperability between systems and not for interaction on information from different systems. Other more practical difficulties have been:

- The enterprise environment includes many different vendors. The objective of these vendors has been to enable system-to-system communication - retrieve and send. Infobroker and sharing of the information is completely different from the idea system-to-system communication.
- The perspective from vendors has been that they own the data within their systems databases. The argumentation is that they otherwise cannot handle the information in their workflow. Contrarily, the care givers' perspective is that they own the information that is stored in a vendor system and produced from a

patient perspective. This gets more complex when the region is of the opinion that they own and manage the information. Who owns the information and how do we get vendors to cooperate instead of competing within the enterprise environment?
- Standards are not complete out of an enterprise view as it opened up for different ways of interpretation and using the standards on.

5. Success

Infobroker is implemented and used daily in VGR since 2006. During 2010 Infobroker also fed the national "historical patient overview" service deployed in Sweden, being a role model for other healthcare regions to follow.

Conclusion

Development of the Infobroker solution, with an unlimited number of healthcare organisations and individuals, within the VGR enterprise involved continuous negotiations regarding (among others): the harmonisation and ownership of information, and knowledge of who should collaborate with who to achieve new ways of working together. Infobroker is just a starting point for the sharing of information.

The impact of the Infobroker solution is comprehensive as sharing quality data could lead to a more interactive healthcare. Where traditional boundaries are broken, novel ways of social collaboration are introduced and new ways of carrying out the work will be seen. *Sharing is caring*.

HEALTH PERSONAL FOLDER (HPF) IN CATALONIA

AUTHOR

Adapted from
a presentation by
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Catalonia is an autonomous community inside Spain and has full powers regarding its citizens' healthcare. It is developing a National Healthcare System that grants assistance to every citizen, over seven million in 2006, and where different services are requested to different providers.

The ICT Strategic Plan 2008 – 2011 focuses on two groups: Citizens and professionals. The plan seeks to guarantee citizens' right to access information and to support the task of professionals to improve the quality of healthcare assistance. The department is developing a leadership role in the ICT sector, promoting both the image of Catalonia as an innovative territory and the participation of all healthcare actors.

There are four key ICT projects in Catalonia: Telemedicine, electronic prescribing, medical image digitisation and the Personal Health Folder (see Figure 1). These systems are interconnected; the focus is on interoperability. The forthcoming HC^3 will be connected to other strategic projects such as the digitalised medical images central repository or the Catalan Cancer Register, both developed under the Catalan Health Department leadership. Through the implementation and interconnection of different products like we have just mentioned, we are building up a very solid HC^3 in terms of healthcare continuity and we are also forcing the establishment of a high quality communication network.

The Health Personal Folder (HPF) is a space where the Catalan Department of Health will store and offer to all Catalan citizens, through the Internet, relevant information about their health status. This project represents the evolution of the Shared Medical Record of Catalonia, where not only health professionals will be able to access health information.

The development of this project is based on a new concept identified by surveys made to the population, who demand more information and access to their health records.

The main principles and objectives of the HPF are as follows:

Principles:
- The citizen as owner of his data;
- To generate confidence in the system;
- A shared model of information management, and
- The use of communication standards and catalogues.

Objectives:
- Encourage citizens' co-responsibility for their own health;
- Enable the participation of citizens in the management of preventive actions and healthcare, and
- Improve the quality of care, the coordination between different healthcare levels and between the professionals involved.

The overall goal is to reach an interactive model of consultation and work between patients and the health system (professionals included) to promote citizen's commitment to their own health.

There are clear benefits for all the relevant actors involved. For citizens, they have more autonomy, there is more emphasis on prevention and monitoring and the HPF can be recognised as the main source of health information. For healthcare providers, HPF brings a unique view of health services and reduces errors and redundant tests. For the government, the

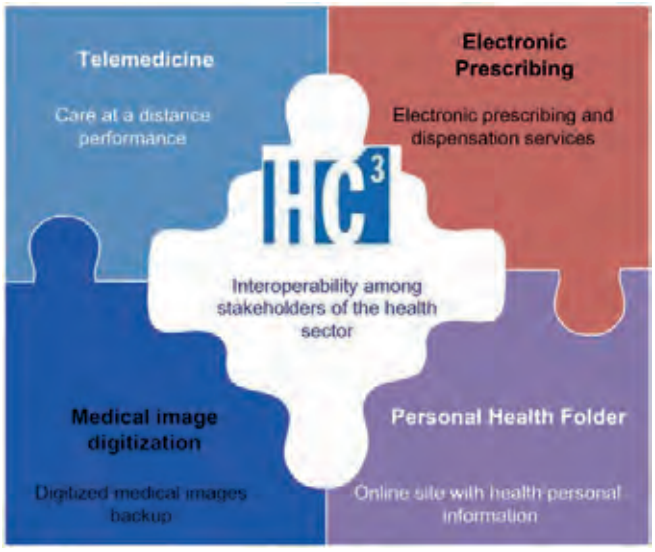

Figure 1. Key ICT Projects in Catalonia

HPF allows for the better and more efficient use of health resources and as a result of increased prevention and citizen commitment to their health, cost reductions.

Currently, the PHF has some functionalities and information available to the citizens. As well as the basic consultation like prescribed medicines, medical reports, etc, some virtual procedures are available at the virtual office. Specifically important are those related to patients who are diabetic, pregnant women, and blood donors.

Interactivity

Due to the information available in the future model of the HPF, it will directly change the relationship between patient, doctor and administration. Citizens are more implicated in the care of their own health and there are a wide range of procedures available and information is personalised. Through the PHF procedures and consultation are simplified and all actors can make better use of available resources. In order to extend the functions of the HPF with new features and to boost the new relationship model between patient-physician-administration, the key concept is interactivity.

Success

A usability study of the PHF was conducted during 2009 in Calella based on a group of approximately 100 people. Following this study, a survey was carried out on the participants showing unanimous support and acceptance of the PHF.

Although July is a month where many people begin their holidays in this city, 217 citizens accessed the PHF. More important is the fact that they made an average of 2.2 activities. They do not access only the first page, but to consult and make use of other functionalities available.

Outlook for the Future

New features will gradually become available, improved and expanded and with special attention to those points that enable the citizen to upload their own information and self control tools. The health department has been expanding the PHF throughout Catalonia since the usability study. The deployment has been gradual, starting with cities of 20,000 inhabitants and communities with specific patients/citizens (blood donors, diabetics) and was subsequently extended to the whole territory. Finally, and with interactive functionalities available, one of the new projects being carried out is a pilot to secure access through mobile phone due to the widespread tendency and importance of these devices in citizens' lives.

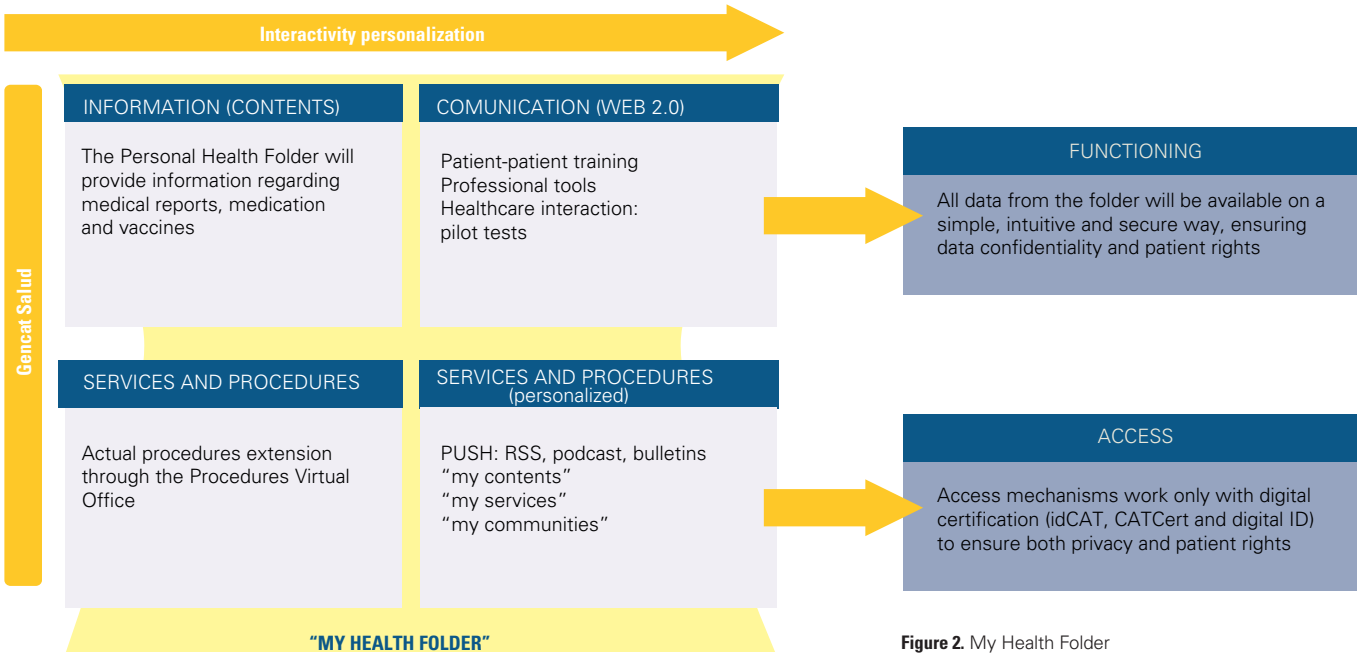

Figure 2. My Health Folder

CATALAN MEDICAL IMAGE REPOSITORY FOR PHYSICIANS AND CITIZENS

AUTHOR
Adapted from a presentation by
Carles Rubies
Digitalisation of Medical Imaging Plan Director

The Catalan Healthcare System

The Health Department (HD) has responsibility to draw up the health policies, ensure the system's sustainability and oversee the quality of services. It has the legal authority to authorise, inspect and also close down activities and centres, both from the public and the private system. Furthermore, it has the functions of planning health and services policies.

One of the challenges for the HD was the existence for most healthcare suppliers of a fragmented Information System (IS) due to healthcare system diversification (56 providers, each with different IS). A system that could process multiple sources of information efficiently and effectively was urgently required.

As a result, ICT became an strategic component of the Catalan healthcare system.

Digitalisation of Medical Imaging Plan

The main objective of the digitalisation of medical imaging plan is to provide access from any point of the network to any medical image anywhere at any time.

It enables health centres to have a secure backup system of medical images (Bi), while it storages all the radiological images in the same database.

Technological Functionality:

- Servers and disks booths at 150 TB per year for radiological images;
- To facilitate the backup of medical imaging for health centres of the public system;
- Independent supplier of PACS;
- The centre needs network connectivity: Anella TicSalut, and
- No cost for health centres.

Current Situation:

- A 200 TB storage infrastructure is available;
- Went into production November 1, 2009;
- Currently there are 20 production centres with approximately 40 TB storage and two milions studies available, and
- By the end of 2011, an expected 100 percent of health centres will have the technology available.

Integration of Digital Imaging with the Shared Medical Record

It allows the distribution of citizen's medical images through the HC^3 and for sharing medical images between health centres.

Healthcare Functionality:

- SW Platform to integrate backup images with the Shared Medical Record of Catalonia - HC^3;
- CDA radiology report is improved;
- Independent manufacturer of PACS and RIS, and
- Access to images is available through the HC^3.

Current Situation:

This phase of deployment is moving forward after functioning for two months:

- Two centres publishing medical images at HC^3,
- 5,000 studies published monthly.

Importance of Technology

A unique model of proven interoperability and standards rather than a unique information system allows interconnection among the developed systems and initiatives, even when they are promoted by different stakeholders. This also allows the RCIM system to easily connect with other information systems developed in Catalonia, based on the same principles:

- HL7 standard for medical data exchange;
- DICOM standard for medical images exchange, and
- IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical needs in support of optimal patient care.

Benefits of RCIM

RCIM enables health centres to have a secure backup system of medical images (Bi), while it stores all the radiological images in the same database.

It also allows the integration of the digitalised image in the Shared Medical Record of Catalonia (i-HC3), which will serve as the basis for distributing citizen's medical images through the HC^3 and for sharing medical images between health centres.Further, the Catalan Medical Image Repository facilitates the creation of advanced telemedicine services networks (PAi) and the RCIM images integrated in the Shared Electronic Medical Record of Catalonia will provide a centralised computer-aided diagnosis (CAD).

Conclusion

Despite some challenges in ensuring that all projects for medical digitisation satisfy interoperability requirements, and as such, receive HD funds; by August 2010, 95 percent of radiological images have been digitalised, with most area facilities participating. The HD is continuing to work towards the provision of funds to all centres that require network connectivity to the "Anella TICSalut".

THE INTEGRATED OR:

An "In-House" Customer Satisfaction Survey

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Technology evaluation is considered a must in today's healthcare systems, especially when a significant monetary investment is required. Such evaluation is to be conducted before the introduction of a new technology by means of a multidisciplinary approach that should take every aspect into account. Evaluations can also useful as a follow-up verification, especially in cases where little literature is available due to recent introduction on the market or very limited access to technology. Moreover, managers might be interested in verifying if statements, data and stakeholders introduced during the acquisition process are real or need to be redefined. Varese Town and University Hospital in Italy performed such an evaluation of their integrated operating rooms.

The integrated Operating Room (OR), otherwise referred to as "digital OR" or "interventional suite" is a technical solution mainly dedicated to minimally invasive surgery where environment (lights, climate, etc.), medical devices and video distribution are controlled via one or more PCs and activated via a single graphic interface. In such an OR each and every control is in the surgeon's reach, allowing him to interact and control the system using a boom-mounted, sterile touch screen that can be placed right on the operating field. A computerised video matrix controlled by the same touch screen distributes images to boom mounted monitors thus allowing the best viewing angle to each operator. Only solutions granting video distribution and medical device control should be categorised as an integrated OR.

Vendors state that boom-mounted devices, the possibility to view images on many displays that can be best fitted for the surgeon and surgeon's direct device control connote the digital/integrated OR as a very efficient and effective environment, providing enhancement in flexibility and integration of information. This aspect is to be investigated and verified.
At the time being, there are many installations worldwide of such Integrated ORs which differ by vendor, degree of integration available, surgical specialty they are destined to, etc. Nevertheless, it is not clear whether this technological solution is useful, effective or worth the economical and organisational effort needed to implement it in a new or existing hospital.

In Varese Town and University Hospital 20 digital ORs [15 Olympus Endoalpha®, 2 Karl Storz OR1®, 3 Smith & Nephew Digital OR™ have been recently built to fulfill the needs of ten surgical specialties. The imaging distribution control can be performed using a multiple choice of monitors available as destination, i.e. one or more boom-mounted displays, a 40" plasma monitor on the wall, a video-conference system, a DVD recorder or centralised storage. If the OR is fully integrated, a medical device control is also present.

Objectives

After two years from installation, the hospital management and Clinical Engineering Department wanted to evaluate the surgeons' and staff nurses' satisfaction and comments on the ORs. Such evaluation is considered an assessment of the acquisition process, assessing whether expectations had been fulfilled or how they had been missed or over-considered. A qualitative study based on clinical staff opinion was conducted and was considered a valuable judgment of the solution implemented. Moreover the evaluation is by all means needed by the entire scientific community due to the lack of literature on the subject. Although the data is limited in its scope, referring to a local situation only, it still represents a valuable set of data for hospital management.

Methods

A multiple answer questionnaire was handed to surgeons and scrub nurses. 17 surgeons and nine scrub nurses were interviewed. Interviewees were all fully integrated OR users in order to allow a complete evaluation, especially on the device control integration. Only surgeons and scrub nurses were interviewed as they represent the real direct users of the OR. The interviewees belong to different affiliations (mainly general surgery) and have different experiences; they also use different products since three different solutions are in use. There are some common questions asked to both surgeons and scrub nurses. These common questions made it possible for us to evaluate the different profession's approach to the digital OR.

Multiple guided answer questions were proposed; the interviewee had to define a level of importance by distributing 100 points among the available options. Questionnaires were answered with the interviewer present; this encouraged detailed comprehension and more reliable answers.

Results

Six subjects are considered in this article. The first one aims to test the usefulness of the integrated OR. Answers available ranged from the reduction of patient risk to hospitalisation time, rehabilitation, quality of surgery, surgical stress, and surgery time. Surgeons classified enhanced quality of the surgical act as the best option (total reached scores: 520 points) while the second choice was stress reduction (475 points total), followed by reduction in surgical time (375 points total) (see Fig. 1, p.34). It's interesting to read the same data in terms of classification: quality of surgery has been chosen as the

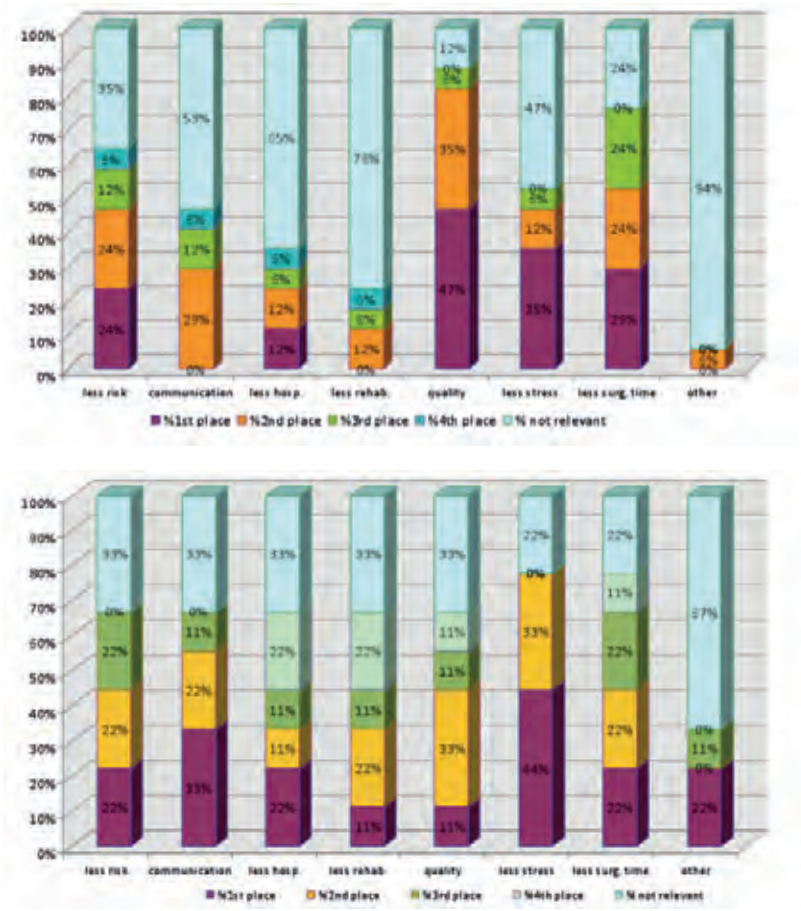

Figure 1. Answer distribution to first item (performance improvement) a) surgeons; b) scrub nurses

best option by 47 percent of surgeons vs only 11 percent of scrub nurses, while 35 percent of surgeons rank it as second option, resulting in an overall 82 percent of surgeons stating that the integrated OR augments quality. Both surgeons and scrub nurses agree that the integrated OR can reduce stress related to intervention (35 percent of surgeons and 44 percent of scrub nurses chose this as the best option) and reduce surgery time (29 percent of surgeons rank it as first, 24 percent as second and 24 percent as third, 22 percent of scrub nursed rank it as first, second and third).

The fact that the integrated OR can reduce risk related to surgery has been voted with 315 points, and obtained a total (first and second place considered together) percentage equal to 48 percent and 44 percent of surgeons and scrub nurses respectively.

In order to acquire more details on the subject, a specific question was proposed about surgical time reduction. Surgeons think that time reduction can be achieved in surgery scheduling phase while staff has the impression that surgical act duration and devices set up phase has been reduced. Scrub nurses in particular stressed the point that also anesthesia preparation procedure became shorter due to the integrated OR facilities.

Moreover automatic presetting functions (a tool that allows to store in the system functional parameters which have to be set on each device for a defined user) can help staff reduce theater preparation time (53 percent of surgeons and 67 percent of scrub nurses).

OR layout was then analyzed to evaluate available functions such as the usefulness of the computerized video matrix for images acquisition and distribution, the control system use, the utility of mounting devices (endoscopic camera, light source, CO2 insufflator, electrosurgical unit) on a single boom and the possibility to orient more than one display on independent boom arms. 47 percent of surgeons rank video acquisition and distribution most important (first place, and a total score equal to 470 points) (Fig. 2) while on the contrary, 78 percent of scrub nurses rank device control in first place with a total assigned score of 295 points. A different judgment regarding the need for boom mounted devices can be seen to: it has been voted with 330 points by surgeons (35 percent of surgeons rank it in 1st place and 29 percent in second) and with 145 points by scrub nurses (mainly ranked as third place). The judgment on the availability of more than one display is comparable.

Options regarding medical device control were: Increased reactivity to events, reduced setting errors, reduced confusion and reduced displacements of devices and monitors. Both surgeons and scrub nurses stated firstly that direct control can grant better reactivity to events that occur during surgery (this point was particularly emphasised by scrub nurses). On the other hand, both surgeons and scrub nurses observed that such a system can reduce device setting errors (surgeons a little more than scrub nurses – 35 percent as first place vs 22 percent). It has been additionally noticed that device control implemented inside integrated ORs can reduce mess and racket and the number of displacements of devices, monitors etc, during surgery although scrub nurses don't consider this aspect as most relevant.

Teaching capabilities of the integrated OR were considered. The majority of the interviewed surgeons (76 percent) think primarily that a better "point of view" on the surgical field can be achieved and therefore that a higher amount of surgeries can be viewed. Scrub nurses also indicated the chance to have more interventions available for learners.

Evidently there is still more work to be done; surgeons and scrub nurses agree that there is first of all a need for education (i.e. knowledge of how to operate the integrated OR) and how a correct operation can affect organisation. Moreover nurses evaluated as a relevant problem the lack of integration of specific medical devices (i.e. ultrasonic scalpels, electrosurgical units) and think that there is a significant cultural problem when approaching such technology (Fig. 2).

Conclusions and Discussion

The results of the questionnaire show substantial satisfaction by both surgeons and scrub nurses, given that the in-

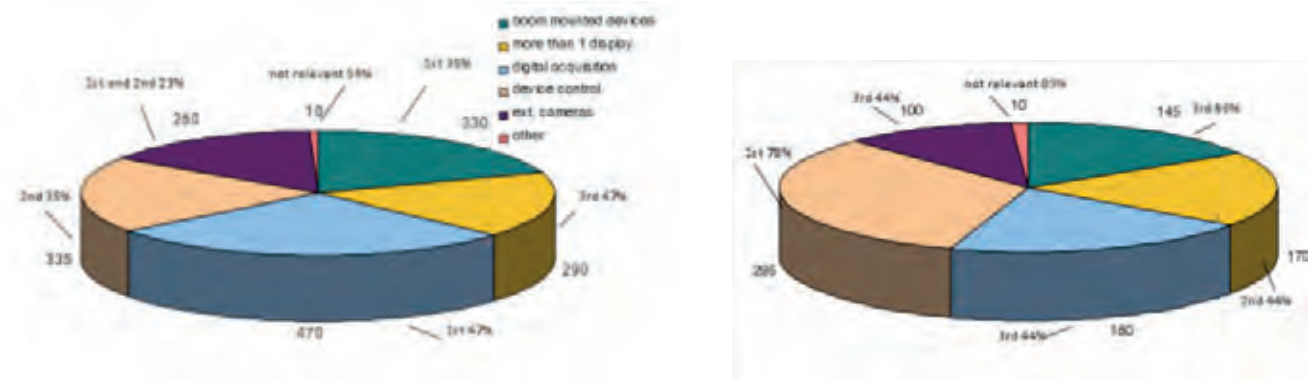

Figure 2. Answer distribution to classification of each technology employed in integrated OR, (a) surgeons, (b) scrub nurses. Next to each value indicating the total score obtained by each option the highest ranking expressed in percentage has been annotated.

stalled technology grants multiple advantages to workers and patients. Among such advantages we can enumerate increased quality of patient treatment and reduced stress during surgical act (Fig. 3), reduced time for device setup and surgical act, increased reactivity for urgent decisions and reduced setting errors and racket. These advantages are mainly obtained using features of the integrated OR such as video acquisition and distribution and medical device control. The use of medical device control and availability of different types of information can improve security and efficiency of the surgical act, as stated by other authors.

In fact, the main conclusion derived from results, while considering the data as a post installation impact, is that a relevant improvement in quality has been introduced with the integrated OR and a less stressful and shorter surgical procedure has been achieved.

The results presented above show a different approach to technology between surgeons and scrub nurses, the latter being more concerned about workflow and surgical process in general. This is confirmed by answers given to the question concerning layout (where little interest was reserved to video acquisition) and to utility of medical device control and presetting. Surgeons appear to be more concentrated on the surgical act itself; such conclusion is endorsed by the ranking given to availability of images from surgery, reduced surgery time and increased quality (Fig. 3) rather than device control, setting errors or process standardisation. The results shown outline that it is clear that the Integrated OR can help overcome the usual problems of modern ORs, i.e. a conspicuous presence of high tech devices with little care to ergonomics of the OR itself.

The data presented illustrate that the integrated OR is a technical solution that should be evaluated by each institution wanting to enhance its healing capabilities and its organisational structure. The great need for education, a modification of cultural approach and coordination between surgeons and scrub nurses (Fig. 3), with related costs, can be used as other drivers to define if the solution is to be acquired or not.

Education of surgeons and scrub nurses on the advantages of such systems as providing substantial and literature-evident improvements in treatment, organisation and, as a direct consequence, economy, could help to impact on the users' approach and then corroborate the thesis that the Integrated OR is by all means a valuable technology.

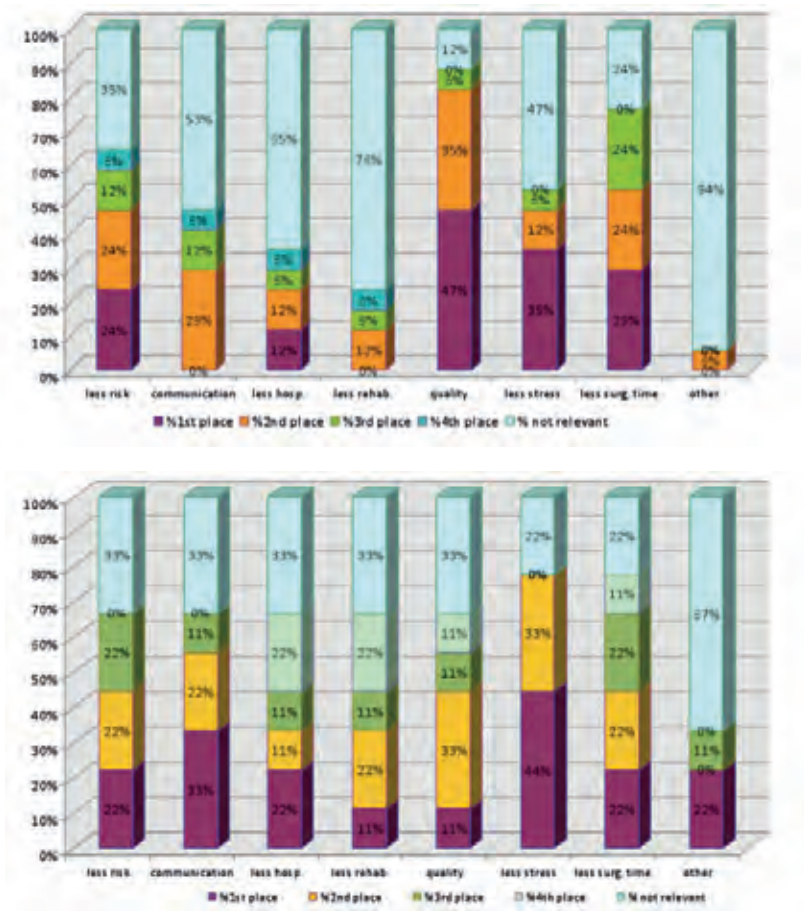

Figure 3. Answer distribution for "unsolved issues" related with integrated OR.
a) surgeons b) scrub nurses

ADVANCED PACS APPLICATIONS:
The Hub of the New Medical Enterprise

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Despite the widespread adoption of the DICOM standard in medical imaging, it can still be challenging to share data across institutions. Too often simple yet inefficient means of sharing data are used due to the lack of fast and secure mechanisms that support interactive access to data resources from outside institutional firewalls. Virtual PACS, a mechanism for standardised, efficient and secure access to geographically distributed resources of imaging data, has been discussed in the literature as a potential solution.

Virtual PACS federates multiple remote data sources including those that do not support DICOM messaging and presents them to a DICOM client as a single virtual resource. It can behave as a virtual DICOM PACS server that allows local DICOM data producers and consumers to interact with multiple image data sources over the internet. These data sources can be native DICOM sources (such as DICOM PACS servers) and non-native DICOM sources (i.e. sources of DICOM objects which do not support DICOM messaging and may store images on disk or in databases). This federation of PACS archives serving cooperative backup archives for one another can be effectively realised utilising GRID technology.

In this design, only a small fraction of the PACS data archive resource is needed from each federated member. Essentially, any federated member can link to this data GRID with minimal cost while benefitting from the continuous availability of image data recovery. GRID computing uses GRID-enabled software so that healthcare enterprises can share geographically dispersed resources, including software, applications, data and computing and storage platforms. GRID computing is not so new within the scientific community but the medical imaging community has only recently begun to explore its possibilities further.

Advanced Image Processing

A vital step in developing image processing applications in medicine is that of evaluation and validation of algorithms, software models and protocols. This requires that the procedure be tested on a sufficiently large set of test cases, i.e. an image database. Generating such an image database, while far from trivial, is only part of the task: Tools are required to access and use data, and in addition to perform something akin to a clinical trial based on which the performance of the procedure can be assessed.

The development and evaluation of effective algorithms requires access to a large number of cases from different geographical locations so that variations in the population are adequately modeled. A traditional approach would involve the collection and transfer of image data to a central location, enabling remote use. While high-speed networks are often necessary for such remote resource use, they are far from sufficient: remote resources are typically owned by others, exist within different administrative domains, run different software and are subject to different security and access control policies. These issues have historically made distributed computing difficult.

Today's technologies do not provide uniform mechanisms for such critical tasks as creating and managing services on remote computers, for supporting "single sign on" to distributed resources, for transferring large datasets at high speeds, or for forming large distributed virtual communities and maintaining information about the existence, state and usage policies of community resources. GRID systems and technologies provide the infrastructure and tools to solve these kinds of issues and make large-scale, secure resource sharing possible and straightforward.

GRID for CAD

There is a growing body of literature supporting the ability of CAD systems to increase diagnostic accuracy when used in combination with human readers. However, the additional time required for use of CAD systems suggests a need for the development of modifications in workflow and in how CAD is used to streamline the interpretation process.

Current CAD systems operate on local data sources and in most practices, a CAD system from a single vendor is used at a specific location. As the diagnostic imaging data obtained with CT and MR imaging increases in spatial and temporal resolutions as well as in overall complexity, the amount of data stored per patient also increases dramatically. Latency in the transfer of data across the healthcare enterprise for remote image review increases with data size, thus adversely affecting the user's ability to dynamically interact with databases. GRID technology could greatly increase the accuracy and speed of image analysis by sharing data as well as computational resources. Indeed GRID computing is suited to complex and computationally demanding applications in medical imaging.

As opposed to current commercially available CAD systems, GRID-CAD integrates different CAD programmes into a GRID framework from multiple vendors, thereby creating an infrastructure that allows invocation of multiple CAD algorithms in parallel on one or more image data sets. For example, especially intriguing is the possibility of using CAD software programmes from different vendors in a cooperative manner to enhance the performance and accuracy of lung nodule detection in a single image data set.

GRID for Efficient Storage

PACS technology remains weak in the area of clinical image data backup. Current solutions are expensive or time consuming and the technology is far from foolproof: many large-scale PACS archive systems still encounter downtime for hours or days where it is possible to lose access to pertinent clinical image data.

Current recovery solutions suffer a few limitations. For example the CA archive server has eluded widespread implementation due to confinement of manufacturers by current IT standards. As far as the ASP model backup archive is concerned, image recovery procedures have turned out to be tedious, requiring manual intervention together with the additional complication that the ASP backup server is one site serving potentially multiple hospital sites which could quickly outgrow its cost-effectiveness as more hospital sites are incorporated. To serve enterprise level clinical data recovery, an innovative approach is needed:

- By applying GRID computing architecture to a DICOM environment, a federation of PACS can be created allowing a failed PACS archive to recover image data from others in the federation in a seamless fashion;
- By distributing redundant copies to different storage sites, a GRID implementation would avoid a single-point of failure, thus assuring compliance to FT/CA requirements, and
- GRID technology would enable resource optimisation by matching network availability with the specific task to be performed.

Future Directions

Security, authentication and authorisation are among the most challenging current issues in GRID. Traditional security technologies are concerned primarily with securing client-server interactions in which a client and server need to mutually authenticate and the server needs to determine whether it wishes to authorise requests issued by the client. Sophisticated technologies have been developed for guarding against and/or detecting various forms of attack. In GRID environments, the situation is more complex: the distinction among client and server tends to disappear (a GRID is a peer-to-peer system) because an individual resource can act as a "server" one moment and a "client" another. It is not so difficult to see how security and privacy could be mined when data treatment requires a geographically widespread resource allocation.

Indeed, a single computation may access many resources at the same time and it is generally unacceptable to require that the user re-authenticate on each occasion. Instead, a user should safely be able to authenticate once and then assign to the computation the right to operate on their behalf. This authentication capability is achieved via the creation of a proxy credential which is a form of delegation, an operation of fundamental importance in GRID environments. A GRID computation that spans many resources creates subcomputations that may themselves generate requests to other resources and services, perhaps creating additional subcomputations. Yet the further these delegated credentials are disseminated, the greater the risk that they will be acquired and misused by an adversary.

Security, authentication and authorisation are among the most challenging current issues in GRID.

EU R&D Projects Using GRID Technology

Numerous government-funded R&D projects are applying GRID technologies to challenging applications. Industrial interest is growing and the number of radiology-related applications of GRID computing are increasing. Such applications include MammoGrid, a European database that allows access to mammograms by using a GRID-based software, and Connection-5, a project group where GRID-based applications are used for the detection of breast cancer and Alzheimer's disease. One of the most promising GRID computing projects was caBIG, a community initiative sponsored by the National Cancer Institute (NCI) Center for Bioinformatics to create an informatics infrastructures among clinical cancer centres that would facilitate research through the sharing of data, software and expertise. Things keep moving on, even if a long and intensive process is still foreseen in the next future.

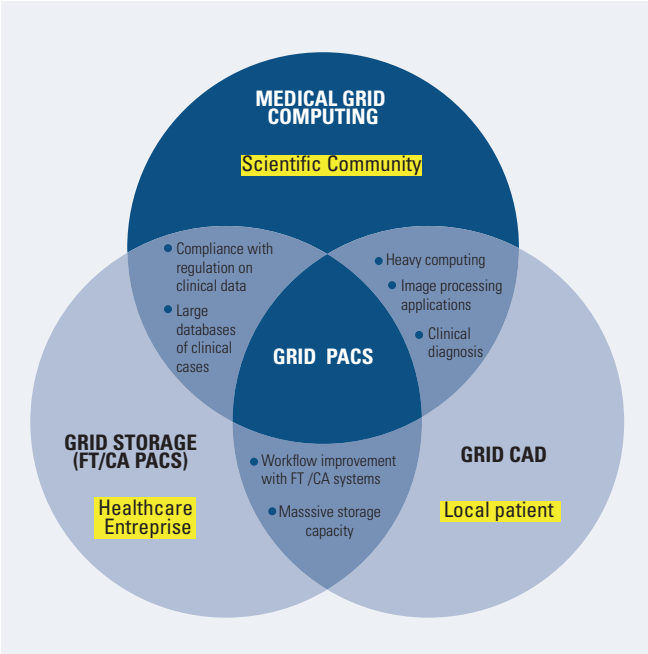

Figure 1. GRID PACS will bring various benefits at different levels of the organisational structure.

ANTIMICROBIAL RESISTANCE AND ANTIBIOTIC USE IN THE ICU:

Utilising Computer Surveillance to Improve Workflow and Outcomes

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COSARA (Computerised Surveillance and Alerting of nosocomial infections, Antimicrobial Resistance and Antibiotic consumption in the ICU) is a software application designed and developed for the registration and integration of infection-related data in the ICU patient. The application architecture consists of three different software modules: 1) A registration module which in real-time requires the ICU-physician at each (electronic) antibiotic prescription, 2) A presentation module which provides the ICU-physician with all infection-related data of the individual ICU-patient in a concise and visually attractive way, and 3) An information module which incorporates infection-related data at the level of the ICU and can be used for surveillance purposes and to steer infection control measures.

Background

Nosocomial (i.e. hospital-acquired) infections are common, and are important contributors to unfavorable clinical and economic outcomes. In Belgium, these nosocomial infections are estimated to be responsible for a yearly excess mortality, an additional 607,880 hospitalisation days and a total extra society cost of more than 300 million euro. The ICU is clearly the epicentre of the nosocomial infection problem. Furthermore, it is estimated that 20 to 30 percent of these infections are preventable.

Given the importance of infection control in the ICU, one would expect that the medical files and nursing charts of the ICU patient would include a well documented overview of previous and current infections together with the prescribed antibiotic therapy and the associated microbiological data (i.e. cultured bacteria and antibiograms). Unfortunately however, this is not the case, not even in an ICU that utilises advanced computerisation. As such, the intensivist in charge returning to work on Monday, needs to investigate all infectiological details in a way a detective does, in order to be able to answer the following questions:

- Why was this antibiotic regimen chosen?
- Why was it changed after two days?
- What was the focus of this infection?
- Was this a firm diagnosis, or only a suspicion?
- Is there a positive culture?
- What was the severity of the infection?
- What is the resistance pattern of these cultured bacteria?
- Did the patient respond well to the initialised therapy?
- What is the radiological evolution?

Consulting all these different data sources, and trying to integrate this retained information into a comprehensive infection status of an ICU patient is therefore often a very time consuming and frustrating job.

Furthermore, in the absence of a readily available standardised infection overview, high quality infection data are lacking. These data however, are essential to implement an efficient nosocomial infection surveillance system and to perform advanced clinical research regarding infection control.

Solution

An advanced and user-friendly software application (named the COSARA project) was developed by a consortium of the ICU and Information Technology departments from Ghent University in order to alleviate some of these issues. COSARA

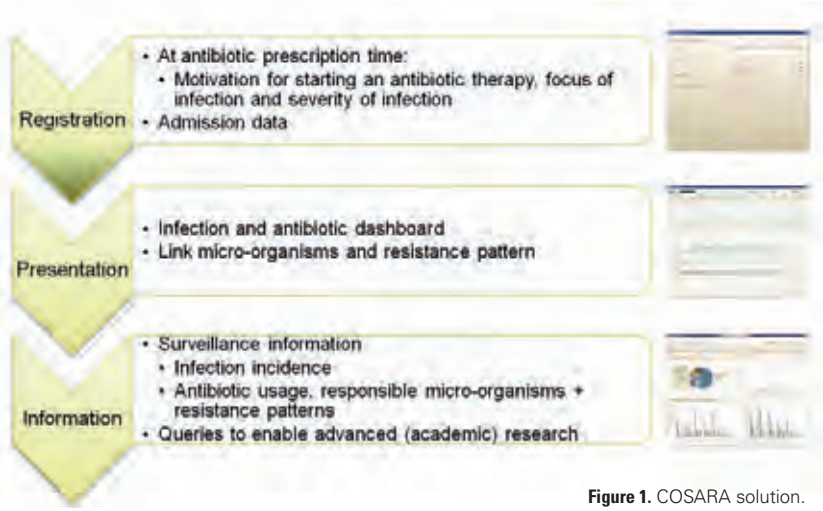

Figure 1. COSARA solution.

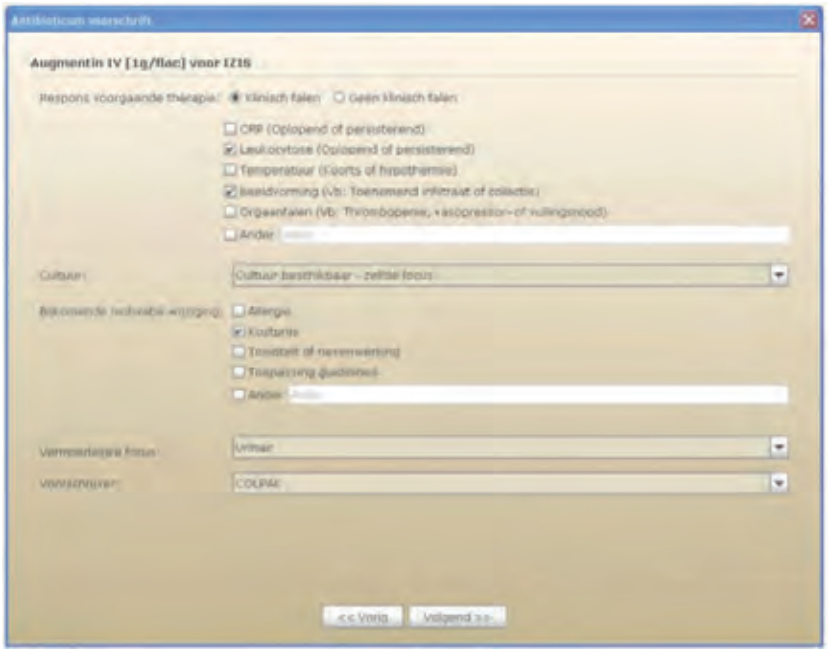

Figure 2. Pop-up screen at time of antibiotic prescription.

Figure 3. Infection overview tab.

is an acronym for "Computerised Surveillance and Alerting of nosocomial infections, Antimicrobial Resistance and Antibiotic consumption in the ICU".

The goals of COSARA are to support the intensivist in the daily workflow by automatic integration of all relevant infection related data from different data sources. Besides a continuously available up-to-date view on all parameters regarding the infectious management for every single patient, the application also provides high quality data surveillance data on the ICU level with respect to incidence, severity and focus of infections, antibiotic drug treatments and the micro-organisms involved, including their resistance pattern. These data are stored in a relational database and can be used for clinical research.

Implementation

In the COSARA project, three main software modules were designed: A registration module, a presentation module and an information module (Fig. 1, p. 39). These modules are integrated with the existing hospital information systems.

At the moment of a new prescription of antimicrobial therapy, popup screens appear in real-time on the PC monitor (Fig. 2) asking for a motivation for the start of this new therapy including the probable focus and the severity of infection. These pop-ups appear on the bedside or on the central PC monitor, depending on the workstation where the intensivist is prescribing the drug. There is no possibility to bypass these pop-up screens. As the registration maximally requires 20 seconds and does not require specialised training, the user acceptance is excellent, both by senior ICU physicians and by fellows in training.

The presentation module is the core of the COSARA software. In one single surveyable figureical view, the intensivist can consult the selected patients' current and past infections during his/her ICU stay, together with the associated antibiotic therapies (Figure 3). After linking of a certain infection with the related microbial data, the figureical view shows the responsible micro-organism and, only one click away, the related antibiogram. The patient's evolution of infectious laboratory parameters (i.e. CRP, WBC count), together with the automatically captured daily SOFA scores, are shown in a graphical way.

Without any delay in loading time, all available chest x-rays are available in another tab (Fig. 4, p. 42), and even the chest x-rays taken before ICU admission are shown.

In contrast to the presentation module, which is focused on the individual patient level, the information module (Fig. 5, p. 42) is entirely focused on the ICU unit level. Incidence of specific infections, antibiotic usage, responsible micro-organism and resistance pattern can be analysed together with their evolution over time. Furthermore, it is possible to perform very advanced and refined queries for academic research.

The benefits of COSARA are the potential to decrease the time to therapeutic intervention in case of infection (on

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the individual patient level), to decrease the intervention time for targeted infection control measures in case of outbreaks (on the ICU level) and to investigate accurately the impact of infection control programmes and antimicrobial exposure on the incidence of nosocomial infection and microbial ecology, taking into account a maximum of potential confounders. Eventually, the implementation of COSARA as a computer-based surveillance and alerting system will likely result in (1) less nosocomical infections, (2) reduced emergence of resistance, (3) better patient survival and (4) less costs for society.

Future Expansions

In a future version, COSARA will be extended to generate specific alerts indicating alarming trends in (i) nosocomial infection incidence, (ii) microbial ecology, and (iii) antimicrobial consumption, using expert based thresholds and longitudinal data analysis. Besides the alerts itself, COSARA will automatically provide the associated information in order to make the interpretation of every alert easy and efficient.

Another extension of COSARA will include the integration of a rule base-expert system assisting the intensivist with respect to the optimal choice and duration of antimicrobial therapies. Already in 1998, Evans [1] showed in an article in the New England Journal that a computerised anti-infectives management program can improve the quality of patient care and reduce costs. However, at that time, important technological barriers were still present, problems that are now solved within the COSARA software.

Conclusion

Advanced computerisation of the ICU has allowed the development of specific software (COSARA) designed to capture and integrate all data related to infection and antibiotic prescription in the ICU patient. These data are returned to the ICU physician as a comprehensive and up-to-date 'infection status' of the individual patient, assisting in daily decision-making. In addition, this software builds up a high-quality database, which provides a sound basis for infection surveillance and control policy as well as testing research hypotheses.

References available upon request,
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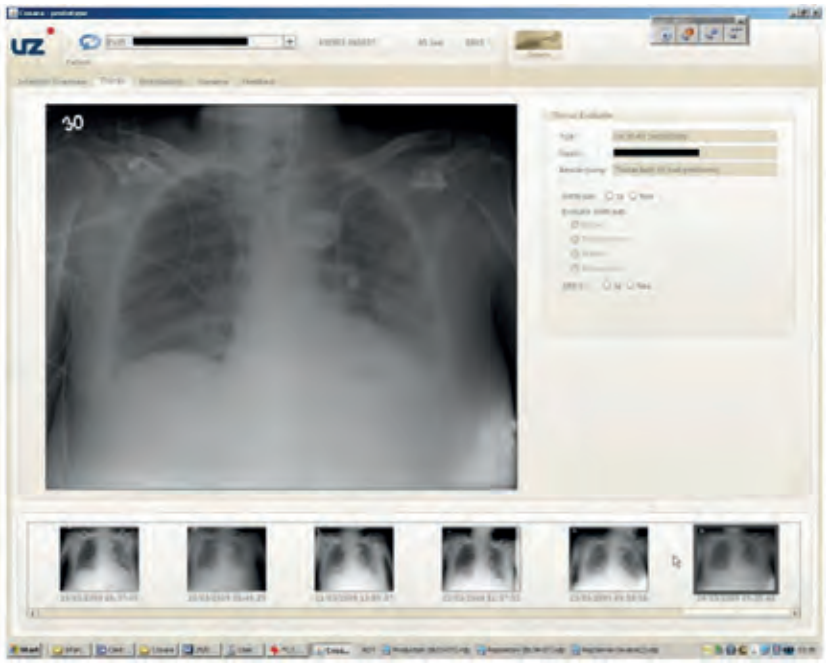

Figure 4. Thoracic radiography tab.

Figure 5. COSARA management module.

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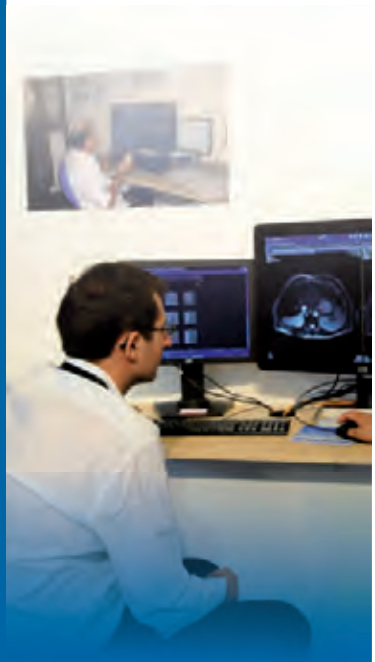

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HEALTHCARE SYSTEM IN CYPRUS

SOURCE

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Cyprus is the third largest Mediterranean island after Sicily and Sardinia, situated 60 km south of Turkey and 300 km north of Egypt. Cyprus is a divided island. In general, access to information concerning the northern part of the island is limited. Thus, this article refers to the Republic of Cyprus.

Population

Cyprus' estimated population is 730,000 of which 87.5 percent belongs to the Greek Cypriot community and 12.5 percent to the Turkish Cypriot community. Greek and Turkish are the official languages of the Republic but English is widely spoken and understood.

Mortality Rates

In 2001, Cyprus had a life expectancy at birth approximately equal to the EU-15 average for both males (76.1) and females (81) (WHO, 2001). Infant mortality has declined gradually and is now approximately equal to the EU-15 average of 4.94.

Health Trends

Traditional Mediterranean eating habits are being abandoned gradually in favour of fast-food based dietary habits that have contributed to the 44.3 percent male and 29.7 percent female obesity rate among Cypriots in 2001. Furthermore, 24.6 percent of men and 19 percent of women are overweight. There are significantly higher rates of obesity among male Cypriots. A study showed a paediatric obesity prevalence of 10.3 percent for males and 9.1 percent for females, with approximately 15 percent of both sexes defined as overweight. Tobacco consumption is extremely high though adult alcohol consumption is 8.96 litres per capita, lower than the EU-15 average of 11.69 litres.

Health System

The Council of Ministers has overall responsibility for the state's role in the social protection and healthcare system in Cyprus. It exercises this authority through the Ministry of Health and the Ministry of Labour and Social Insurance and, to a smaller extent, the Ministry of Finance. The Ministry of Health is responsible mainly for the organisation of the healthcare system in Cyprus and the provision of state-financed healthcare services. The Ministry of Health formulates national health policies, coordinates the activities of both the private and the public sector, regulates healthcare standards and promotes the enactment of relevant legislation. It is organised into various departments and manpower development institutes including:

(i) General Laboratory, which provides laboratory analysis services including inspection of food, water, medicine, police evidence and drugs investigations (but not services for clinical purposes);
(ii) Pharmaceutical Services, responsible for the testing, supply and pricing of pharmaceuticals, inspection of pharmacies, etc;
(iii) Medical and Public Health Services, responsible for services in the fields of prevention, primary, secondary and tertiary care;
(iv) Dental Services, and
(v) Mental Health Services.

Cyprus is a small country with a highly centralised public administration system. Public health services are provided through a network of hospitals, health centres, sub-centres and dispensaries. Most of the system's organisational, administrative and regulatory functions take place at state level; the lower administration levels cooperate with the central administration primarily for the implementation of public health and

Health Informatics in Cyprus

The Cyprus Society of Medical Informatics (CSMI) is a non-profit, non-governmental organisation based on the voluntary work of health professionals and computer scientists with a special interest in medical informatics. The purpose of the society is to promote the use of the telecommunications and information technology as a means to improve the services offered by the healthcare delivery system. One of the most effective ways to promote the use of information technology is to educate health professionals. Amongst the society's activities are the organisation of educational seminars, conferences, discussion groups and other activities that promote research, progress and enhancement of the application of information technology in the field of medicine.

Examples of Healthcare IT Projects in Cyprus:

- A Medical Device for Emergency Telemedicine: the Ambulance and Emergency-112 Projects;
- EROS: Evaluation of the Risk of Stroke by Telemedicine;
- TELEGYN: Diagnostic Telepathology Network – Application in Gynaecological Cancer;
- DITIS: Collaborative Virtual Medical Team for Home Healthcare of Cancer Patients, and
- HEALTHNET: Health Telematics Training Network.

Further information:
http://www.csmi.org.cy

health promotion initiatives. Yet, following recommendations, a reform of the Ministry of Health is under way. New departments are being established and the administration of public hospitals decentralised on the basis of modern systems of management and medical audit.

Financing & Health Coverage

There are five types of coverage:
(i) Public health provision;
(ii) Private health provision;
(iii) Funds for medical care by employers and trade unions;
(iv) Schemes for sponsored patients abroad, and
(v) Private health insurance schemes.

Presently, government provision of healthcare services is funded by general taxation, with the exception of a small part financed from charges imposed on some services. The financing scheme is expected to change with the implementation of the comprehensive National Health Insurance Scheme (NHIS), when financing healthcare services will be based largely on compulsory health insurance contributions. Social protection schemes, other than health, are financed by a mixture of income related contributions and general taxation. The social insurance scheme is financed by earnings-related contributions (16.6 percent of gross salary for employees, 15.6 percent for self-employed persons and 13.5 percent for the voluntary insured). The social pension scheme is paid out of general taxation and reviewed each year to take account of increases in wages and the cost of living.

TELE-HEALTH IN CYPRUS

Effectiveness of Remote Ultrasound for Ambulatory Patients

INTERVIEWEE

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What kind of background does Cyprus have in tele-health?

Telemedicine is evolving in Cyprus, with some forms of telemedicine in common practice in many fields of medicine throughout the country. Our aim is to incorporate telemedicine in everyday practice in Cyprus, especially as the whole island is covered with state of art telecommunications. Health technology projects already implemented in Cyprus include the following:

- RIS/PACS internet gateway system;
- Wireless emergency orthopaedics telemedicine system between Nicosia hospital & rural health centres;
- Mediterranean "OTELO" tele-echography project, " MARTE I", " MARTE II" and " MARTE III" projects;
- Echonet ultrasound network;
- Orthopaedic Teleconsultation Paraskevaidion (CY) & Shriner´s Hospital (USA) project;
- Telepathology network (TELEGYN);
- Emergency telemedicine (ambulance & emergency - 112) project;
- Oncology radiation therapy and radiation diagnostics (TELEPLAN and VIRTUOSO);
- Collaborative virtual medical team for home care of cancer patients (DITIS);
- Teleconsultation and teleradiology between medical centres in Cyprus in viewing and reporting cases and interactive participation of radiologists during the examinations.

Tell us about your collaboration with the University of Bourges, France, using robots to perform tele-echography.

Our collaboration with the University of Bourges/France began in 2003 as part of the OTELO project which involved satellite connection between Cyprus, France and Spain. My role was as physician operating the robot while specialists in two other countries performed the exam. It was repeated in 2005 with the MARTE I remote examination of patients in the rural hospital of Kyperounta by expert doctors in the radiology department of Nicosia General Hospital (2005) and in 2007 MARTE-II, the remote examination of volunteer patients on a cruise ship in the Mediterranean sea by expert doctors from Nicosia General Hospital and Bourges Hospital in France, using satellite communication (2007).

After the first two phases of the MARTE-I and MARTE-II projects both teams decided to continue their co-operation via the MARTE-III research programme. The cooperation between French and Cypriot researchers, expert doctors, partner organisations and sponsors was, from start to finish, of a very high standard. The project's lead organisations were the Cyprus University of Technology (CUT) and the University of Orleans (IUT), Bourges, France, with the University of Cyprus. The project started on January 1, 2008 and was completed on the April 30, 2010. The project was funded by the Cyprus Research Promotion Foundation under the auspices of the "Programme of Bilateral Protocols for Research and Technological Development" between Cyprus and France.

The MARTE-III project involved applied research in the field of mobile robotic tele-echography. The general aim of the project was to treat emergency patients in a moving ambulance, by the

Figure 1: Images from Marte IIII

performance of remote ultrasound exams from a central hospital, by clinical radiologist experts in cooperation with the paramedics in the ambulance. The expert doctor examines the patient directly using the MARTE system based on wireless telecommunications. In many cases, the expert concludes that the patient is not at all a patient, or the problem with his health is not so serious. So the MARTE system may act in many cases as a 'carrier of good news' and help streamline otherwise urgent workflow.

The "MARTE I" project was organised in collaboration between the University of Cyprus, the Higher Technical Institute of Cyprus and the University of Bourges and Nicosia General Hospital. My role in the project was to use a victim probe and conduct a teleradiological examination from Nicosia General Hospital in a patient settled at Kyperounta Medical Centre based in a rural area outside Nicosia. MARTE II in 2008 was similar and the patient was based on a ship outside the country and in 2010, MARTE III involved a patient based on a moving ambulance; in both projects I performed the ultrasound exam through a robot based in Nicosia General Hospital.

Tell us about the system that MARTE III uses. What were the requirements for its architecture & configuration?

The system consists of:

1) A specially equipped medical workstation on the expert's side, situated in the medical centre from where the expert doctor remotely performs tele-echographic exams and gives advice to the medical/paramedical staff in the ambulance for the support and treatment of the patient. The expert station in medical centre (central hospital) consists of:
   (i) The fictive probe and its accessories,
   (ii) The computer, which is connected to the fictive probe and
   (iii) Teleconferencing equipment (camera, microphone, screen, loudspeaker), through which there is optical and acoustic communication between the central hospital and the ambulance.
2) The specially equipped mobile workstation (on the patient's side in the ambulance) is used by medical/paramedical staff in the ambulance. This mobile workstation consists of:
   (i) The robot;
   (ii) The real probe, which is 'held' by the robot;
   (iii) The computer, which is connected with the robot and controls it;
   (iv) The teleconferencing equipment (camera, microphone, screen, loudspeaker), and

(v) The ultrasound device.

The motion of the fictive probe is transferred via the network which is formed by the expert's computer, the terrestrial and satellite link.

(3) The system also includes the computer of the robot in the ambulance;
(4) The robot, and
(5) The real probe (which is applied to the patient).

The ultrasound applied to the patient is transmitted via the network formed by:

(1) The teleconferencing system in the ambulance;
(2) The satellite and terrestrial networks, and
(3) The screen of the teleconferencing system on the expert's side (central hospital) where it appears on the screen of the teleconferencing system, for the expert doctor to be able to make the examination as if he were next to the patient. In this way the MARTE system safeguards the possibility of provision of high quality of emergency health services.

How are image acquisition, transmission and processing set up?

The methodology that was applied was the following: At the beginning an analysis of the various aspects of the project was performed so as to define the specifications and needs for equipment and software. Preliminary experiments were then performed using the vehicular satellite antenna, installation of the mobile unit in the ambulance, installation of the expert site unit in the central hospital (CUT telemedicine laboratory), connection of both systems and testing of the whole arrangement. Then the software was written according to the specifications and design of the new and improved model robot, called "Melody". Then the mobile workstation was installed in the ambulance as well as the installation of the necessary equipment in the central hospital, and connection between the two units and testing of the operation of the system made as a whole. Then the software was designed and finally the integrated experiment of examining volunteer patients in the moving ambulance was performed successfully from the telemedicine lab of CUT, which was acting as the central hospital.

Samples of the experiment's results were used for analysis of the ultrasound images and videos recorded during the experiments, giving emphasis on the quality of the transmitted images and videos. The main outcome, the successful operation of the system as a whole, with reception of high quality ultrasound images via satellite links, was achieved with excellent results.

How does tele-echography compare to traditional methods in accuracy and image quality?

The tele-echography system is not the same as traditional ultrasound. The major drawback is the lack of free movement of the probe on the patient's body, which using the robot can only be done in an X/Y axis plane. This limits the ability of the physician to check specific areas compared to the traditional method; however the areas of interest can be reached and diagnosed. The interruption of transmission in some cases during the examination also limits the accuracy of the method in the same time frame as traditional means. Image quality is slightly decreased for technical transmission and acquisition purposes, however it has continuously improved and now compares to the standards of traditional ultrasound machines. Overall the examining physician, if trained, can establish a general diagnosis using these systems, covering most of the scenarios under interest.

Is this new digital means of diagnosis cost-effective compared to traditional methods?

This means of diagnosis involves certain extra costs that are not needed for traditional ultrasound exams. Currently the robot system costs approximately 50,000 euros for experiments, while a basic ultrasound machine and the transmission system are also needed at the patient location and the basics (victim probe, etc.) in the diagnostic centre where the examination will be perfomed. In these terms, tele-echography seems not to be cost-effective; however the consideration of the particular circumstances of the use of these methods is imperative since under certain scenarios teleradiology is the only mean of establishing a basic urgent diagnosis and moreover the transfer of every such patient to specialised centres is not only impossible at certain times (e.g. as in the case of ship passengers) but costly as well, as is the cost of hiring expert radiologists in centres located in distant areas.

How is the patient's consent being obtained, and how is their digital privacy being protected?

The patient's consent is a major legal issue in the field, and in our projects was obtained after the remote examining physician informed the patient via teleconference and the patient signed his/her consent form in the presence of an assistant or other physician based at the patient's location (this was only required in the "MARTE I" project where real patients took part at Kyperounta rural medical centre. The patient's privacy is protected as in other medical examinations firstly with the presence of authorised personnel in both places involved in the examination. The digital data are encrypted and protected throughout their transmission.

At the time they are not saved in a system such as PACS but in the future they will be protected with same means as digital CT or other imaging exams stored in PACS, in an encrypted form that needs the authorisation code of professionals in orderto be viewed.

Are physicians and patients happy and confident with this remote method?

Physicians seem to be satisfied with this method, and confident that besides various issues in its implementation it is continuously improved and will hopefully reach the standards of traditional practice. Patients are sometimes hesitant about the accuracy of the method, but are willing to participate and are finally happy with the results, especially in those emergency scenarios tested through some of our projects.

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