IMAGING
Management

Promoting Management and Leadership in Medical Imaging

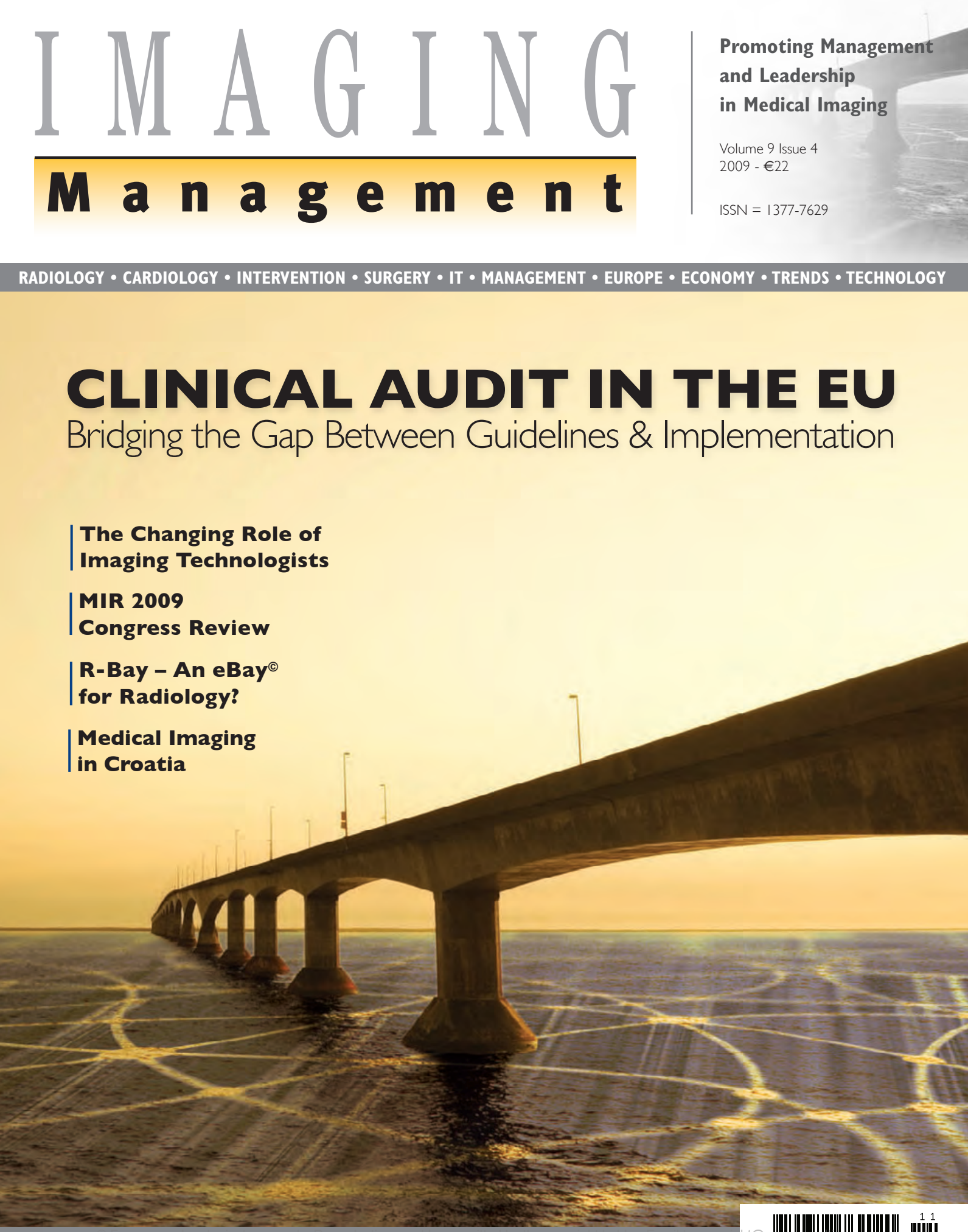
Volume 9 Issue 4
2009 - €22

ISSN = 1377-7629

RADIOLOGY • CARDIOLOGY • INTERVENTION • SURGERY • IT • MANAGEMENT • EUROPE • ECONOMY • TRENDS • TECHNOLOGY

CLINICAL AUDIT IN THE EU

Bridging the Gap Between Guidelines & Implementation



www.imagingmanagement.org

you can

Canon

Devotion to Motion
Canon Dynamic DR

New Dynamic Portable DR*

Canon's Dynamic Portable DR System is the world's first DR system to incorporate a Portable Flat Panel Direct Digital X-ray Detector capable of acquiring both fluoroscopic as well as static radiographic images. This unique system enables a variety of advanced imaging applications in a single general X-ray room, maximizes its true potential and your return on investment.

medical.canon-europe.com/X-Ray

Imaging the next move

*Work in progress

Prof. Iain McCall

Editor-in-Chief

editorial@imagingmanagement.org

Dear Readers,

The concept of auditing the quality of care provided by a healthcare facility and of clinical outcome, is not a new one. However, in a number of countries the importance of auditing clinical work has risen rapidly up the agenda and is now included as a quality standard for healthcare facilities. Evidence of involvement in the audit of the quality of care is also likely to be one of the factors taken into account in the revalidation of specialists, where this is being introduced by national governments.

For clinical audit to be of value, it must be structured. Radiological practices, procedures and outcomes must be measured against agreed standards of good radiological practice, and the full audit cycle completed. The audit cycle initially identifies the quality of one's own performance and potential reasons for limitations of performance. A series of recommendations will then be made and a plan of action plotted to implement changes to raise the level to the expected standard. Finally, a re-audit is undertaken to define whether these changes have been successful. Audit is therefore an ongoing and continuous process, which must involve all personnel in the department to ensure total ownership by the team.

The European Union has recently addressed the issue of clinical audit in relation to the EURATOM directive 97/43, which stipulates that EU member states are required to implement clinical audit 'in accordance with national procedures'. Despite the 10 years that have passed since the directive, implementation of clinical audit at a national level has been variable and not comprehensive.

The EU has now developed guidelines for clinical audit that have been subjected to rigourous critical reviews by major scientific professional organisations and further introduced and discussed at an international workshop. These guidelines are designed to assist in the implementation of clinical audit at a national level and produce a degree of uniformity into the process. The European Society of Radiology (ESR) has also established an audit and standards committee to assist radiologists and radiology departments to implement clinical audit. It may also be possible in future to undertake multicentre audits to increase the harmonisation of services.

This edition of the journal includes four articles by authors who have been closely involved in these initiatives, to throw further light on recent developments in clinical audit. These stories highlight the main issues from surveying which countries are most active in implementation of audit at present, to examining why it is not yet fully integrated across the EU. Undoubtedly, clinical audit will cease to be optional and will increasingly become a requirement to satisfy the regulatory authorities and our patients that the quality of care we provide is of a high standard. It is incumbent on us all to embrace this process.

As usual, we welcome your thoughts and feedback. Please send your comments to editorial@imagingmanagement.org

Prof. Iain McCall

www.shimadzu.eu
medical@shimadzu.eu

Shimadzu Europa GmbH
Albert-Hahn-Str. 6-10
47269 Duisburg, Germany

Phone +49 - 203 - 7687-0
Fax +49 - 203 - 7687680

Brilliant

BRANSIST safire – outstanding image quality

www.shimadzu.eu

The unique and brand-new BRANSIST safire digital x-ray angiography system family provides outstanding high-quality clinical images to support safer and quicker intervention procedures. This is achieved particularly with the latest in flat panel detector (FPD) technology called "Direct-conversion."

Through flexible system configurations, BRANSIST safire meets perfectly the needs of today's clinical demands: it is available with a 9 inch or 17 inch FPD, as ceiling or floor mounted version, or even as a bi-plane system.

Functions and features such as 3D-imaging, No Mask DSA, SYNCHRONAVI, SUREengine Image Enhancement and CT-like imaging support the full range of intervention applications. BRANSIST safire provides flexible system operation, fast digital image processing and patient comfort:

- Outstanding image quality achieved particularly by "Direct-conversion" FPD
- High-speed response and various applications ensured by latest digital technology
- Fast, easy and precise C-Arm positioning up to 60 degrees per second
- Advanced dose management ensuring safety of patients and operators.

BRANSIST *safire*

SHIMADZU
Solutions for Science
since 1875

IMAGING Management
Volume 9 Issue 4, 2009

Cover Story: Clinical Audit in the European Union

Healthcare Economics

Features

CONTENT

IMAGING Management
Volume 9 Issue 4, 2009

Country Focus – Radiology in Croatia

First Hospital in the UK Trials Using 3D Imaging for Breast Cancer Screening

New Technique Could Save 12,000 Lives a Year

Breast tomosynthesis, a new three-dimensional (3D) digital x-ray technology for breast cancer screening and diagnosis, is being trialled at King's College Hospital (London, UK), the first national hospital in the UK to undertake this kind of trial. If successful, 3D breast imaging could offer new hope in the fight against breast cancer.

King's College Hospital is one of the UK's largest and busiest teaching hospitals, with over 6,000 staff assisting around 700,000 patients a year.

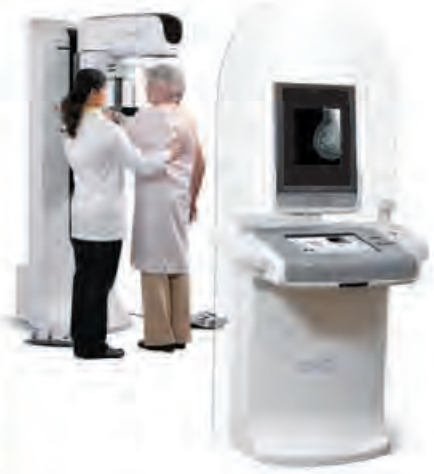
With around 46,000 women diagnosed with it and causing over 12,000 deaths in the UK each year, breast cancer is the commonest cancer in the country. This trial will hopefully prove that 3D technology can assist doctors in reducing the numbers of not only the estimated 70 - 80,000 women every year who are wrongly told that something unusual has been found, as well as the small number of women mistakenly given an all-clear.

The system used in the trial is a Hologic Selenia Dimensions breast tomosynthesis system, now commercial in Europe and other areas of the world and in the process of gaining FDA approval in the US.

2D IMAGING SHOWS ROOM FOR IMPROVEMENT

At present, two-dimensional (2D) mammography is the standard breast x-ray used in the UK. Although recognised as safe and reliable in detecting the early signs of cancer, the so-called 'anatomical noise' associated with 2D imaging can sometimes hide cancers, or produce shadows that falsely create the suspicion of cancer. The new technology at King's enables doctors to look at separate 'slices' of the breast. Some cancers remain undetectable with 2D technology. The trial hopes to prove the efficacy of 3D in overcoming this deficiency.

In March King's College hosted the first ever hands on breast tomosynthesis users training meeting attracting radiologists from tomosynthesis sites throughout Europe.



The Selenia Dimensions breast tomosynthesis system looks much like a conventional 2D mammography system, but generates 3D images.

2D VERSUS 3D IMAGING

Breast tomosynthesis is a three-dimensional imaging technology that involves acquiring images of a stationary compressed breast at multiple angles during a short scan. The individual images are then reconstructed into a series of thin high-resolution slices that can be displayed individually or in a dynamic ciné mode.

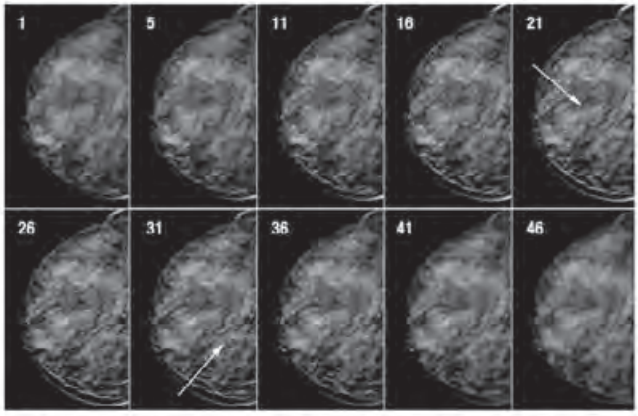
Reconstructed tomosynthesis slices reduce or eliminate the problems caused by tissue overlap and structure noise in single slice two-dimensional mammography imaging. Digital breast tomosynthesis also offers a number of exciting opportunities including improved diagnostic and screening accuracy, fewer recalls, greater radiologist confidence, and 3D lesion localisation.

Dr Michael Michell, Director of Breast Screening at King's, has this to say about the developing technology:
"This is exciting new technology, which could improve the accuracy of breast cancer screening and help save more lives by detecting more breast cancers when they are small and at an early stage, when they can be more effectively treated."

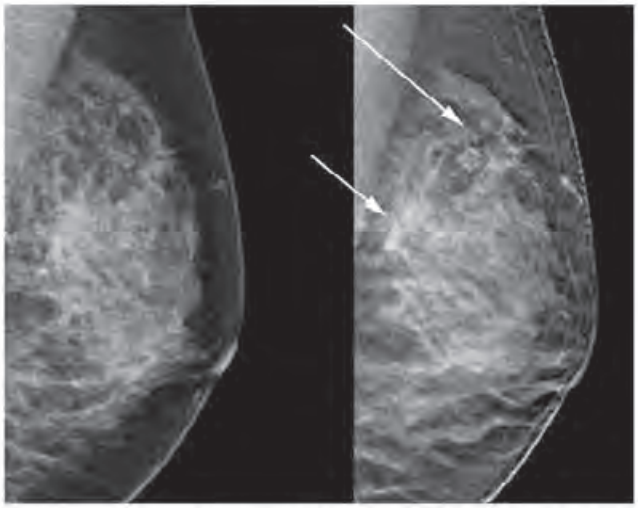
"In human terms this technology could spare a lot of women a lot of heartache, and also save the NHS [National Health Service] valuable resources through people not having to attend follow-up appointments and undergo further tests."

Mrs Sarah Sellars, Assistant Director of NHS Cancer Screening Programmes, added:
"The NHS Breast Screening Programme welcomes research into the use of new technology for screening and we await the outcome of this study with interest."

The trial use of digital breast tomosynthesis at King's has been authorised by the hospital's Ethics and Research and Development committees. The clinical results of the trial at King's will be considered by the NHS Breast Screening Programme.



Tomosynthesis slices reveal objects lying at differing heights in the breast, such as cysts and calcifications shown by arrows.



Infiltrating lobular carcinoma and multifocality not seen well in a conventional 2D mammogram (left image) is visible with 3D breast tomosynthesis (right image).

News

EUROPE

Swedish Presidency Seeks to Strengthen Knowledge Triangle

The Swedish presidency plans to encourage interaction between education, research and innovation by promoting better coordination between these three sides of the 'knowledge triangle'. Of the three points of the triangle, the presidency plans to focus specifically on the role of education.

Dr. Jan Potocnik described the complex role that must be played by European universities in building the knowledge triangle, and emphasised the need for stronger collaboration at European level in terms of funding agencies, student mobility, mutual recognition of curricula, European doctoral training, professionalisation of university managers, development of a code of good practice for international cooperation and opening up recruitment to international staff and students.

On the subject of organising, connecting and funding graduate schools in the EU, he cited the example of the European Institute for Innovation and Technology (EIT), whose Knowledge and Innovation Community, he said, is a concept that emerging institutions should consider following.

Dr. Potocnik also reiterated his belief, expressed earlier this year at the Competitiveness Council, that more strategic and relevant research funding could be better achieved if funding institutions had in hand common guidelines for 'responsible external research funding'. The Commissioner stressed that for the research base to thrive in Europe, its universities must remain dynamic; universities, research institutions and business should make every effort to interact, cooperate, compete, develop and excel. 'Innovation capacity allied to higher education capability - this is what makes the world go round these days,' he said. According to Dr. Kranz, Sweden has called for a shift in the EU budget from agricultural subsidies to research investments. "But we also need each Member State to invest more, because the pluralism of research funding on the European continent is one of our big advantages,' he said.

For more information, please visit:

- Swedish Presidency of the European Union: **http://www.se2009.eu**
- European Institute for Innovation and Technology: **http://eit.europa.eu**

RESEARCH

Eurostat Figures Show Growth in Research Funding

Recent figures from Eurostat on research spending across the European Union show a growing trend in research investment. In 2007, the EU spent 229 billion euro on research and development (R&D), equivalent to 1.85% of Gross Domestic Product (GDP). The EU has set itself the goal of spending 3% of GDP on R&D by 2010; however, spending has remained stable at around 1.85% of GDP over the past few years.

For comparison, the US spent 2.67% of GDP on R&D in 2007, and in 2006 (the latest year for which data are available), Japan spent 3.40%. In 2007, just two countries spent over 3% of GDP on R&D: Sweden and Finland spent 3.60% and 3.47%, respectively, although even these nations spent less than they had in 2005. A further four countries (Denmark, Germany, France and Austria) spent over 2% of GDP on R&D in 2007.

The countries that have increased their R&D spending the most since 2001 are Austria (which increased its spending from 2.07% in 2001 to 2.56% in 2007), Estonia (0.71% to 1.14%) and Portugal (0.80% to 1.18%). However, 10 EU Member States still spend less than 1% of GDP on research, and of these, Bulgaria, Cyprus and Slovakia all spent less than 0.5%.

On the employment front, some 2.3 million people (full-time equivalent) were involved in R&D work in the EU in 2007. In addition to researchers, this figure includes research managers, administrators and clerical staff. These R&D personnel made up 1.6% of the EU's workforce. As with R&D spending, there are immense differences between the Member States. In Finland, R&D personnel account for 3.2% of total employment. R&D personnel make up over 2% of employment in Denmark, Luxembourg, Austria and Sweden. In contrast, they account for less than 1% of employment in Bulgaria, Cyprus, Poland, Portugal and Romania.

For more information, please visit:

- Eurostat: **http://epp.eurostat.ec.europa.eu**
- EU 'Investing in European Research' web pages: **http://ec.europa.eu/invest-in-research/index_en.htm**

Call for Proposals for Marie Curie Initial Training Networks Launched

The European Commission's Directorate-General for Research is calling for proposals for Marie Curie Initial Training Networks (ITNs). In support of training and career development for researchers, the action addresses joint-research training networks in the form of either multi- or mono-partner ITNs. Multi-partner ITNs require at least three participants from three different Member States or Associated Countries. Mono-partner ITNs, on the other hand, are composed of just one single participant in a Member State or Associated Country and a network of associated partners. The indicative budget of this call for proposals amounts to 243.79 million euros. The deadline for submitting proposal is 22 December 2009.

Full details of the call are available at: **http://cordis.europa.eu/fp7/calls**

CORPORATE UPDATE

Bayer to Partner With Algeta for Radiopharmaceutical Agent

Bayer Schering Pharma has entered into a global agreement with Algeta, to develop and commercialise Alpharadin. Alpharadin an alpha-emitting radium-223-based radiopharmaceutical, is being tested in the ALSYMPCA (ALpharadin in SYmptoMatic Prostate CAncer) clinical trial to determine the efficacy and safety of the compound in 750 patients with symptomatic hormone-refractory prostate cancer (HRPC) and skeletal metastases.

An upfront payment of 42.5 million euros will be augmented by certain cash payments depending on the achievement of certain development, manufacturing and commercialisation milestones totaling up to 560 million euros, according to Bayer.

>Continued on page 12

12TH ANNUAL **MANAGEMENT IN RADIOLOGY (MIR) CONGRESS**

Making Imaging Relevant

The 12th edition of the annual Management in Radiology (MIR) congress, a professional meeting aimed at leaders, practitioners, managers and administrators of radiology departments worldwide, took place in Riga, Latvia from 30 September until 2 October, 2009. The meeting experienced a large boost in the number of attendees, compared with previous years, with a large number of local participants from the Baltic States, and shows that management is gaining ground as a stand-alone topic amongst today's increasingly business-oriented healthcare leaders, including radiologists. Following on from the success of MIR's first annual junior workshop for radiologists interested in healthcare business and management topics, which took place this summer in the UK, the Riga congress attracted top presenters to share their thoughts on important subjects pertinent to the working lives of chairmen of medical imaging departments.

Chairman Assembles Information-Rich Programme

For the third year in succession since she first took up the mantle of chairman of MIR, Dr. Nicola Strickland put together an incisive and comprehensive programme of management-focused presentations. Representatives locally and from abroad enjoyed lively debates on topics such as regulations and standards in teleradiology, managing imaging IT, and what was largely perceived to be the most valuable and entertaining session of the programme: "A Management Decision Which has Made a Difference to Managing our Imaging Department", conceived and chaired by Prof. Philip Gishen, and debated by eight of the world's most senior medical imaging experts, including Prof. Jim Thrall (US), Prof. Michel Claudon (FR) and Prof. Maximilan Reiser (DE).

The session was followed by an equally engaging discussion of the threats faced by nuclear medicine today: representatives of the European Association of Nuclear Medicine (EANM) and other related bodies were present to debate issues such as who should have control of nuclear medicine, the radiologist or nuclear medicine physician, and how thus to develop a curriculum to educate young specialists with an interest in the discipline.

Does Radiology Have an Image Problem?

The 2009 MIR Congress was subtitled "Making Imaging Relevant": an important alternative definition of the MIR acronym. A recurrent topic that threaded through many of the sessions is the growing need for radiologists to initiate and value closer links with their clients. This closer relationship between the radiologist, their scientific colleagues and, crucially, the patient, is intended to combat the impression that radiologists merely generate imaging reports. Many sessions questioned the present tendency to hand more roles to radiographers, without first increasing the standards of radiographers' professional education to meet an expanded workload with respect to patient safety. The sessions also emphasised concerns over the perceived passivity of radiologists in considering how peers and the public view their work. The major concern is that a lack of recognition for the work and expertise of the radiologist amongst the scientific community may undermine and ultimately fragment the field.

Threats to Leadership in Radiology: The EU and US

Present as a representative of the European Society of Radiology, Prof. Luis Donoso (Spain), gave a talk on the new and intense focus






of the ESR on radiology and the European Institutions. Introducing the new ESR webpage that aims to disseminate information on the various topics of interest specifically to the imaging community, from the working time directive to training and education, the talk had much to say about why radiologists should pay attention to legislative developments. This was followed by a talk from Prof. Steven Baker (US) on the challenges being faced by radiologists in the US, touching on topical issues such as public versus the private sector, and access to medical imaging by patients.

Outstanding Social Events

The MIR congress in Riga was the culmination of three years of shaping and planning by local organiser Dr. Mara Epermane from Valmiera, Latvia, who received well-deserved thanks for her role in promoting the congress locally and for organising an outstanding and unique evening entertainment programme, including a special gala dinner held inside the museum of modern art in Riga, which enabled attendees to peruse Latvian art following a wonderful local dinner, accompanied by a very talented band of jazz singers. Dr. Epermane was also responsible for coordinating a presentation at the beginning of the congress on the many diverse economic and fundamental challenges being faced by medical imaging in the Baltic States, featuring luminaries from the national radiology societies in the three countries of that region. These include a decreasing and rapidly aging population, funding problems within the national reimbursement systems and a lack of technological parity compared with other EU states.

Registration Now Online for MIR Annual Winter Course

Aside from the congress, MIR has just opened up online pre-registration for its annual winter course, to be held near Schladming in Austria, from 14 – 16 January, 2010. As usual, a set programme of structured interactive workshops by experts in healthcare management will be offered to attendees. This course traditionally receives great feedback from attendees, and continues to increase its reputation for high quality content. More information on this and other activities are available at **www.mir-online.org.**









News

>*Continued from page 8*

Siemens Tout Simpler MR Breast Software

Siemens has developed new diagnostic reporting software for breast imaging in MRI. The syngo BreVis diagnostic reporting software shows all of a patient's examination results in a single view – e.g, ultrasound or radiography images next to MRI images – not possible with previous technology. Additionally, the physician can use syngo BreVis Biopsy interventional software to plan and perform a biopsy when needed.

Matrox Announce New RAD LPX Series

Matrox have introduced a new "Low Power, Low Profile, eXtended function" RAD LPX Series of display controller boards for space, budget and energy sensitive healthcare enterprises and medical imaging professionals. Designed to extend the life of the RAD Series, the RAD LPX line offers several additional features.

Sectra Launches Newsroom

Sectra has launched a dedicated newsroom. The newsroom presents articles, trend coverage and information within the medical imaging field, focusing in particular on such areas as wide area radiology and dose awareness within mammography. The site can be found on newsroom.sectra.com, and is designed to provide customers, press and media with online news about hot topics and trends within medical imaging.

GE and TomTec to Cooperate on Project

GE Healthcare and TomTec Imaging Systems, a developer of 2D/3D/4D imaging and quantification technologies, have entered into a formal cooperation contract for echocardiography.

The companies will integrate TomTec's CardioArena programme for analysis of 2D/3D/4D data into GE's cardiology IT solutions portfolio, Centricity. Munich-based TomTec said its clinical application packages are available for the visualisation and quantification of the left ventricle, right ventricle, mitral valve, vascular measurement and arterial health and 2D image review and measurements.

Vital Hire AGFA Executive

Vital Images has named Erkan Akyus as executive vice president of engineering. He will be responsible for product development. Vikram Simha will continue as chief technology officer (CTO). Akyuz was most recently with Agfa HealthCare, where he served as CTO for several years where he led the imaging informatics and radiology IT business units.

Carestream Install DRX-1

A Carestream DRX-1, a wireless, cassette-size detector, has gone into service at the Countess of Chester Hospital in Cheshire in the northwest of England. The Countess of Chester is a 580-bed NHS Foundation Trust hospital catering for more than 400,000 patients a year. The radiology department was already using a Carestream DR 9500 and DR7500, leaving 'room six' as the only non-digital exam room. With the installation of the DRX-1, the Countess of Chester has now gained a DR-enabled room that combines low dosage radiation, wireless operation and higher quality images.

ProStor Systems Announce New Storage Device

ProStor Systems has announced the general availability of the new ProStor InfiniVault Model 5. This is designed to meet the storage needs of small-to-medium businesses that may have two different data retention requirements, and where two copies of data are necessary for disaster protection. The new model is an integrated storage appliance in a tower design with five slots for RDX removable disks and a 1.8TB file area that can manage 250 million files. Using 500GB removable disk cartridges, it can keep 2.5TB (5TB compressed) of data online (in RDX removable disk cartridges) and an infinite amount of data capacity offline.

Philips Upgrade Allura Solution

Philips have launched a new upgrade programme for its Allura Xper devices. The complimentary upgrade will be provided globally to more than 2,000 customers with the necessary agreements. All other Philips cardiovascular customers will be able to purchase this upgrade, which includes sophisticated remote technologies for remote proactive support, enabling Philips to automatically monitor each system and send alerts when issues arise.

Hologic Gets Approval for Integrated Imager

Hologic has received CE marking approval for its ThinPrep® integrated imager. The integrated imager for cervical cancer screening combines ThinPrep imaging technology and slide review into a single stand-alone device. As the majority of laboratories in Europe would fall into the small or medium category, this allows laboratories of all sizes to benefit from the clinical advantages of ThinPrep imaging for cervical screening.

Canon Celebrates Production of 10,000th DR System

Canon has celebrated the 10,000th CXDI digital radiography system to be manufactured, an accomplishment that was reached over a period of ten years and nine months, beginning with the launch of the CXDI-11 in December 1998.

Fujifilm Announces First EU Military Deployment of Synapse

FUJIFILM will undertake the first deployment of the company's Synapse™ PACS® at an American military medical environment in Europe. The

European Regional Medical Command (ERMC) has selected Fujifilm's Synapse PACS to replace its legacy PACS system, providing a fully integrated, web-based solution. This will provide enhanced communication between ERMC's hospital and clinics and a fully virtualised environment – the first for a Department of Defense (DOD) health centre in Europe. The European Regional Medical Command at Landstuhl Regional Medical Centre provides care to American soldiers serving in Iraq and Afghanistan. Twenty ERMC satellite clinics also practice throughout Germany, Belgium and Italy. These clinics include the NATO army health clinic in Brussels, Belgium. In addition to Synapse PACS, the facilities use Fuji Smart CR and XG5000.

ASSOCIATION NEWS

CARS Congress 2010 Announced

The CARS Congress Organising Committee invites you to be part of their congress which will be held in Geneva, Switzerland from 23 – 26 June, 2010. The congress is aimed at those who work in the fields of radiology, surgery, engineering, informatics and/or healthcare management and have an interest in topics, such as

- Image guided interventions;
- Medical imaging;
- Image processing and visualisation;
- Computer aided diagnosis;
- Surgical simulation;
- Surgical navigation and robotics;
- Model-guided therapy, and
- Personalised medicine.

New PACS applications, including IT-infrastructures adapted for surgery, as well as related results from the DICOM and IHE working groups, are also within the scope of CARS. Recent successful CARS congresses have taken place in Berlin, Paris, Tokyo, San Francisco, London, Chicago, Osaka and Barcelona. The congress will be held in conjunction with the annual meetings of ISCAS, EuroPACS, CAR, CAD and CMI societies. Please note that the deadline for paper and abstract submissions for CARS 2010 in Geneva is January 11, 2010.

Further information is available at: **www.cars-int.org**

New Standards of Practice Initiative for IR

CIRSE has created a Standards of Practice (SOP) Committee to produce evidence-based guidelines for interventional radiologists to enable the standardisation of practice for interventional procedures across Europe. Quality Assurance (QA) guidelines attempt to define principles that should assist in producing high quality care. They are obtained by analysing the data available in the scientific literature. Other sources of information may be used in conjunction with these principles to produce high quality medical care, which is our ultimate goal. These standards or QA guidelines may take the form of one of three types. They may be documents that have been adapted from previous Society of Interventional Radiology (SIR) guidelines; they may be new guidelines produced by CIRSE or they may be new documents produced as joint ventures between CIRSE and SIR Members.

The Society of Interventional Radiology (SIR) has already done extensive work in the US on this subject and published the resulting documents in the Journal of Vascular and Interventional Radiology. It was decided that CIRSE should review the standards set by the SIR and, when possible, adapt them for European interventionalists. CIRSE is most grateful to SIR, for the permission to use their data. Current guidelines are available for download on **www.cirse.org**

ECRI Member Wins Achievement Award

ECRI Institute has announced that Dartmouth-Hitchcock Medical Center of Lebanon, New Hampshire, US, is the winner of the fourth annual Health Devices Achievement Award for excellence in health technology management. The Health Devices Achievement Award recognises an outstanding initiative undertaken by an ECRI Institute member healthcare facility that improves patient safety, reduces costs, or otherwise facilitates better strategic management of health technology.

Dartmouth-Hitchcock's winning submission, "A Multidisciplinary Approach to Improving Patient Safety in the Adult Medical/Surgical Population through Earlier Detection of Patient Deterioration Using Surveillance Monitoring" describes an initiative designed to decrease failure to rescue (FTR) events - instances of severe patient harm (such as death or disability) that occur because a serious deterioration in the patient's condition is not detected in time. The project was designed to reduce FTR events through a new application of pulse-oximetry monitoring: using it continuously from admission to discharge. The primary goal was to enhance nurse surveillance in the postoperative setting. A secondary goal was to reduce the number of "nuisance alarms" which tend to desensitise nurses to alarms. Nurse satisfaction with the new surveillance tool was reported to be very high, and preliminary analysis indicates that the initiative has contributed to decreases in annual rescue calls and transfers to critical care.

More information is available at: **www.ecri.org.uk**

IHE Advancing in Key European Programmes

The past year saw substantial advances across e-health projects in Europe as regional, national and European-level programmes reported moving from strategy development to deployment. Two days of presentations during the recent European Connectathon in Vienna provided a panorama of progress with updates and profiles of best practices. As 230 engineers and programmers ran hundreds of tests for interoperability between new e-Health systems and devices in an adjacent workroom, speakers in a workshop programme organised by IHE-Austria highlighted projects moving forward that all share IHE processes and tools.

Four other countries, Denmark, Poland, Turkey, and Switzerland, are currently in the process of joining IHE-Europe, and Switzerland sent a special delegation to the Connectathon in Vienna to observe the live testing.

More information is available at: **www.ihe-europe.net**

CLINICAL AUDIT IN THE EUROPEAN UNION

Bridging the Gap Between Guidelines and Implementation

Author
Hannu Järvinen

Principal Advisor for Radiation in Healthcare
Radiation and Nuclear Safety Authority (STUK) Radiation Practices Regulation
Helsinki, Finland

hannu.jarvinen@stuk.fi

The concept of clinical audit is not a new one, but has long been applied in some healthcare practices. The European Commission (EC) directive 97/43/EURATOM (MED) introduced this concept for the assessment of medical radiological practices. The MED-directive defined clinical audit as:
"A systematic examination or review of medical radiological procedures which seeks to improve the quality and the outcome of patient care through structured review, whereby radiological practices, procedures and results are examined against agreed standards for good medical radiological procedures, with modifications of the practices where indicated and the application of new standards if necessary".

It is clear from this definition, that clinical audit ought to be a multidisciplinary activity.

EU Member States are required to implement clinical audits "in accordance with national procedures" (Article 6.4 of the MED). By now there has been high variation between the approaches of the Member States in its implementation and therefore, further guidance has been deemed necessary.

In 2007 - 2008, the EC conducted a special project to review the current status of implementing clinical audit in the Member States and to provide guidance on clinical auditing for an improved implementation of Article 6.4 of the MED. The project consortium was led by the Radiation and Nuclear Safety Authority (STUK), Helsinki, Finland, and other partners together with a scientific panel of experts representing hospitals, European or national professional societies, authorities and auditing experts from ten European countries. Before submission to the EC, the draft guideline was subjected to critical reviews by major scientific professional organisations and further introduced and discussed in an international workshop.

Status of Audit Implementation in Europe

The status of the implementation of clinical audit was reviewed by a questionnaire sent to the Member States, including some candidate and associated states. About 80% of them replied. The results confirmed the earlier findings about the diversity of approaches to clinical auditing and the lack of practical implementation in several Member States.

While in some countries a systematic approach to clinical audit had been established (e.g. in the UK, Germany, France and Finland), in most countries clinical audits were only occasional or had not been implemented in practice. Several problems were identified: incomplete national legislation, poor understanding of the purpose of clinical audits, lack of formal framework of auditing, lack of criteria for standards of good practice and practical problems of implementation such as financing of audit work. In some countries, clinical audit seemed to be confused with internal quality assurance programmes or external assessments such as accreditation and regulatory inspections.

EC Guideline on Clinical Audit

The EC guideline provides a general framework for the Member States in order to establish sustainable national systems of clinical auditing of radiological practices (e.g. diagnostic radiology, nuclear medicine and radiotherapy). It is sufficiently flexible and will enable Member States to adopt a model of clinical audit with respect to their national legislation and administrative provisions.

The guidance introduces the basic principles of clinical audit (objectives, coverage, standards of good practice, etc.) aimed at clarifying its profound meaning and recommended application. It defines the topics that should be covered while the criteria of good practice are discussed only on generic levels. It discusses the interrelation of clinical audit with other audit systems such as certification of quality systems, accreditation, peer review and quality award, and also its interrelation with regulatory control. Finally, it gives general advice for the practical implementation of audits, including organisation of audits, recommendations for auditors, models of financing, national coordination and the role of scientific and/or professional societies and regulatory authorities.

Table 1. The priorities of clinical audit of diagnostic radiology practices

Structure	• The mission of the unit carrying out radiological practices • Lines of authority and radiation safety responsibilities • Staffing levels, competence and continuous professional development of staff, in particular for radiation protection • Adequacy and quality of premises and equipment
Process	• Justification and referral practices, including referral criteria • Availability and quality of examination guidelines (protocols, procedures) • Optimisation procedures • Patient dose and image quality and comparison of patient dose with nationally-accepted reference levels • Quality assurance and quality control programmes • Emergency procedures for incidents in use of radiation • Reliability of information transfer systems
Outcome	• Methods for the follow-up of outcome of examinations

It is important to recognise that the EC guideline is not an obligatory, or legal requirement. It will only give recommendations and highlight some possible "national procedures" as expected by the MED. However, the general framework that is published in the EC guideline is well supported by other international and national developments, e.g. the practical guides published by the International Atomic Energy Agency (IAEA) or the AuditLive system in the UK.

Essentials of Clinical Audit

The general purpose of any clinical audit is to:
- Improve the quality of patients' care;
- Improve the effective use of resources;
- Enhance the provision and organisation of clinical services, and
- Further professional education and training.

Clinical audit should thus address the structure, process and outcome of practices. For diagnostic radiological procedures, the priorities should be as shown in Table 1 *(see above)*. Clinical audit should be a continuous activity for quality improvement.

Both internal audits (where auditors come from inside a given healthcare unit) and external audits (where auditors come from outside the unit) should be implemented. These are of equal importance and should supplement each other. External audits are needed to remove possible "blindness" of internal experts to recognise weaknesses in their own unit and to give more universal and broader perspectives.

These standards of good practice should be derived from evidence-based data, long-term experience and knowledge gained. In practice, these can be adopted from legal requirements, results of research, consensus statements, recommendations by learned societies, or local agreements (if there is no other more universal reference).

Clinical audit should not be confused with:
- Research;
- Quality (system) audit to verify that the quality systems conform to a quality standard;
- Accreditation, or
- Regulatory inspection, nor any other regulatory activity.

Conversely, clinical audits should be developed to supplement, and not duplicate, other efforts of quality assessments. The practical organising of external clinical audits can be through site visits of an audit team or, for a limited part of practices with relevant documented or measurable data, by mailed review and central analysis of the data.

Impact and Future

Clinical audit is an important tool of quality improvement in medical imaging, and can have a major impact on developing practices in compliance with the most recent data on

good imaging practices. Audits will yield multiple benefits to the healthcare system, such as:

- Improvement of practice;
- Recognition for quality and awareness of good practices;
- Recognition of outdated practices;
- Motivation of staff to increase quality;
- Improvement of local standards and adherence to national standards;
- Prevention against litigation;
- Improvement of communication within the institution;
- Revealing weak points, and
- Promoting development of quality systems.

Future work for the promotion of clinical audits should aim to collect and report the beneficial experiences gained from various levels and approaches to clinical audit.

Further Reading

- European Commission Guideline on Clinical Audit for Medical Radiological Practices (Diagnostic Radiology, Nuclear medicine and Radiotherapy), to be published in EC Radiation protection series available from **http://ec.europa.eu/energy/nuclear/radiation_protection/publications_en.htm**
- International Atomic Energy Agency (IAEA). Guidelines for Clinical Audits of Diagnostic Radiology Practices: A Tool for Quality Improvement. IAEA, Vienna 2009.

Acknowledgements

The preparation of EC guidelines reported in this article was financed by the European Commission (Contract N TREN/07/NUCL/S07.71512) ■

GUIDE TO CARRYING OUT **AN AUDIT PROJECT**

What is Clinical Audit, and Who Should do it?

Author
Dr. Jane Adam

Radiologist
Department of Radiology
St George's Hospital
London, UK

jane.adam@stgeorges.nhs.uk

Clinical audit has an image problem in Europe. Firstly, there is wide variation in the way the term is interpreted. It can be used in a way that variously overlaps with regulation, accreditation, management and research. The second is encapsulated in the word 'audit' and its common usage in financial management, where it refers to evaluation carried out by outside agencies to uncover mistakes, poor performance or even fraud. This perception does not encourage radiologists to participate in the process. In fact, clinical audit should be viewed primarily as a learning and quality improvement tool, and in some countries where clinical audit is well established in practice, it has a very positive role.

The 'clinical' part of clinical audit is the key. It is the evaluation of structure, process or outcome of medical care by professionals, usually those directly involved in providing that service. The local performance is measured and compared with a pre-selected standard. If the standard is met, this provides reassurance about the quality of the service, if not, the reasons are investigated, change implemented, and re-audit carried out to see if the standard has been reached. This is described as the audit cycle (see Fig. 1, Page 18).

What can be Audited in Radiology?

All parts of the patient pathway, from referral to final patient outcome, can be audited. By convention, clinical audit is classified into:

- **Structure Audit:** audit of the facilities, staff and management structures in place to provide the service. Examples might include numbers of MRI scanners per unit of population, staff sickness rates, or availability of interventional radiology for emergency cases.
- **Process Audit:** audit of all or specific parts of the patient pathway through the service. Examples are waiting times for investigations, evidence of satisfactory justification processes, radiation doses received, or report turnaround times.
- **Outcome Audit:** audit of the final result of the delivery of the service. Examples of outcome audit would include patient satisfaction ratings, procedure complication rates or breast cancer detection rates on screening mammography.

The most difficult type of audit to carry out is outcome audit. This is because quantitative measurement of patient outcome is in itself difficult, and standards for outcome are scarce.

A change is taking place.
Fresh thinking. New ideas. Better solutions.

Our portfolio of integrated imaging and information management solutions can help you expedite patient care, improve diagnostic results, build bridges among multiple sites, encourage collaboration, reduce expenses, and improve daily workflow.

We're evolving to make imaging solutions better. For you.

Experience it first hand at RSNA.

evolve+ imaging solutions made better

RSNA09|BOOTH211
CHICAGO | LAKESIDE CENTRE | HALL D

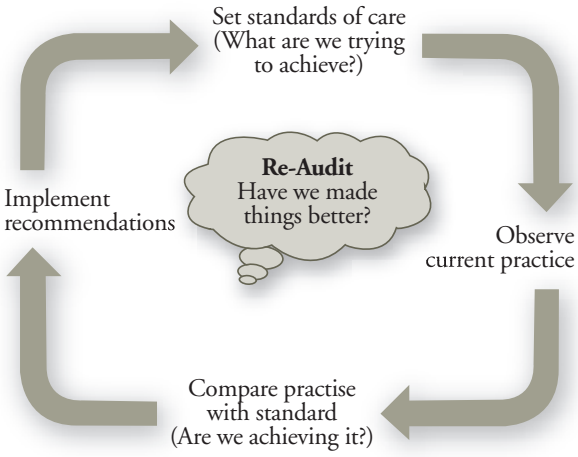
www.carestreamhealth.com

Integrated solutions for every step of diagnostic imaging

CR+DR+RIS+PACS+ARCHIVE+PRINT+

Carestream HEALTH

Fig. 1. The Audit Cycle



Who Should Carry out an Audit?

An audit is a professionally led activity and those responsible for delivering the service should be fully involved in the process. It can involve all members of the radiology team including radiologists, radiographers, physicists and ancillary staff. Local staff are most likely to know where there are areas that might benefit from detailed evaluation, and also to suggest what changes might be made if the standard is not met. Since it is an improvement tool, audit should be carried out within a positive 'no blame' culture, and appropriate confidentiality should be observed. If outside teams are invited to carry out audit, they should only carry this out with the full knowledge and cooperation of the local team.

Carrying out an Audit Project

When part of a service is selected for audit, the desired level of performance or standard should be selected in advance of any data gathering. Services can of course be sampled and performance measured, but without a pre-set standard, the measured performance cannot readily be judged as satisfactory or unsatisfactory, and this is a prerequisite for clinical audit. It is not always easy to find published standards, although they may be found in articles of legislation, national targets, peer-reviewed literature, from learned societies or professional consensus. If no published standard is available, a local agreement may be required between interested parties on an appropriate target standard before the audit is undertaken.

Setting Audit Indicators

As clinical audit is a numerical rather than qualitative process. One or more measurable indicators are selected for data gathering to determine whether the standard is met. These can include widely differing factors such as waiting times, scanner occupancy rates, radiation doses, consent form completion, staff training courses attended, procedure complication rates, reporting times and patient satisfaction ratings. Measurement and subsequent evaluation of this indicator should allow a conclusion to be drawn as to whether or not the target standard has been reached.

Sufficient data should be gathered to give a good sample on which to base the evaluation. However, audit remains a sampling process, and is not designed to be statistically robust in the same way as a research study. This must always be borne in mind when interpreting the results.

Dealing with the Results of an Audit

If properly designed, the results of an audit should be clear; the standard will or will not have been achieved. Even if achieved, it is possible to decide to raise the target standard to encourage further improvement, though usually, achieving the standard provides reassurance that the quality of the service is satisfactory. If not achieved, then the reasons for this should be explored in an open, honest and non-accusatory atmosphere of professional cooperation. All possible reasons (and there may be more than one) why the standard was not reached should be explored, including everything from sampling error through to inadequate funding for the service. Once the causes have been identified and appropriate changes have been instituted, it is necessary to repeat the audit to ensure that the changes have been successful. This is often referred to as 'closing the loop'.

Should we Fear Audit?

As professionals, we all have a duty to examine our work and systems within which we work to ensure that patients receive the best possible care. It can nevertheless be worrying and intimidating if we feel that the service we offer may be judged unfairly or harshly. However, when properly and professionally conducted in a fair, open and blame-free culture with the sole aim of benefiting patients, it is a process to which most of us can subscribe. ■

Further Reading

- The Royal College of Radiologists. Clinical Audit in Radiology: 100+ Recipes, Goodwin R, de Lacey G, Manhire A. (eds), The Royal College of Radiologists (1996)
- European Society of Radiology (ESR): Good Practice Guide for European Radiologists (2004)

IMPLEMENTING EXTERNAL CLINICAL AUDITS IN RADIOLOGICAL PRACTICES

The Experience in Finland

In Finland, the introduction of the requirement for clinical audits in the legislation in accordance with Council Directive 97/43/EURATOM has resulted in a systematic approach of regular external auditing, while the legislation also requires self-assessments of radiological units. The external clinical audit system has been supported by the major professional societies and coordinated by an independent National Advisory Committee. In this article, the development and current status of clinical audits in Finland for diagnostic radiology is reviewed.

Author
Prof. Seppo Soimakallio

Chairman
Department of Radiology
Tampere University Hospital
Tampere, Finland

seppo.soimakallio@pshp.fi

Legislative Basis

According to Finnish legislation (law and decree), clinical audits shall be arranged to supplement, in an appropriate way, the self-assessment of practices. The goal is set so that all radiological practices would be externally audited for all essential parts at a minimum frequency of once every five years. The decree also specifies ten points, which shall, among other things, be considered in external clinical audits. According to the decree, clinical audits shall be carried out by competent and experienced auditors who are independent of the organisation being audited.

Practical Implementation

Auditing Organisation and Auditors

Finnish legislation has not assigned a specific organisation to carry out clinical audits. Since the decree was issued, the Finnish Medical Association convened two meetings to discuss the matter with the key stakeholders: the radiological departments of university hospitals, societies of radiographers, cardiologists, oncologists, nuclear medicine experts and physicists, the Association of Finnish Local and Regional Authorities, the Society of Private Institutes and the Radiation and Nuclear Safety Authority (STUK). These meetings led to the establishment of a working group to prepare the audit programme, to recruit auditors, to build-up an auditing organisation and to organise training of auditors. After completing the first audit programme and recruiting a number of auditors, the actions of the working group resulted, in 2001, in the establishment of a special organisation to develop and provide the necessary clinical audit services. The working group then organised several training courses for the auditors, with some financial support from the Ministry of Social Affairs and Health and the Association of Finnish Local and Regional Authorities.

The special auditing organisation was a joint-stock company owned by 20 owners. The auditors work at the request of the company for each individual audit, and are paid for their services, while the audits are charged from the audited organisations. The first complete audit round was carried out solely by the above organisation, while at present there are two organisations offering similar clinical audit services.

National Steering Committee

In 2004, the Ministry of Social Affairs and Health set up an advisory committee for the coordination, development and follow-up of clinical audits to ensure the quality and consistency of clinical auditing. The committee is a multidisciplinary group of clinical experts, independent of any auditing organisations. Its tasks include, among other things, evaluating the suitability and coverage of the criteria used in clinical audits and collecting summaries and reviews of the results. The advisory committee has issued four recommendations dealing with practical issues of clinical audits and more recommendations are being prepared. The committee has also conducted a survey of the results of the complete first round of audits in Finland (2000 - 2006).

Radiation and Nuclear Safety Authority (STUK)

The role of the Radiation and Nuclear safety Authority (STUK) is to control the implementation of clinical audits through regular inspections of radiation practices. Furthermore, STUK has a representative in the National Advisory Committee and provides secretarial services to the Committee.

International Activities

The development of clinical audits in Finland has given rise to two international meetings organised in Finland, and Finland's leading role in a European Commission project for preparing guidance on clinical audit. The chairman and secretary of the national advisory committee on clinical audit carry the main responsibilities for these activities.

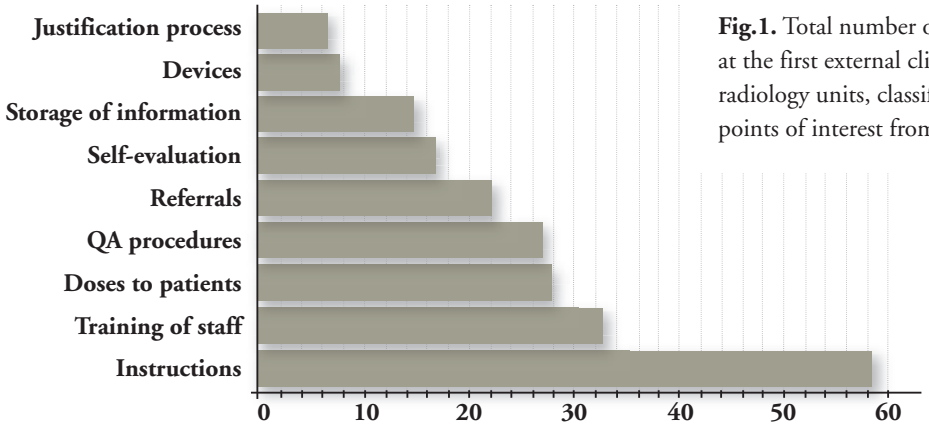


Fig.1. Total number of recommendations given at the first external clinical audits of diagnostic radiology units, classified according to the points of interest from Decree 423/2000.

Review of the Outcome of Clinical Audits

After the first five-year period of auditing (2000 - 2006), the National Advisory Committee conducted a survey of the results of the audits by reviewing audit reports, numbering altogether 346, with the permission of the audited healthcare units. All of the first clinical audits were carried out by the same organisation, employing a total of 38 auditors from volunteered healthcare professionals. Audits were typically carried out by a team consisting of a medical expert (physician) and a radiographer, and in several cases such as for radiotherapy, nuclear medicine and large units of diagnostic radiology, a physicist.

The duration of the audit varied between 0.5 and 4 days depending on the size of the unit, with most typically taking between 1 - 2 days. The audits were based on guidance and check-lists developed by the auditing organisation. The criteria of good practices were derived partly from legislative requirements, and partly from existing recommendations for good clinical practices (e.g. referral guidelines, image quality criteria), while audits also relied to a great extent on the professional judgement of the auditors. Besides interviews and reviews of documents and data, the audits included assessment of the image quality for a sample of patient images.

The total cost for a single audit day with two auditors in Finland is typically about 2,500 euros, also including work prior to the audit visit. It is interesting to note that the costs of clinical auditing are only a few cents when counted per radiological examination. A significant number of recommendations to improve practices have been issued as a result of the audits, on average four - seven recommendations per healthcare unit (see Fig. 1, above). The results suggested that the criteria of good practices, now mainly based on legislative requirements, should be supplemented by more clinical criteria in order to avoid unnecessary overlap with regulatory inspections.

Conclusions

The organisation of and criteria for external clinical audits in Finland have been successfully developed, providing radiological units with easy access to better standards. The objectives and criteria are in close consistency with the general principles published in the forthcoming EC guideline. The review of the outcome of clinical audits indicates many practical benefits of the audits, such as improvements in the referral practice, quality assurance programmes, distribution of responsibilities, and communication between different professionals. Implementation of clinical audit in Finland has included a lot of stakeholder involvement and has lead to successful improvement of clinical procedures and radiation safety in the Finnish healthcare system. ■

Further Reading

- Soimakallio S., Järvinen H., Kortelainen K. Proceedings of the International Symposium on Practical Implementation of Clinical Audit for Exposure to Radiation in Medical Practices, Tampere 24 - 27 May, 2003. Available from: **www.clinicalaudit.net**
- Järvinen H. (ed.). International Workshop on Practical Implementation of Clinical Audit for Medical Exposure to Ionising Radiation, Tampere Hall, Tampere, Finland, 7 - 10 September 2008.
- Programme, general information and abstracts. Available from: **www.clinicalaudit.net**
- Hirvonen-Kari M., Järvinen H. and Kivisaari L. Clinical Audits and Regulatory Inspections – Double Efforts and Expenses for Radiation Protection?, Acta Radiologica (2009), accepted for publication.
- Hirvonen-Kari M.,Salo S.,Dean K. and Kivisaari L. Effect of Clinical Audits of Radiation use in One Hospital District in Finland., Acta Radiol. 2009;50:389-395.

YOUR GATEWAY TO HEALTHCARE MANAGEMENT

EMC Consulting Group
The innovators in healthcare communications
28 rue de la Loi, B-1040 Brussels
Tel: +32 2 286 8500
www.emcconsulting.eu

EMC Consulting Group

HARMONISING CLINICAL AUDIT IN EUROPEAN DIAGNOSTIC RADIOLOGY

What Needs to be Done to Improve Uptake?

Author
Dr. Andras Vargha

Chief Radiologist
Department of Radiology
Gróf Eszterházy Hospital
Pápa, Hungary

varghand@t-online.hu

In today's medical imaging department, the sophistication of technology means that we already automatically know quite a lot about some processes and their efficiency However, this only gives information about equipment performance. Typically, questions that help us to understand and improve our daily work include:

- Is this the best exam choice for that clinical question?
- Does the examining radiologist have all necessary patient information?
- Was the exam a benefit to the patient or was it deleterious?
- Did we get closer to the final diagnosis, or are we at least on the way to it?
- What are the clinical and legal consequences if we make a wrong diagnosis?
- How can we correct this as soon as possible in clinical work?
- How can we prove that everything was performed in the best way?
- Is it possible to avoid similar failures and how?

Clinical audit is a process that treats these questions and can be a solution as a continously developing control system. In summary it performs the following functions:

- It controls individual exam processes including the parameters of the used equipment of any modality and also the work of related personnel;
- It controls the whole diagnostic route for a certain patient or illness if it is done in the most effective way according to the given possibilities;
- It helps to maintain and develop interdisciplinary work, which is the key to doing the best for the patient and to be professionally and economically effective.

Legal Liability and Harmonisation: Big Issues

International consultations show that here in the EU, we have different ideas about quality control from country to country. The European Society of Radiology, the national societies and the European Union are concerned about the lack of harmonisation of clinical audit guidelines. A recent EU project on clinical audit of radiological practices tried to provide a possible way to make a better standardisation according to the EC directive 97/43/EURATOM, which governs the use of ionising radiation in medicine.

In our everyday work and decisions, sometimes we have to make hard compromises due to economic pressure. So how could the present level of uptake and implementation of clinical audit be more harmonic?

Perhaps one way to improve uptake and implementation of clinical audit, would be to create a clear outline of the practical and financial requirements for implementing clinical audit – demystifying it and clarifying the potential benefits would catalyse more initiative from department leaders to take charge of quality in their department. However, it is still not clear what a complete audit process would cost. The goal should be to earn more in the long-term than the initial start-up cost for an audit by informing ourselves of what works and what doesn't.

Checklist for Cost Calculations

The initial investment for internal audits is only to set up and run a stable team for clinical audit mostly draws from existing resources. If a continuous rather than a sporadic system for internal audit is set up, then over time, this will not require too much extra cost, and maybe it can be fit in during normal working hours for involved personnel. At the start phase, more human work hours may be needed. Thus, when counting costs, it is advisable to consider the following factors:

- How many people will be on the audit team;
- How many work hours should be paid outside regular working hours;
- Size of the department;
- Number of examination types;
- Heterogenity of disease groups, and
- Number of involved clinical partners.

Conclusion

Medical imaging absolutely needs a professional control system for our work that includes the whole patient route before and after the patient visit to the imaging department. This must be based on professional decisions discussed among all stakeholders and should be continouosly revised according to feedback. Knowledge about which exams are efficient and which are not, could even be used to inform reimbursement systems. This is the key to be the most effective and to stay economic at the same time and can help later in allocating and managing resources. Also, dealing with problems that arise in the diagnostic process could be simpler, if they were consistently audited. Legal liability to the patient is no small matter. Clinical audit should not be a simple administrative task, but rather a living and progressing pathway, which helps us in developing a more quality-focused everyday work. ■

2010 | UKRC

Birmingham, UK
7-9 June 2010

The leading and largest Medical Imaging event in the UK

* Abstract submission now open!

Deadline for applications: 11 December 2009

* Early Registration deadline

7 April 2010

* Why attend this event?

- Fantastic comprehensive Exhibition
- Focus on current and emerging technologies
- Prestigious international speakers
- Unique eponymous Lectures from the UKRC partner societies
- Free stream aimed at those early in their career
- Exciting interactive Case Studies with electronic voting
- Over 3000 delegates and visitors.
- CPD accredited education on the stands

Visit: www.ukrc.org.uk

APPLYING A "BUSINESS PROCESS RE-ENGINEERING" MODEL TO RADIOLOGY

Part II: Developing Intelligent Structures and Managing the Change

Authors
Prof. Dr. Frederik L. Giesel

National German Cancer Centre
Department of Radiology
Heidelberg, Germany
f.giesel@dkfz-heidelberg.de

Dr. Philipp Herold

Project Manager
Radiological Imaging Training & Consulting (RICT) Heidelberg
Heidelberg, Germany

In the first part of this series on the concept of Business Process Re-engineering (BPR), we introduced BPR as a philosophy that advocates restructuring an organisation, based around processes rather than individual tasks, to generate new structural efficiencies. In this follow-up article, we explore the pros and cons of a BPR-centric radiology IT systems re-design. The aim is to allow radiological entities to not only react to financial cutbacks, but also to increase the quality of care delivery.

Redesigning IT Systems: The Ideal Solution

The first step is to analyse any IT integration needs from the point-of-view of patient flow. Designing a new integrated system begins with creating an appointment for the exam. At this point, information about the patient is entered via one interface and distributed to all relevant locations. Medical history is entered into the electronic health record (EHR), the date of the appointment is entered in both the physician's and the scanner's schedule and the ordering of all necessary material in the EPR system is triggered automatically for that particular exam.

Furthermore, this IT system can group similar exams to engineer new, smoother routines and place possibly complicated exams at the end of the day in order to avoid disruptions. The physician is reminded about the exam when the patient arrives, and gets all the relevant information prepared in advance of the appointment. Assistant medical technicians will no longer have to order material manually and stock can be reduced, increasing inventory reliability.

After the exam, images are sent to the RIS/PACS, which again, is hooked up to a workstation with access to other patient data (e.g. reports and test results). Hence, the physician has all relevant information in one spot and does not have to interrupt diagnosis for research into past results. Standardised tools for diagnosis and reporting can be made available to create a reliable qualitative and quantitative report. This helps physicians to perform more sophisticated diagnosis and arrive at more relevant reports given the same or even decreased time.

In summary, a system that operates on the basis of isolated work steps loses valuable time compared to an integrated BPR-centric system. A more integrated model allows automated data-processing. Thereby, redundancies and idle periods can be reduced and the quality of exams can be increased. This not only yields cost reduction, but also increases output efficiency.

Will Increasing Efficiency Decrease Safety?

As mentioned above, BPR aims at increasing efficiency. BPR is often mentioned interchangeably with Toyota's vision of LEAN production, which eliminates redundancies and increases speed. However, in radiology, increased efficiency can equate with decreased safety. For example, the reduction of idle time at scanners and acceleration of exam throughput yields a more narrow scope for spontaneous reactions by physicians in complex cases. While patients may perceive reduced waiting lists positively, an acceleration of steps may be discomfiting, as patients feel inadequately treated.

So, how can BPR resolve these concerns, while occasioning greater efficiency? Firstly, a basic process for each type of exam is designed and implemented. This process is highly standardised and restrictive. This part of the process should cover a majority of about 85% of all exams. In addition, one or more parallel processes can be predefined to address cases where the basic process is insufficient. These parallel processes are less standardised and give room for individual responses to anomalies. For this system to work:

- Decision gates are clearly defined so that staff know exactly when they have certain alternatives available, and
- Staff must be briefed on new processes to ensure decisions are made correctly.

Pitfalls of BPR in Radiology

There are potential pitfalls specific to BPR in radiology that must be kept in mind during the redesign process. If existing processes are only superficially reshaped, inferior results are seen. This is crucial to radiology, as there is a lack of alternative "business models" that would help as a starting point to rethink exam processes. Hence, interdisciplinary teams of physicians and organisational designers must collaborate on new ideas for how to better conduct radiological exams.

Summary

Though it is arguable how to measure the impact of restructuring measures in general, Coutre et al. (2009) mention considerable positive impact observed during a case study at a US hospital. Among these is "an increase in net patient revenue… to 12,909 dollars in 2007 from 11,312 dollars in 2004". It is advisable to evaluate BPR projects using a cost-effectiveness formula (Weinstein et al. 1977), taking into account effects on the patient (immediate and collateral), and staff in radiology and related departments.

Radiology managers are advised to proceed carefully when applying BPR within a healthcare setting - potential pitfalls are mainly down to complex healthcare specific requirements. If the issues laid out above do not interfere, BPR is expected to be a useful tool for radiology. ■

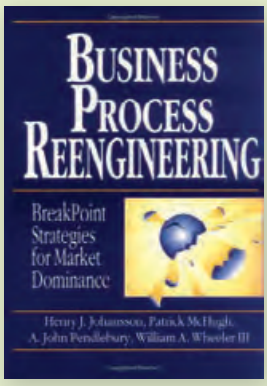
Recommended Reading List

- Coutre et al. 2009: Achieving Process Innovation, in Healthcare Executive, March 2009, pp. 25-31
- Evans et al. 1997: Cost Reduction and Process Re-engineering in Hospitals, in Journal of Cost Management 11, no. 3, pp. 20 – 27
- Hammer & Champy 1993: Re-engineering the Corporation, Massachusetts
- Ho et al. 1999: The Implementation of BPR in American and Canadian Hospitals, in Health Care Manage Rev, 24(2), pp. 19 – 31
- Klimas 1997: Re-engineering in the Real World, in Management Accounting 78, no. 11, pp. 30 – 36
- Packwood et al. 1998: Good Medicine? A Case Study of Business Process Re-engineering in a Hospital, in Policy & Politics 26(4)
- Weinstein et al. 1977: Foundations of Cost-Effectiveness Analysis for Health and Medical Practices, in The New England Journal of Medicine Vol. 269, pp. 716 - 721

BOOKS IN REVIEW

Business Process Re-engineering:
Breakpoint Strategies for Market Dominance

by Henry J. Johansson, Patrick McHugh, A. John Pendlebury & William A. Wheeler



The idea of re-engineering first appeared in an article in the Harvard Business Review journal, in July – August 1990, written by Michael Hammer, a professor of computer science at MIT. The method was commonly referred to as business process re-engineering (BPR), based on an analysis of the way information technology was affecting business processes. This was followed by the original and classic "Re-engineering the Corporation: A Manifesto for Business Revolution", written by Hammer and James A. Champy, which focused the business community on a new, process-based corporate improvement philosophy. 2.5 million copies of this book sold, and the book stayed in the New York Times' bestsellers list for over a year.

In "Business Process Reengineering: Breakpoint Strategies for Market Dominance", you will find updated practical advice from a team of highly experienced manufacturing consultants, who previously worked with companies such as Coca-Cola & Schweppes and AT&T. These experts explain why they believe BPR supercedes older models for business improvement. BPR involves a dramatic redesign of business processes, organisational structures and the use of technology, to achieve breakthroughs in business competitiveness, that is applicable across all types of business, including healthcare. Included are examples of how companies can streamline operations and cut costs, creating process excellence in key aspects of the organisation.

From Inside the Flap:

"A core business process is one that cuts across boundaries, functions and departments. By focusing on the effectiveness of core business processes, and "pulling" supporting processes and resources to those core business processes, companies can streamline operations and inevitably cut costs without making arbitrary headcount decisions. By "reading the market" to see which core business processes can produce results beyond what the market knows is possible, a company can find a BreakPoint, an opportunity that will cause a disproportionate reaction in the marketplace and pull the company into a leadership position".

ECRI Institute
The Discipline of Science: The Integrity of Independence.

RADIOGRAPHY/ FLUOROSCOPY SYSTEMS

ECRI Institute, a non-profit organisation, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for nearly 40 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research.

ECRI Institute's focus is medical device technology, healthcare risk and quality management, and health technology assessment. It provides information services and technical assistance to more than 5,000 hospitals, healthcare organisations, ministries of health, government and planning agencies, voluntary sector organisations and accrediting agencies worldwide. Its databases (over 30), publications, information services and technical assistance services set the standard for the healthcare community.

More than 5,000 healthcare organisations worldwide rely on ECRI Institute's expertise in patient safety improvement, risk and quality management, healthcare processes, devices, procedures and drug technology. ECRI Institute is one of only a handful of organisations designated as both a Collaborating Centre of the World Health Organisation and an evidence-based practice centre by the US Agency for healthcare research and quality.

For more information,
visit **www.ecri.org**

Contact
ECRI Institute Europe,
Weltech Centre Ridgeway,
Welwyn Garden City,
Herts AL7 2AA, United Kingdom
info@ecri.org.uk - www.ecri.org.uk

PHILIPS
sense and simplicity

Model	MultiDiagnost Eleva
WHERE MARKETED	Internationally
FDA CLEARANCE	Yes
CE MARK (MDD)	Yes
CONFIGURATION	
Tube position	Over, Under table
Operation concept	Remote and Tableside
TABLE	
Tube/ image receptor movement	Yes, all C-arm longitudinal and lateral movements with 180 rotation and + 45° to - 45° angulation
Table top travel	Scanning C movement around patient
Longitudinal table top travel	160 cm (63) with C-arc (table is fixed)
Transverse table top travel	+ 12.2 / - 28 cm (+4.8/11.02) with C-arc (table is fixed)
Diagonal table top travel	Yes, with C-arc
Removable grid	Yes
Maximum patient weight, kg (lb)	185 kg (407 pounds)
Table height	height adjust 23.6 - 55.1 inches
Table tilt	+ 90° to - 20° (optional up to - 90°)
Oblique projections	Yes, over 180 degrees
DETECTOR/ IMAGE INTENSIFIER	
Image receptor type	Image intensifier
Size, cm (in)	38cm, 15 inches
Field sizes, cm (in)	38,31,25,20,17 cm
IMAGING CAPABILITIES	
Matrix	1kx1K
Fluoroscopy	0.5 - 30 p/s and Continuous
Radiography	Yes
Digital imaging system	Yes
Last image hold	Yes
Copper prefilters	Yes, spectrabeam RF 0 / 0.1 Cu 1 Al / 0.2 Cu 1 Al / 0.3 Cu 1 Al
Virtual collimation	Yes
Virtual object repositioning	No
Digital subtraction angiography	Optional
Manual pixel shift	Yes, with vascular option
Roadmapping	Yes, with vascular option
Opacification	Yes, with vascular option
Reference image display	Yes
Tomography	No
Long image acquisition (Ortho)	Yes, optional full spine, legs and Colonmap package
X-RAY PRODUCTION	
Generator power, kW	65 kW, 80 kW, 100kW
X-ray tube	SRO 33100, SRM06/08
Radiographic kVp	40-125
Radiographic mA	1 to 1250 mA depend on powerpack
Fluoroscopic kVp	40 kV - 110 kV
Fluoroscopic mA range	1 to 1250 mA depend on powerpack
CONNECTIVITY	
DICOM 3.0	Yes
IHE profiles	Yes
LAST UPDATED	Oct 2009

PHILIPS
sense and simplicity

PHILIPS
sense and simplicity

PHILIPS
sense and simplicity

	MultiDiagnost Eleva Flat Detector	EasyDiagnost Eleva	EasyDiagnost Eleva DRF
	Internationally	Worldwide	Worldwide
	Yes	Yes	Yes
	Yes	Yes	Yes
	Over, Under table	Undertable tube (optional 2nd ceiling suspended tube is available)	Undertable tube and 2nd ceiling suspended tube
	Remote and tableside	Tableside	Tableside
	Yes, all C-arm longitudinal and lateral movements with 180 rotation and + 45° to - 45° angulation	Yes	Yes
	Scanning C movement around patient	Yes	Yes
	161 cm (63) with C-arc (table is fixed)	+/-84cm (33in)	+/-84cm (33in)
	+ 12.2 / - 28 cm (+4.8/11.02) with C-arc (table is fixed)	-10cm to +9cm (-3.0" to +3.5")	-10cm to +9cm (-3.0" to +3.5")
	Yes, with C-arc	Yes	Yes
	Yes	Yes	Yes
	185 kg (407 pounds)	250Kg (550lbs)	250Kg (550lbs)
	height adjust 23.6 - 55.1 inches	83 cm (32.7in)	83 cm (32.7in)
	+ 90° to - 20° (optional up to - 90°)	+90 to -20 (optional -30, -45, -85)	+90 to -20 (optional -30, -45, -85)
	Yes, over 180 degrees	n/a	n/a
	Dynamic Flat Detector	Image Intensifier	Image Intensifier and digital static detector
	30x40 (12x16)	38cm (15") 31cm (12") 23cm (9")	38cm (15") 31cm (12") 23cm (9")
	30x40, 30x30, 22x22, 16x16	38cm, 31cm, 25cm, 17cm (15", 12", 10", 7") / 31cm, 25cm, 20cm, 17cm (12", 10", 8", 5") / 23cm, 17cm, 14cm (9", 7", 5.5")	38cm, 31cm, 25cm, 17cm (15", 12", 10", 7") / 31cm, 25cm, 20cm, 17cm (12", 10", 8", 5") / 23cm, 17cm, 14cm (9", 7", 5.5")
	2Kx2K	1024x1024 and 512x512	1024x1024 and 512x512
	0.5 - 30 p/s	0.5-30 p/s GCF in pulse control and continuous	0.5-30 p/s GCF in pulse control and continuous
	yes	Optional: with ceiling-suspended X-ray tube in combination with bucky unit in table and/or EasyLat option and vertical stand.VS advanced with or without tilting supporting cassette formats from '18x24 to 35x43. Full CR integration is also available.	Via one of the following configurations: a Ceiling suspended tube in combination with 1) Buckytray or EasyLat in combination with Digital wallstand 2) Digital detector in table or 3) Digital detector in Table and Digital detector in wallstand.
	Yes	Yes, Extended Digital Imaging	Yes, Extended Digital Imaging
	Yes	Yes	Yes
	Yes, spectrabeam RF 0 / 0.1 Cu 1 Al / 0.2 Cu 1 Al / 0.3 Cu 1 Al	Yes, spectrabeam RF	Yes, spectrabeam RF
	yes	Yes	Yes
	No	n/a	n/a
	Optional	Yes, with vascular option	Yes, with vascular option
	Yes, with vascular option	Yes, with vascular option	Yes, with vascular option
	Yes, with vascular option	Yes, with vascular option	Yes, with vascular option
	Yes, with vascular option	Yes, with vascular option	Yes, with vascular option
	Yes	Optional	Optional
	Yes, stack views via 3D reconstruction.	n/a	n/a
	Yes, optional full spine, legs and Colonmap package	optional: CR stitching with cr integration	Optional
	66 kW, 80 kW, 100kW	50kW, 65, 80kW optional	50kW, 65, 80kW optional
	SRM06/08	SRO 2550, SRM 2250 GS and SRO 33100 (for CS)	SRO 2550, SRM 2250 GS and SRO 33100 (for CS)
	40-125	40-150	40-150
	1 to 1250 mA depend on powerpack	1 to 1100 (depending on powerpack)	1 to 1100 (depending on powerpack)
	40 kV - 110 kV	40-110	40-110
	1 to 1250 mA depend on powerpack	0.2 to 6	0.2 to 6
	Yes	Yes	Yes
	Yes	Yes	Yes
	Oct 2009	Oct 2009	Oct 2009

	SIEMENS	SIEMENS
Model	**AXIOM Luminos TF with optional mobile flat detector**	**AXIOM Luminos dRF**
WHERE MARKETED	Internationally	Internationally
FDA CLEARANCE	Yes	Yes
CE MARK (MDD)	Yes	Yes
CONFIGURATION		
Tube position	Undertable	Overtable
Operation concept	Tableside	Remote and tableside
TABLE		
Tube/ image receptor movement	4-way image tower movement	2-way tube movement
Table top travel	8-way table top travel	8-way table top travel
Longitudinal table top travel	+/- 80 cm	+/- 80 cm
Transverse table top travel	+/- 12.5 cm	+/- 17.5 cm
Diagonal table top travel	Yes	Yes
Removable grid	Yes	Yes
Maximum patient weight, kg (lb)	272 kg (600 lbs)	230 kg (500 lbs)
Table height	Fixed, 85 cm	Height-adjustable from 48 cm to 98 cm
Table tilt	+ 90° to - 15° (optional up to - 90°)	+ 90° to - 45° (optional up to - 90°)
Oblique projections	With ceiling-suspended X-ray tube. Optional	+/- 40°
DETECTOR/ IMAGE INTENSIFIER		
Image receptor type	Image intensifier	Flat panel (CsI scintillators)
Size, cm (in)	33 cm or 40 cm (13" or 16")	43 cm x 43 cm (17" x 17")
Field sizes, cm (in)	For 40 cm I.I.: 40, 30, 22, 17 cm	43 x 43, 30 x 30, 22 x 22, 15 x 15 cm
IMAGING CAPABILITIES		
Matrix	1k x 1k	1440 x 1440 in DFR; up to 2880 x 2840 in radiography
Fluoroscopy	30 fps, optionally 15, 7.5, 3 pps	15, 7.5, 3 pps
Radiography	Digital high-resolution radiography with ceiling-suspended X-ray tube, mobile flat detector (35 cm x 43 cm), wall stand. Optional	Digital high-resolution radiography with integrated flat detector in table. Optional: digital high-resolution radiography with ceiling-suspended X-ray tube, wireless flat detector (35 cm x 43 cm), wall stand.
Digital imaging system	Yes, FLUOROSPOT Compact	Yes, FLUOROSPOT Compact
Last image hold	Yes	Yes
Copper prefilters	0.1; 0.2; 0.3 mm	0.1; 0.2; 0.3 mm
Virtual collimation	Optional	Optional
Virtual object repositioning	Optional	Optional
Digital subtraction angiography	Optional	Optional
Manual pixel shift	Yes, with DSA option	Yes, with DSA option
Roadmapping	Yes, with DSA option	Yes, with DSA option
Opacification	Yes, with DSA option	Yes, with DSA option
Reference image display	Optional	Optional
Tomography	Optional	Optional
Long image acquisition (Ortho)	No	Optional
X-RAY PRODUCTION		
Generator power, kW	65 kW, optional 80 kW	65 kW, optional 80 kW
X-ray tube	OPTITOP 150/40/80HC-100	OPTITOP 150/40/80HC-100
Radiographic kVp	40 - 150	40 - 150
Radiographic mA	up to 1000	up to 1000
Fluoroscopic kVp	40 - 110	40 - 110
Fluoroscopic mA range	0.2 to 18	0.2 to 23
CONNECTIVITY		
DICOM 3.0	Yes	Yes
IHE profiles	Yes	Yes
LAST UPDATED	Oct 2009	Oct 2009

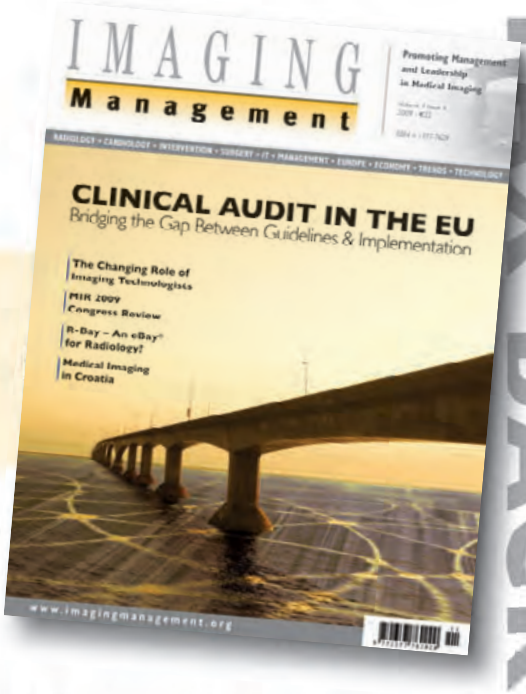
SIEMENS	SIEMENS	SIEMENS
AXIOM Iconos R200	**AXIOM Iconos MD**	**Luminos RF Classic**
Internationally	Internationally; not for USA	Internationally; not for USA
Yes	No	No
Yes	Yes	Yes
Overtable	Overtable	Overtable
Remote and tableside	Remote and tableside	Remote and tableside
2-way tube movement	2-way tube movement	2-way tube movement
8-way table top travel	8-way table top travel	8-way table top travel
+/- 80 cm	+/- 80 cm	+/- 80 cm
+/- 17.5 cm	+/- 17.5 cm	+/- 17.5 cm
Yes	Yes	Yes
Yes	Yes	Yes
230 kg (500 lbs)	200 kg (440 lbs)	200 kg (440 lbs)
Height-adjustable from 79 cm to 110 cm. Optional	Fixed, 89 cm	Fixed, 89 cm
+ 90° to - 17° (optional up to - 90°)	+ 90° to - 17°	+ 90° to - 17°
+/- 40°	+/- 40°	+/- 40°
Image intensifier	Image intensifier	Image intensifier
33 cm or 40 cm (13" or 16")	33 cm (13")	23 cm or 33 cm (9" or 13")
For 40 cm I.I.: 40, 30, 22, 17 cm	30.3, 21.5, 16 cm	For 33 cm I.I.: 30.3, 21.5, 16, 12 cm
1k x 1k	1k x 1k	1k x 1k
30 fps, optionally 15, 7.5, 3 pps	30 fps	30 fps
Fully automatic cassette spotfilm device for cassette radiography. Automatic loading, centering, and format sensing. Optional: overhead projections with ceiling-suspended X-ray tube, wall stand.	Fully automatic cassette spotfilm device for cassette radiography. Automatic loading, centering, and format sensing. Optional wall stand.	Fully automatic cassette spotfilm device for cassette radiography. Automatic loading, centering, and format sensing. Optional wall stand.
Yes, FLUOROSPOT Compact	Yes, FLUOROSPOT Compact	No
Yes	Yes	Yes
0.1; 0.2; 0.3 mm	0.1; 0.2; 0.3 mm	0.1; 0.2; 0.3 mm
Optional	No	n/a
Optional	No	n/a
Optional	No	No
Yes, with DSA option	n/a	n/a
Yes, with DSA option	n/a	n/a
Yes, with DSA option	n/a	n/a
Optional	No	n/a
Optional	No	Optional
Optional	No	n/a
65 kW, optional 80 kW	50 kW	55 kW, optional 80 kW
OPTITOP 150/40/80HC-100	OPTILIX 150/30/50	OPTITOP 150/40/80HC-100
40 - 150	40 - 150	40 - 150
up to 1000	up to 800	up to 800
40 - 110	40 - 110	40 - 110
0.2 to 18	0.2 to 4.1	0.2 to 4.1
Yes	Yes	Yes
Yes	Yes	Yes
Oct 2009	Oct 2009	Oct 2009

Model	Sonialvision Safire	Sonialvision Versa 1001
WHERE MARKETED	Worldwide	Worldwide, except USA
FDA CLEARANCE	Yes	Yes
CE MARK (MDD)	Yes	Yes
CONFIGURATION		
Tube position	Over	Over
Operation concept	Possible	Possible
TABLE	235 x 76.5 (92.5 x 30.1)	235 x 76.5 (92.5 x 30.1)
Tube/ image receptor movement		
Table top travel	no data	no data
Longitudinal table top travel	no data	no data
Transverse table top travel	no data	no data
Diagonal table top travel	155 (61)	155 (61)
Removable grid	no data	no data
Maximum patient weight, kg (lb)	318 (701.1) limited	318 (701.1) limited
Table height	47 (18.5)	85 (33.5) for 41 cm (16 in) II; 78 (30.7) for 31 cm (12 in) II
Table tilt	+90 to -90	+90 to -90
Oblique projections	Yes	Yes
DETECTOR/ IMAGE INTENSI-FIER		
Image receptor type	Direct conversion flat-panel detector	Image intensifier
Size, cm (in)	43 x 43 (17 x 17)	31 and 41 (12 and 16)
Field sizes, cm (in)	23 x 23 (9 x 9), 30 x 30 (12 x 12), 38 x 38 (15 x 15), 43 x 43 (17 x 17)	31 (12) II: 15, 23, 31 (6, 9, 12); 41 (16) II: 15, 23, 31, 41 (6, 9, 12, 16)
IMAGING CAPABILITIES		
Matrix	2880 x 2880	1024 x 1024 in 12bits
Fluoroscopy	Yes	Yes
Radiography	Yes	Yes
Digital imaging system	Yes	Yes
Last image hold	Yes	Yes
Copper prefilters	Yes	Yes
Virtual collimation	no data	no data
Virtual object repositioning	no data	no data
Digital subtraction angiography	Optional	Optional
Manual pixel shift	Optional	Optional
Roadmapping	Optional	Optional
Opacification	no data	no data
Reference image display	Yes	Yes
Tomography	Yes (Digital Tomography standard, Tomo-Synthesisy Optional)	Yes (Digital Tomography standard, Tomo-Synthesisy Optional)
Long image acquisition (Ortho)	Optional	No
X-RAY PRODUCTION		
Generator power, kW	80	80
X-ray tube	750 KHU	Various choice
Radiographic kVp	40-150	40-150
Radiographic mA	10-1,000	10-1,000
Fluoroscopic kVp	50-125	50-125
Fluoroscopic mA range	0.3-20	0.3-20
CONNECTIVITY		
DICOM 3.0	Yes	Yes
IHE profiles	Not specified	Not specified
LAST UPDATED	Oct-09	Oct-09

IMAGING
Management

Subscription Form

for IMAGING Management



Title:

First Name:

Surname:

Job Title:

Institution:

Address:

Postcode:

City:

Country:

Telephone:

Email:

Subscription Rates (5 Issues / Year)

One year	❑ Europe 85 euros	❑ Overseas 105 euros
Two years	❑ Europe 150 euros	❑ Overseas 180 euros

Or enter your ESR Registration Number for your free subscription

Reg.nr.:

How to Subscribe?

- Send an email with name and address to subs@imagingmanagement.org;
- Complete this form and post it to:
  28, rue de la Loi - B-1040 Brussels - Belgium;
- Complete this form and fax it to +32 2 286 8508.

In order to qualify please fill in the questions below:

Medical Doctors (respond below)

1. What is your occupation? (check only one)
   - ❑ Diagnostic Radiologist
   - ❑ Other Physician (please specify)

1a. I am Chief of my Department
   - ❑ Yes
   - ❑ No

1b. What is your radiology sub-specialty? (check only one)
   - ❑ General Radiology
   - ❑ Neuroradiology
   - ❑ Nuclear Medicine
   - ❑ Vascular & Interventional
   - ❑ Nuclear Radiology
   - ❑ Cardiovascular Diseases
   - ❑ Paediatric Radiology
   - ❑ Other (please specify)

Non-physician professionals (respond below)

1c. What is your occupation? (check only one)

Administrator/Manager:
- ❑ Radiology Administrator
- ❑ Radiology Business Manager
- ❑ PACS Administrator

Executive
- ❑ Chief Information Officer / IT Manager
- ❑ Chairman / Managing Director / Executive Director
- ❑ Chief Financial Officer / other executive titles

Other
- ❑ Medical Physicist
- ❑ Academic
- ❑ Chief Technologist / Senior Radiographer
- ❑ Manufacturer
- ❑ Business Consultant
- ❑ Distributor / Dealer

All respondents reply to the questions below

2. In what type of facility do you work? (check only one)
   - ❑ Private clinic
   - ❑ Hospital (check number of beds)
   - ❑ More than 500 beds
   - ❑ 400-499 beds
   - ❑ 300-399 beds

3. With what technologies or disciplines do you work? (check all that apply)
   - ❑ Diagnostic X-ray
   - ❑ Nuclear Imaging
   - ❑ Interventional Radiology
   - ❑ CT
   - ❑ Ultrasound
   - ❑ MRI
   - ❑ Mammography
   - ❑ Bone Densitometry
   - ❑ PACS/Teleradiology
   - ❑ Cardiac Imaging
   - ❑ PET
   - ❑ Echography
   - ❑ Angio/Fluoroscopy

FAX BACK TO +32 2 286 8508

RE-EXAMINING THE ROLES OF RADIOLOGISTS AND TECHNOLOGISTS

Is a Transfer of Tasks Inevitable?

Author
Prof. Frank Boudghene

Radiologist
Hôpital Tenon
Paris, France

frank.boudghene@tnn.aphp.fr

Technology and tools in medical imaging are rapidly evolving. Demand for medical imaging continues to grow and concomitantly, new needs will rapidly appear. Thus, as we enter this new era, it seems probable that, to respond appropriately to our colleagues and patients, we must adapt our practice to these changes. In my opinion, this calls for a future transfer of tasks from radiologists to technologists and an expanded training curriculum that takes into account an analysis of what roles they are capable of performing and (eventually) a re-examination of current national legislation, which presently limits such an expansion.

What Roles do Technologists Perform in France?

In France, there are two categories for services performed by radiologic technologists:
- Diagnostic examinations and/or procedures that are relevant for medical imaging, or functional exams, using or not using ionising radiation, or other physical agents, and
- Radiotherapy treatments using ionising radiation or not, or other physical agents.

To simplify our purpose, this article will examine those activities related to diagnostic imaging, with the exception of radiotherapy treatments.

In France, technologists assume a range of technical and clinical acts in relation to medical imaging. These include:
- Informing the patient about the exam;
- Clinical and psychological evaluation;
- Correct patient positioning;
- Patient preparation in respect to safety rules;
- Clinical follow-up during the technical act;
- Emergency care until medical intervention;
- Procedures transmissions;
- Stock and waste control;
- Correct functioning of radiological material, and
- Application of quality control programmes.

In France, with the appropriate medical prescription, a technologist is allowed to:
- Perform an exam without administration of contrast (radioactive or not);
- Prepare material for intravenous procedures (e.g. injection, catheterisation, etc.);
- Prepare any products to be administered;
- Adjust and use the imaging machines;
- Collect and work on signal and images, and
- Assume cutaneous care.

> **"Radiologists should participate actively in the education and training of technologists"**

At the medical prescription of an immediately involved doctor, a technologist can:
- Administer IM or IV contrast agents or drugs, either orally or rectally;
- Verify radioactive substances, and
- Perform blood sampling.

In the presence of a radiologist, a technologist is allowed to:
- Prepare automated injection systems;
- Determine the doses for diagnostic or therapeutic procedures, and
- Oversee an intra-operative supply.

Regarding medical practice in French university hospitals, as is also the case in some other public or private hospitals, technologists also have to participate in university activities

such as teaching, research, prevention, screening, training and management. The main topics of concern are:

- Initial and continuous professional development for technologists;
- Teaching of other professionals;
- Collaboration with other professions to coordinate activities (e.g. prevention), and
- Research (e.g. safety, quality insurance, radiation protection and hygiene).

Increasing the Role of Technologists to Address Growing Demand

As previously mentioned, technology and tools in medical imaging are rapidly evolving. To execute a transfer of roles and/or skills from radiologists to technologists to address this increasing pressure on the department, there are two areas that must be rethought:

- What possible new tasks should technologists integrate into their current duties?
- What needs to be altered within current legislation to regulate any transfer of task?

> **"Some radiologists may fear that it would create turf wars"**

One good example of where current French legislation restricts the authorised duties of technologists, for example, is that they are not presently allowed to acquire images or signals in ultrasonography.

What could be proposed, for example, would be the possibility for the technologist to acquire this competency under the responsibility and surveillance of a radiologist, as is done in other countries. This means that French legislation would be be modified, and moreover that learning in ultrasonography would be offered to technologists. Furthermore, we should also ponder what other techniques, such as gastro-intestinal radiography or computed tomography could be added to the training of technologists, both initially and during their ongoing education.

There are other clinical conditions where technologists could be allowed to take charge of patient care, and where more specific learning should be developed for technologists, e.g.

- Roles within emergency radiology;
- Roles within bedside radiography, and
- Roles within interventional radiology.

Obstacles to Increasing Technologists' Workload

Numbers of technologists in France remain limited, in contrast to the rapid development of medical imaging. Thus, such a transfer of skills would not be realistic today. However, this provides a golden opportunity for those in governance to prepare the way for such a future. If we wish to embrace this future solution to the changes occurring in the department, we firstly need to promote this new job description amongst the younger generations as early as possible. As co-workers, experienced radiologists are well positioned to develop this education, and to promulgate this expanded role.

Information campaigns on the profession of medical imaging technologists would be clearly reinforced, and would make this job more attractive, when it becomes visible to future candidates that new responsibilities could be assumed by technologists.

However that means that these skills have to be validated by a diploma, as they would be the core activity of technologists. So, we have to examine how the diploma of technologist in medical imaging should evolve, and how to start new professional educational programmes under the direction of radiologists. That could be prepared through 2010, and be planned to start in 2011.

Technologists Demanding Greater Recognition

Now technologists are pushing for recognition on a similar level to that of nurses, and also for greater autonomy in their professional practice than currently exists. It appears necessary that radiologists accompany their co-workers in this direction. But definition of the level of medical supervision required for such activities remains to be clarified, in terms of quality of care, and also as some radiologists may fear that it would create turf wars.

Radiologists should participate actively in the education and training of technologists, not only during their formal education through initial learning, but moreover through informal education as a professional project issued from their professional experience. On this basis, we would be better able to construct an educational programme that is based around such a transfer of professional task.

Clearly, radiologists and technologists must work together in order to define what type of skills can be promoted, and what boundaries they feel valuable for such transfer for the future; preparation is a key condition if we are to enable an enlarged future collaboration that is ultimately, to the benefit of patients. ■

R-BAY: AN EBAY® FOR RADIOLOGY?

Teleradiology Marketplace Brings Smarter Resources Use

A smooth, functional and efficient system for managing and overcoming the short or long-term challenges in imaging diagnostic services is a necessity – especially as human and economic resources are scarce in the healthcare sector. One novel solution to this is represented by R-Bay, a recently ended project in which a consortium of hospitals and healthcare system providers created and tested an online marketplace for selling and buying radiological services like commodities.

A System Under Pressure

European health systems are under heavy pressure from many sides. The demographic challenges alone are enormous. In an aging population, more people will suffer from chronic conditions like COPD, diabetes and cardiovascular diseases – conditions that are already the main "big spenders" in health systems and, on top of that, the cause for severely decreased quality of life for many people.

> **"Only one connection to a central online portal is needed, regardless of the number of teleradiology relationships"**

Another worrying issue is recruitment in the health and social sectors. General care personnel are scarce, and certain medical specialties like radiology, psychiatry and oncology are lacking specialists. As the prospect for recruiting sufficient personnel is only getting bleaker given the wider imbalance between capacity need and available resources, the situation will become very serious in most countries throughout Europe and beyond, in the near future.

Financial supply to the healthcare arena is unequal to these challenges. From a political side, there is much focus on controlling and containing expenditure for the public sector while at the same time enacting laws on e.g. waiting list guarantees. The general perception is that more health should be possible for the same amount of money - but high expectations are coming not only from the political environment, but also from the general public where a consumer mentality is applied to the public health arena, and citizens require fast diagnosis and treatment, coherent course of treatment, involvement, access to their data, control, and the highest quality at every level.

With this level of pressure from all sides, current and future health systems are forced to reorganise and re-engineer the provision of their services. Consequently, healthcare managers must look to flexible and resource-saving solutions or systems that support optimal utilisation of personnel, technology, and costs.

Meeting the Challenge: The Odense Experience

At the Odense University Hospital in Denmark (OUH), one of the largest university hospitals in the Nordic countries, there is much focus on meeting these challenges. Throughout the organisation, activities and projects have been initiated to seek innovative solutions that can change the provision of care and services. For years now, the LEAN approach (Toyota's business philosophy on simplifying and streamlining production processes) was implemented in the organisation, encouraging personnel at all levels to contribute with ideas that improve workflow, patient care, and/or optimise use of resources.

The hospital is working extensively with innovative e-health and telemedicine applications as a strategic method for optimising resources and providing better health services to patients. For example, an online interpreter service through a video conference system is cutting costs and heightening the interpretation service. Another of the hospital's telemedicine services enables COPD patients to be home-hospitalised and receive care and treatment from hospital specialists in the home through an online video interface equipped with appropriate measurement devices.

Authors
Janne Rasmussen

Consultant
MedCom
Odense, Denmark

jar@medcom.dk

Dr. Peder Jest

Director
OUH Odense University Hospital
Odense, Denmark

Crossing Distances

Teleradiology has, in recent years, gained substantial ground among healthcare providers. Many hospitals are now deliberately outsourcing larger parts of their imaging production to help overcome lacking resources in times where personnel are insufficient and waiting lists continue to grow. The market is also witnessing that more remote reporting companies and clinics are entering the arena and providing remote and cross-border services.

Consequently, as the market and number of users grow, the demands on efficiency, flexibility, cost containment, and not least quality, increase. One of the main constraints on teleradiology in its traditional form is that it is characterised by point-to-point connections. As customers' needs increase and change over time, this becomes a problem because the set-up is rigid and limited. Each customer and provider relationship has its own technical set-up, connection, administration process, etc. making multiple relationships resource-demanding.

> **"The general perception is that more health should be possible for the same amount of money"**

Based on the positive experiences from the Baltic e-health project and the strategic decision to implement telemedicine in its daily health provision, OUH participated in a new project aiming to test a solution where only one connection to a central online portal is needed regardless of the number of teleradiology relationships an organisation has with external organisations. The idea was to create an e-Marketplace for imaging services - a complete solution for establishing, administering and using remote imaging reporting - that can meet not only the users' present but also future demands.

A Unique, Single Point-of-Contact

What makes R-Bay unique to traditional teleradiology setups is that it operates via a single-point-of-contact. A health provider only needs to establish and pay for the connection to the portal and not to the different hospitals, reporting companies, clinics, etc. that the hospital wants to exchange images with. Secondly, R-Bay provides a brokering service, which contains online contracts, billing system, quality assurance, and identification management systems. This adds unique value to the system and streamlines processes for the users - not only the clinicians who work on the diagnostic side but also for technicians and administrative personnel.

At OUH, this means that they can use the service in a way that suits their organisation and their needs while at the same time having a constant and current overview of the situation and conditions on the market as R-Bay equals transparency. The portal can be used for managing capacity problems in one diagnostic area or in a certain period of time by utilising available resources within another hospital, clinic etc. and in another region or country. R-Bay will enable the hospital to streamline processes through the involved departments while at the same time have a flexible solution for managing the capacity problem. ■

An eBay® for Radiology?

The R-Bay project was part-funded by the European Commission under the DG INFSO/eTEN programme coordinated by the Region of Southern Denmark through MedCom. The project was launched in August 2007 and ended May 2009. R-Bay builds partly on the Baltic e-health project and was a liaison between different public and private organisations that together wanted to create a solution for integrated image exchange, storage, and brokering services.

Project partners decided to test in a real-life clinical environment, a brokering solution for a virtual marketplace for radiology services where providers and customers can meet, using an existing and running e-Consultation portal as infrastructure. The inspiration for the brokering portal came partly from eBay® - hence the name - where the portal is a reliable and secure infrastructure for parties to meet and trade commodities with each other. Like eBay®, the R-Bay portal does not trade radiology services itself but rather enables others to sell or buy reporting, second-opinion, or other services in a simple, flexible, and trustworthy way.

The key element of R-Bay is the interpretation service like remote viewing, reporting and second-opinion, but the portal also offers support services such as image storage, advanced processing tools, automated structured reporting translation, and training functionality.

World Forum
for Medicine

www.medica.de

40 years
MEDICA

Düsseldorf, Germany
Nov. 18 – 21, 2009

Messe Düsseldorf GmbH
Postfach 10 10 06
40001 Düsseldorf
Germany
Tel. +49 (0) 211/4560-01
Fax +49 (0) 211/4560-668
www.messe-duesseldorf.de

Messe Düsseldorf

INTERVIEW WITH

PROF. JOSE L. ZAMORANO

With over 190 peer-reviewed publications and an impact factor of over 500, Prof. José L. Zamorano, the current president of the European Association of Echocardiography of the European Society of Cardiology, is a well-known luminary in the field of echocardiography. Here, the president of the 2009 edition of the EUROECHO congress shares his opinions with IMAGING Management on how echocardiography has transformed cardiovascular medicine, and how radiologists and cardiologists can and should learn to work together.

Interviewee
Prof. Jose L. Zamorano

Director
Cardiovascular Institute
Hospital Clínico San Carlos
Madrid, Spain

Also,
President
European Association
of Echocardiography

jzamorano.hcsc@salud.madrid.org

Professional Highlights

1999 – Present	Member, Editorial Board, Spanish Journal of Cardiology
1999 – 2002	President, Working Group on Non-Invasive Diagnostic Imaging, Spanish Society of Cardiology
2001 – 2004	Member, Scientific Committee, European Association of Echocardiography of the European Society of Cardiology
2003 – Present	Present Member, Accreditation Committee, European Association of Echocardiography
2004 – Present	Member, Editorial Board, European Journal of Echocardiography
2004 – 2008	Member, Guidelines Committee of the ESC
2005 – Present	Member, Editorial Board, American Society of Echocardiography
2005 – Present	Member, International Relations Task Force of the American Society of Echocardiography
2006 – 2008	Member of the Board – Councilor, European Society of Cardiology
2007 – Present	ACC International Advisor on the International Committee
2007 – Present	Member, Editorial Board, European Heart Journal
2008 – Present	Member, Editorial Board, JACC CV Imaging
2009 – Present	President, European Association of Echocardiography of the ESC
2009 – Present	Secretary-Elect of the European Society of Cardiology
2009 – Present	Professor of Medicine, University Complutense, Madrid Director, Cardiovascular Institute, University Clinic San Carlos, Madrid

What impact has the development of echocardiography had on medical professionals and patients?

Echocardiography has transformed the practice of cardiovascular medicine by improving the prevention, diagnosis, and management of various cardiovascular disorders. It is the most commonly used imaging modality in clinical car diology, since it allo ws a comprehensive, immediate assessment of cardiac and vascular anatomy and function. Its availability, portability, non-invasive nature and cost-effectiveness, together with the wealth of information it pr ovides, r enders echocardiography the first choice imaging technique for the diagnosis and follow-up of most heart diseases.

What are the most exciting advances in the application of 3D and portable echocardiography?

Real time 3D echocardiography has emerged as a paradigm in the field of cardiovascular imaging. This new technique provides decisive and accurate information regarding the diagnosis,

prognosis and management of cardiovascular patients. There is no doubt that echocardiography will all be in 3D in the future. The heart is a 3D structure, and we want to see it and assess it in 3D. However, we can outline the more probable evolution of 3D echocardiography as follows:

- **Improvement in the temporal resolution of 3D echocardiographic images.** Nowadays, the relatively low frame rates obtained by 3D echo systems are an important limitation for the evaluation of frequent cardiological problems such as infective endocarditis or cardiac asynchrony. The development of new technologies will provide the cardiologist with new and better systems, working with higher frame rates.

- **Improvement in spatial resolution.** Similar to the preceding point, advances in this area of the technology will also come to fruition.

- **Increment of the volume captured in real time by the echo system.** This will provide the cardiologist with a more complete evaluation of the heart and great vessels.

- **Development of new tools and software to use echo contrast agents in daily clinical practice with 3D echocardiography.** Furthermore, the development of new protocols might provide a new way to evaluate myocardial perfusion by means of 3D echocardiography.

What can be done to increase routine use of echocardiography?

Both miniaturisation and portable echo systems are going to drive the uptake of echocardiography. Cheaper equipment prices will also help to make echo more widespread. I am positive that echo will go outside the echo lab to involve GPs - not for a complete diagnosis, but definitely for screening. This means that quite soon, we will have to integrate education on the use of echo for screening into the present curricula of GPs and medical students at university.

What are the most enjoyable aspects of your professional life, and which are the most challenging?

Medicine is a profession that allows you to serve mankind and this is, at the core, what motivates me. I have no doubt that you get out much more than you give. Each patient gives you an opportunity to grow. Moreover, as a researcher, I have enjoyed meeting and learning from different colleagues worldwide, and many times you even get to know their families and relatives, which enriches professional relationships. Also, as a researcher, you always face novel challenges, so your profession never grows old. One of the most challenging issues from a diagnostic perspective, is detecting subclinical disease when the patient is still asymptomatic and much work remains to be done here.

Is "management" important to you?

Management is extremely important nowadays. I am the Director of the Cardiovascular Institute at the University Clinic of Madrid. I did a four-year MBA course over an 18-month period, and this has certainly helped me in managing and addressing different situations, and being aware of the alternatives.

Is education a strong part of your professional life?

Well, education is one of my major professional passions. As professor of medicine, I have responsibilities at the university of Madrid. The implied responsibility of this position means that you must be available to the students, trying to teach and influence their lives forever. I love this part of my life, particularly trying to introduce new technologies into the education of our students. I also implemented a web-based "student's corner" that seems to be a very effective platform for our students.

> **"The heart is a 3D structure and we want to see and assess it in 3D"**

Do turf wars exist between radiologists and cardiologists? Who should take on imaging of the heart or cardiovascular system?

I have been working with radiologists for the last five years, without any problems in collaboration. The main point for any physician in this field is to have an interest in cardiovascular imaging regardless of specific job titles. Cardiologists have the advantage of knowing the specific disease more deeply, and this makes a great difference to image interpretation. Though our patients are in a 'cardiology arena', I can see a future where the radiologist is working as an integral part of a big cardiology department, without any problem. In the near future, there will be fully dedicated CT or MRI scans for cardiology, so in fact there will inevitably be professionals working full-time in this field, whether radiologists or cardiologists. ■

HIGHLIGHTS ON HEALTH IN THE REPUBLIC OF CROATIA

First Year of Healthcare System Reform

Author
Dr. Drazen Jurkovic

State Secretary
Ministry of Health
and Social Welfare
Republic of Croatia

drazen.jurkovic@mzss.hr

Facts & Figures

Full name:
The Republic of Croatia

Official Language:
Croatian

Population:
4.7 million

Capital:
Zagreb

Area:
56,542 km²

Major Religion:
Roman Catholic

Life Expectancy:
71.9 (men) and 78.9 (women)

Monetary Unit:
Kuna (1 Kuna = 100 Lipa)

GDP Per Capita:
48,502 Euros

Expenditure on Healthcare:
22.4 billion Kuna (2008)
(1 Kuna = 0.137 Euro)

The dissatisfaction of Croatian citizens with the healthcare system is reflected through the use of private doctors. About 45% of Croatians have used the services of a private doctor and the main reason why people see private doctors are the speed of the service (58% of those surveyed) and better quality service (46%). According to an estimate of those surveyed, citizens who use private doctors spend on average about 320 kuna per visit. Croatian citizens spent roughly 610,000,000 kuna for the services of private doctors in the past year, that is, about 660 kuna on average per person who used that type of service.

Prior Reforms Lacked Impact

Previously, national healthcare reforms were based on restrictive, bureaucratic methods that did not result in quality improvements or an active approach to healthcare protection in the community. In 2008, immediately after the election and establishment of the Croatian government, the Minister of Health and Social Welfare initiated and supported a model of structural innovative reform based on science and knowledge, deriving positive solutions from developed healthcare systems worldwide. The fundamental reason for initiating this reform was the aggregation of debt in healthcare from a constant increase of costs that did not result in adequate quality improvement, nor in improved indicators on life expectancy or quality of life for citizens/insured persons.

Financing Health

Given that money for the healthcare system in Croatia is collected exclusively from contributions from employed persons, with an insignificant amount coming from the budget, one of the most important chapters of the reform was finding new sources of funding through the broad introduction of supplementary health insurance, a special contribution from a tax on tobacco products, contributions from the unemployed, pension fund contributions, charging treatment costs in traffic accidents from insurance companies instead of healthcare funds and increasing the share of personal consumption for healthcare.

Rationalisation of Consumption – Modified Payment System

Instead of a payment system that consisted of paying hospital capacities and capitation systems for primary healthcare, the payment system for provided services, that is, the system of paying delivered health was introduced through DTS (DRG - Diagnose Related Groups) for payment of hospitals, and a performance payment system for payments in primary healthcare, and new mechanisms of intensive care payment (SAPS II score). In the field of consumption of medications, an array of measures is being introduced, a "pay-back" system, utilisation of electronic guidelines in prescribing medications for most frequent illnesses, international competition for procurement of especially expensive medications, public procurement for vaccines, and so on. Also contracted was the delivery of an integral healthcare information system, which, inter alia, should enable the monitoring of healthcare consumption and implementing reform.

What Has Been Achieved so Far

Achievements include a reduction of sick-leave rates from 4.2% to 3.69% in the first four months, a reduction of the physical volume of drug consumption by 7%, and a reduction of the number of referrals for consultative or specialist healthcare. Prescribing permanent prescription for chronic patients, and a simplified manner of prescribing orthopaedic aids were introduced, and consultative examinations in the same institution was provided to specialists in secondary and tertiary level. Competition for the digitisation of primary healthcare systems and equipment procurement was also completed. These, and other implemented reforms will hopefully bring real and lasting progress to the provision of healthcare in Croatia. ■

RADIOLOGY **IN CROATIA**

Highlights of the Main Issues

Prof. Boris Brkljacic works as professor and chairman of the department of radiology at the medical faculty of the University of Zagreb in Croatia, and is the current president of the Croatian Society of Radiology. During his career he has worked and published mostly in the areas of renal and vascular ultrasound. He is also involved in vascular and non-vascular interventions, urogenital radiology and breast imaging. He is currently a member of the "Communications and International Relations" committee of the European Society of Radiology (ESR), and a member of the "Professional Standards and Education Committee" of the European Federation of Societies of Ultrasound in Medicine and Biology (EFSUMB). He acts as an executive board member of the Central European Vascular Forum, and is a founder and vice-president of the Adriatic Vascular Ultrasound Society, and fellow of the European Society of Urogenital Radiology (ESUR).

Author
Prof. Boris Brkljacic

President
Croatian Society
of Radiology

Also,
Chairman
Dept. of Radiology
University Hospital Zagreb
Zagreb, Croatia

boris.brkljacic@zg.htnet.hr

The Department of Radiology in Zagreb

I am working in a large radiology department at the university hospital in Zagreb, which has 700 beds. We have two CT scanners, two MRI units (1.5 T and 0.5 T), an angio-suite, four US scanners, two mammographic units and a variety of conventional x-rays. We perform approximately 100,000 exams per year in all areas of radiology with the exception of paediatric radiology. We perform all vascular and non-vascular interventions with the exception of neurointerventions. We are best known for breast imaging and image-guided biopsies, non-vascular and vascular interventions, abdominal imaging and vascular imaging. The hospital was built in 1987, and I have been chairman of the department since 2001.

Education of Radiologists

Up until now, the period for residencies in radiology in Croatia has lasted four years. Currently a new curriculum is in the process of approval, in which the residency period will be prolonged to five years. In this new system, the last year will also count as the first year of subspecialty training for those who choose to practice in one subspecialty area. A board exam has been mandatory for over thirty years now. Three examiners from different institutions examine the candidates, and the exam consists of practical and theoretical parts. The Croatian Society of Radiology is also planning to introduce a written board exam. For the last 15 years, radiologists have the option to subspecialise in interventional radiology, neuroradiology and ultrasound, and we are planning to offer more subspecialisations.

CME is compulsory, and acquiring sufficient CME credits is a prerequisite for the renewal of a medical license to practice. Licenses are renewed every six years by the special commission of the medical chamber, and at least 120 CME credits have to be collected within six years. Employers select their residents themselves. The national Ministry of Health has issued rules of evaluation of MDs applying for residency (marks obtained during medical studies, length of studies, knowledge of languages, etc.). However, there is a commission of five doctors in my institution that selects residents on the basis of an interview, and they are empowered to evaluate their competency.

Sufficiency of Radiologists in Croatia

Croatia has population of 4.4 million. We currently have 315 radiologists and 65 residents. Understaffing is somewhat of a problem, although the situation is better here than in some neighbouring countries (for instance Slovenia, which has less radiologists per number of people than us). Understaffing is a particular problem in smaller provincial hospitals. Large university hospitals in Zagreb, Rijeka, Split and Osijek have less difficulty in attracting radiologists.

A residency in radiology is quite attractive to young Croatian doctors; in my hospital we receive many more

applicants for residency in radiology than in surgery over the last few years. Radiology is better financially compensated here than in most former communist countries, but is much less compensated compared to western European countries. Most radiologists have the option to work part-time in the late afternoon in private offices, and thus earn some additional money.

Croatian Society of Radiology

The Croatian Society of Radiology (CSR) plays a very prominent role in education and training. It oversees residency training programmes, selects board-examiners, and provides regular teaching courses in the various areas of radiology. The CSR organises monthly meetings in Zagreb with three to four lectures allocated CME credits by the national medical chamber. The CSR also organises regular national congresses with international participation that are very well attended.

Challenges for Croatian Radiologists

Challenges for radiologists in Croatia are mainly the same as for elsewhere. Turf battles are serious problems that will affect the future of radiology in Croatia. Access to training is good, we have good cooperation with the ESR, ESOR and some US institutions, like the Memorial Sloan Kettering Centre, and our residents can be educated in Croatia and abroad. Access to high technology is a problem – Croatia is a transitional country with less high-tech equipment compared to very rich countries. Nevertheless, it does not affect residents considerably, since they are trained in very well equipped institutions. Access to research funds is limited. ■

MEDICAL IMAGING **IN CROATIA**

Nuclear Medicine

Author
Asst. Prof. Drazen Huic

Head of Department
Centre for Radiation Medicine and Protection
University Hospital Rebro
Zagreb, Croatia

dhuic@kbc-zagreb.hr

Asst. Prof. Drazen Huic, 46, has been working in nuclear medicine since 1991. He is a nuclear medicine specialist and presently works as head of the Centre for Radiation Medicine and Protection in Clinical Department of Nuclear Medicine and Radiation Protection, University Hospital Rebro, Zagreb, Croatia. Dr. Huic is also involved in students' education as an assistant professor at the School of Medicine, University of Zagreb, Croatia. On a European level, he acts as president-elect of the UEMS/Section Nuclear Medicine. His main areas of interest in nuclear medicine are thyroid cancer, nuclear oncology, haematology and PET.

The Clinical Department of Nuclear Medicine and Radiation Protection, located at the University Hospital Rebro in Zagreb, is the oldest and largest nuclear medicine department in Croatia, originating in 1959. Croatian nuclear medicine started nearly simultaneously with the appearance of other European nuclear medicine departments. The department is organised in several divisions: the polyclinic division for thyroid diseases (consulting and ultrasound), a clinical division with 12 beds for radioisotope therapy, a polyclinic division for functional investigations, a polyclinic division of scintigraphy, division of biophysics, division of radiopharmacy and radioimmunology and a centre for radiation medicine and protection.

There are 84 staff members, out of which there are 18 physicians (three residents), five physicists or electronic engineers, and three chemists. The clinical department of nuclear medicine and radiation protection now has seven gamma cameras; each year about 135,000 diagnostic or therapeutic procedures are performed, which accounts for approximately 30% of all nuclear medicine procedures in Croatia. The most in-demand procedures in my department are cardiac scans, bone scans, brain perfusion and receptor scintigraphy, PET in oncology and renal scintigraphy. There is also huge demand for thyroid studies, especially ultrasound and fine needle aspiration biopsy (about ten thousand ultrasound exams and four thousand fine needle aspirations are carried out yearly). Because of a sufficient number of staff, we do not have long waiting lists, though sometimes patients must wait two to three months for a cardiac scan or thyroid ultrasound. Patients are well informed about the diagnostic/therapeutic procedures they will be exposed to, and informed consent is required.

> Continued on page 44

AUTHOR GUIDELINES

Content

IMAGING Management welcomes submissions from qualified, experienced professionals active in the imaging industry, related technology companies and medical healthcare professionals with an interest in imaging-related topics and themes. We are particularly interested in articles focusing on management or practice issues and therefore accept scientific papers with a clear connection to these areas. Articles must be written by independent authorities, and any sponsors for research named. Our editorial policy means that articles must present an unbiased view, and avoid 'promotional' or biased content from manufacturers.

Submission guidelines

Authors are responsible for all statements made in their work, including changes made by the editor, authorised by the submitting author. The text should be provided as a word document via e-mail to editorial@ imagingmanagement.org. Please provide a contact e-mail address for correspondence. Following review, a revised version, which includes editor's comments, is returned to the author for authorisation. Articles may be a maximum 700 words per published page, but may include up to 1,500 words in total.

Structure

Article texts must contain:

- Names of authors with abbreviations for the highest academic degree;
- Affiliation: department and institution, city and country;
- Main authors are requested to supply a portrait photo (see specifications below);
- One contact name for correspondence and an e-mail address which may be published with the article;
- Acknowledgements of any connections with a company or financial sponsor;
- Authors are encouraged to include checklists, tables and/or guidelines, which summarise findings or recommendations, and
- References or sources, if appropriate, as specified below.

Images

Main authors are invited to supply a portrait photo for publication with their article, as well as other images and visuals. This and any other relevant images for publication with an article should be sent by e-mail as separate files (only high resolution images with 300dpi) and their order of placement in the article must be clearly indicated. Only the electronic formats _.tif_ or _.jpeg_ can be used for images, i.e. not Microsoft Word or PowerPoint. Images must be no smaller than 9cm x 9cm at 100% scale. Only images meeting these specifications can be published. If an image has been published before, permission to reproduce the material must be obtained by the author from the copyright holder and the original source acknowledged in the text, e.g. © 2004 Dervla Gleeson.

Format for references

Please use the Harvard reference system. Citations within the text for a single author reference should include the author surname and year of publication; for a citation with two authors include both author surnames and year of publication; for more than two authors, include the first author surname followed by "et al." and the year of publication. Multiple citations should be separated by a semicolon, and listed in alphabetical order. Example of within text citation: (Marolt 2008; Marolt and Gleeson 2002; Miller et al. 2003).

The format for listing references in submitted articles should follow the Harvard reference system. Example of standard journal reference: Sydow Campbell, K. (1999) "Collecting information; qualitative research methods for solving workplace problems", Technical communication, 46 (4) 532-544. Readers will be provided with an e-mail contact for references, which will be kept on file and supplied on request. Authors are responsible for the accuracy of the references they cite.

Acceptance

It is at the discretion of our editorial board to accept or refuse submissions. We will respond to submissions within four weeks of receipt. We reserve the right to revise the article or request the author to edit the contents, and to publish all texts in any EMC Consulting Group journal or related website, and to list them in online literature databases.

For further details or to request a copy of the 2010 editorial planner, with topics and focus areas included, please email **editorial@imagingmanagement.org**.

Thank you,
The IMAGING Management Editorial Team

>*Continued from page 42*

How Evolved is Nuclear Medicine in Croatia?

At present, there are eleven nuclear medicine departments in Croatia. The national development of the science is not uniform. There are some centres with very advanced equipment, but also others with rather outdated gamma cameras. Standard (mostly technetium-based) nuclear medicine is generally well covered, but there is a lack of PET units and sections for radioisotope therapy. Although the first PET study with FDG was performed at the end of 1999 in our department (coincidence PET), advanced PET machines are only available at the moment in private facilities (at PET/CT centres in Zagreb and Split). There is also a problem with the supply of PET tracers, which are imported from Austria. Fortunately, the construction of a cyclotron at an institute in Zagreb will be finished soon and the production of our own PET tracers will begin.

Another field that requires further development is nuclear medicine therapy. Roughly half of nuclear medicine departments in Croatia are capable of doing radiotherapy, but the limiting factors are number of beds and price of differentiated therapy. The waiting list for radioiodine therapy in thyroid patients is about a few months. Others form of isotope therapy (I-131 MIBG, therapy with labeled antibodies in lymphoma, pain palliation in bone metastases and arthritis) are performed according to resources available. The level of nuclear medicine services in Croatia is satisfactory.

All departments are working according to the guidelines published and recommended by the European Association of Nuclear Medicine (EANM) or by the US Society of Nuclear Medicine (SNM). Because of excellent connections with prominent nuclear medicine centres in Europe and the US, a lot of specialists have been trained abroad.

How is Nuclear Medicine Financed in Croatia?

The majority of nuclear medicine procedures (including PET) are covered by health insurance and reimbursed regularly by the state health insurance system. Every department has a monthly budget, which is dependent on the number of patients and number of studies performed. In the case of some new radiopharmaceuticals utilised in research, the approval of Central Ethics Committee and Ministry of Health is needed.

Educating Nuclear Medicine Specialists in Croatia

To become a nuclear medicine specialist in Croatia takes four years. This specialty is not very popular among young medical doctors, though at the moment we do not experience understaffing. There is a slight predominance of female doctors, probably connected with the fact that there are more female students in medical faculties in Croatia. The education programme is coordinated by the recommended curriculum of UEMS/Section Nuclear Medicine. During their training, young doctors spend some time in radiology, cardiology, neurology, paediatrics and some other departments. After finishing their education they mostly stay in Croatia and do not leave the country.

10 or 20 years ago, many of our colleagues left Croatia to work in the US or EU. Since then, the financial situation has improved, but the recent onset of the financial crisis may be the trigger for further migrations. The other factor possibly influencing new migrations would be the expected inclusion of Croatia in the EU. At that moment the movement of specialists between our country and the other European countries will be more simplified, and some doctors will probably decide to move.

Nuclear medicine has also been incorporated in the undergraduate study of medicine at the universities of Zagreb, Rijeka, Split and Osijek as a separate subject with 30 hours of education and examination. Postgraduate study is also available at the school of medicine, at the university of Zagreb. At present we have a mixed population of technologists, some with secondary medical school education and some university educated, but newly employed technologists willing to work in nuclear medicine must finish three years university study obtaining the title of radiological technologists. After completing their studies, they can choose between radiology and nuclear medicine for further work.

The UEMS/Section Nuclear Medicine Preparing Croatia for Europe

As a part of our country's preparations to join the EU, the medical sector is also preparing for unavoidable changes, which will occur at that very special moment for Croatia. Thus, we are very interested in the organisation of medical systems in EU countries, and that is one reason for our deep involvement in the UEMS (European Union of Medical Specialists), which was enabled by giving us the status of associate member country. I was first involved in the UEMS Committee for Syllabus and Education and after several years ended up as president-elect (in October 2009 becoming president). This position provides great motivation for further work and improvement of nuclear medicine services, not only in Croatia, but also in the whole of Europe. ■

Management In Radiology

ESR MIR

European Society of Radiology

Management in Radiology

Winter Course

January 14–16, 2010, Schladming/AT

Further information will be soon
available on **www.mir-online.org.**

MIR is a subcommittee of ESR.

MEDICAL IMAGING **IN CROATIA**

Interventional Radiology

Author
Asst. Prof. Vinko Vidjak

Acting Head
Clinical Department of Diagnostic and Interventional
Department of Diagnostic and Interventional Radiology
University Hospital "Merkur"
Zagreb, Croatia

vinko.vidjak@zg.t-com.hr

Asst. Prof. Vinko Vidjak was the first attendee of a two-year interventional radiology subspecialty programme and undertook further training with a special focus on vascular interventional radiology. He is assistant professor in undergraduate and graduate studies of radiology in the University of Zagreb School of Medicine, chairperson of the Section for Interventional Radiology of the Croatian Society of Radiology (CSR), acting head of the Clinical Institute for IR and the head's assistant for quality. He is also a member of the board of the CSR.

The Clinical Institute for Diagnostics and Interventional Radiology at the University of Zagreb School of Medicine has two imaging rooms, two diagnostic rooms for digestive tract exam, performing diascopic procedures and ERCP, two CT scanners (one single-slice, one 64-slice), MR (1.5T), an angiography room with a machine for DSA, one digital mammography machine, and several machines for other diagnostic imaging exams. We number nine radiology specialists, four radiology residents and two undergoing an education programme on behalf of another institution.

The average annual increase of our activity is approximately 7 - 8%, or around 1,400 procedures (2008). We provide IR services for other less-equipped institutions, which annually adds around 50 additional procedures.

Are Residents Interested in Joining IR?

Education of interventional radiologists in Croatia starts with a radiology residency training programme lasting four years. Afterwards, a subspecialty in interventional radiology is available within a fellowship programme, lasting two years and divided into three parts: clinical work (five months); vascular interventional radiology (nine months) and, nonvascular interventional radiology (eight months).

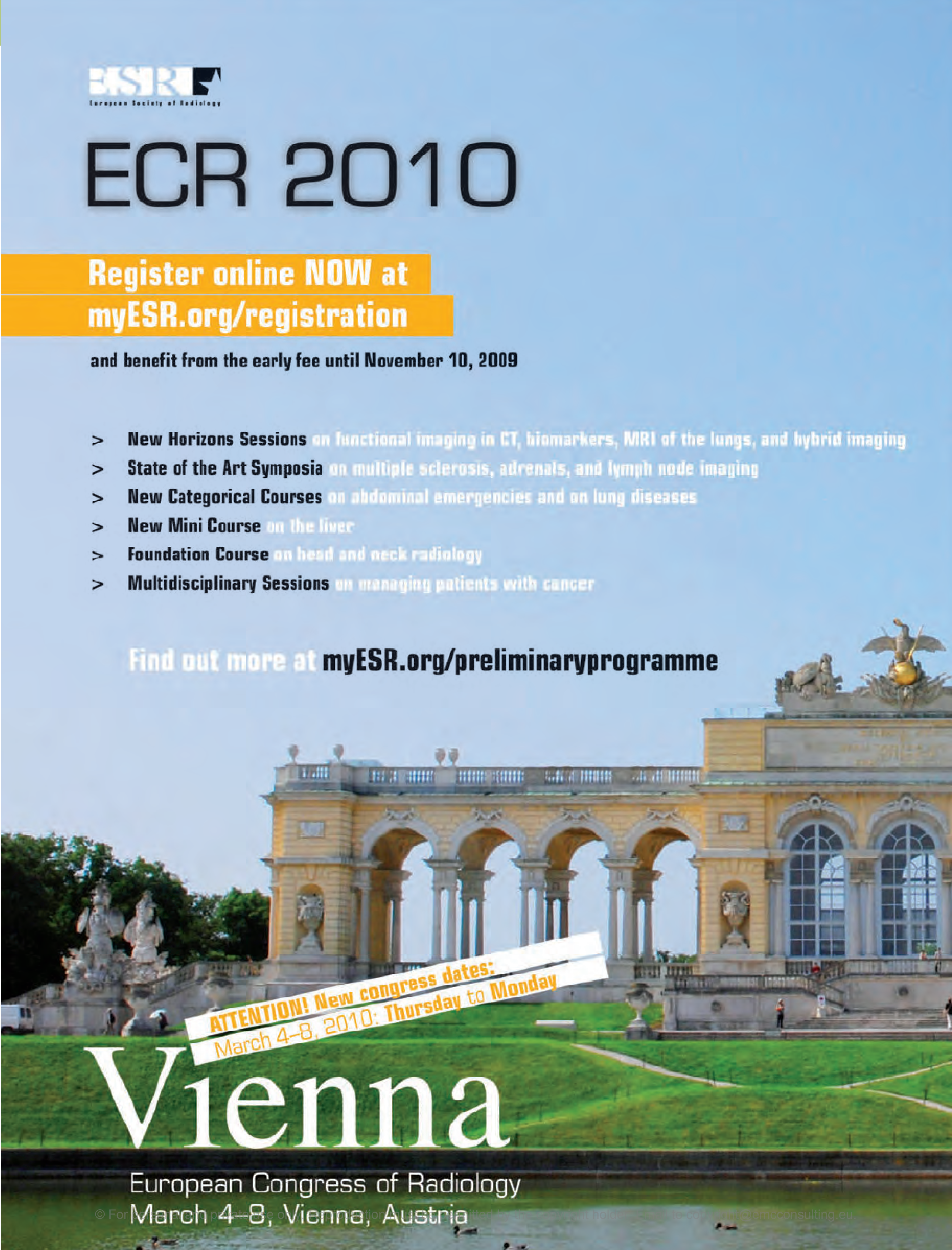
In Croatia, there is a negative ratio of interest in IR compared with for noninvasive diagnostics (e.g. CT, MR). Here, a growing interest in noninvasive radiology resulted in stagnating numbers of IR residents. The main cause is the transition of the economy and the standard of living in Croatia in the past 15 years, as well as the growing number of private radiological centres that offer diagnostic but not therapeutic services. IR services are provided in a few clinical centres and there are no significant trends for IR specialists to migrate abroad.

IR training in Croatia does not use simulators. During the training period every procedure and assessment done by the resident is controlled and appraised by a mentor. Work with residents includes frequent assessments of their knowledge and manual abilities, which has a direct influence on the individual training dynamics and reaching the level of competence necessary for independent work. This is why the total number of procedures during the two-year training period is different for each participant.

State Healthcare & its Impact on IR

Despite economic and social transformations, the central state healthcare system and central health insurance institution (HZZO) have been preserved. Private initiatives and health insurance provides certain advantages, which the inert central system does not allow (waiting lists for diagnostic tests, availability of more expensive tests, etc.).

However, the majority of private institutions provide only diagnostic services and at present, none of them have formed a team of interventional radiologists. Within the state healthcare system a significant number of IR services/procedures are not on the list of services financed by the system, and in addition the cost benefit of some of the costlier IR procedures from the list is low (e.g. TIPS, EVAR), taking into consideration the value of material used and labour costs of the medical team. This has a negative financial effect on the institution providing the IR service. Another important fact is that the team's cost of labour is undervalued regarding the costs of material used to perform a procedure. Such inertia of the system, and a lack of understanding of its true potential, is the cause of poor integration of IR in the state healthcare system. ■


ESR
European Society of Radiology
ECR 2010
Register online NOW at
myESR.org/registration
and benefit from the early fee until November 10, 2009
> New Horizons Sessions on functional imaging in CT, biomarkers, MRI of the lungs, and hybrid imaging
> State of the Art Symposia on multiple sclerosis, adrenals, and lymph node imaging
> New Categorical Courses on abdominal emergencies and on lung diseases
> New Mini Course on the liver
> Foundation Course on head and neck radiology
> Multidisciplinary Sessions on managing patients with cancer
Find out more at myESR.org/preliminaryprogramme
ATTENTION! New congress dates:
March 4–8, 2010: Thursday to Monday
Vienna
European Congress of Radiology
March 4–8, Vienna, Austria

AGENDA

Key Seminars & Conferences

November 2009

1-2 **ESOR Asklepios Course**
Sochi, Russian Federation
www.emricourse.org

5-7 **5th ESGAR Liver Imaging Workshop**
Antwerp, Belgium
www.esgar.org

12-13 **2nd Barcelona PET-CT and Hybrid Imaging Course**
Barcelona, Spain
www.barcelonapet-ct.com

14-14 **RBRS Annual Congress – Genitourinary Radiology**
Ghent, Belgium
www.rbrs.org

29-04 **RSNA 2009**
Chicago, US
www.rsna.org

January 2010

7-9 **4th Leuven Course on Ear Imaging**
Leuven, Belgium
www.headandneckimaging.be

14-16 **Management in Radiology Winter Course**
Schladming, Austria
www.mironline.org

17-22 **EIBIR Winter School on Intedisciplinary Biomedical Imaging**
Viladrau, Spain
www.eibir.org

27-30 **CT 2010 International Symposium**
Garmisch Partenkirchen, Germany
www.ct2010.org

February 2010

1-5 **ERASMUS Course on Head & Neck MRI**
Bruges, Belgium
www.emricourse.org

2-26 **2010 Abdominal Radiology Course**
Orlando, US
www.sgr.org

March 2010

4-8 **22nd European Congress of Radiology**
Vienna, Austria
www.myesr.org

21-26 **42nd International Diagnostic Course Davos**
Davos, Switzerland
www.idkd.org

April 2010

12-16 **ESOR Advanced Imaging Multimodality Seminars for Radiologists from China**
Shanghai, China
www.myesr.org/esor

14-16 **12th ESGAR CT Colonography Hands-On Workshop**
Amsterdam, The Netherlands
www.esgar.org

29-30 **6th ESGAR Liver Imaging Workshop**
Barcelona, Spain
www.esgar.org

May 2010

1-7 **ESMRMB/ISMRM Joint Meeting**
Stockholm, Switzerland
www.esmrmb.org

6-8 **ESOR GALEN Foundation Course – Abdominal Radiology**
Novi Sad, Serbia & Montenegro
www.myesr.org/esor

10-14 **25th Leeds Gastroenterology Course for Radiologists**
Leeds, United Kingdom
www.leedsgicourse.com

13-15 **7th Annual Sports Medicine Imaging Conference**
New York, US
www.med.nyu.edu/courses/cme/sports10

21-23 **ESOR GALEN Advanced Course – Cardiac Imaging**
Paris, France
www.myesr.org/esor

28-30 **18th Annual Meeting of the European Society of Thoracic Imaging**
Berne, Switzerland
www.esti-society.org

Coming in Issue 5 of IMAGING Management:

- *COVER STORY: Patient Access to Radiologic Technology & Services: Europe & Beyond*
- *Best Practice in Breast Screening: The Norwegian Programme*
- *Interdisciplinary Staff Management in the Radiation Oncology Department: The Managers' Guide to Best Practice*
- *Country Focus: Medical Imaging in Finland*

IMAGING Management is published by
EMC Consulting Group
28/7, rue de la Loi
B-1040 Bruxelles, Belgium
T: +32/2/ 286 85 00
F: +32/2/ 286 85 08
www.imagingmanagement.org

Subscription Rates (5 Issues/Year)

One year:	Europe	85 euros
	Overseas	105 euros
Two years:	Europe	150 euros
	Overseas	180 euros

Production & Printing
Print Run: 13,000
ISSN = 1377-7629

Verified Circulation
according to the standards of International Business Press Audits.

IMAGING Management is independently audited by Accountskantoor Closset.

GE Healthcare

A healthy dose of freedom.

Today, thanks to breakthrough ASiR™* technology from GE, clinicians have the freedom to lower patient dose dramatically without compromising image quality. ASiR delivers the high-quality images they need to diagnose with confidence — and only GE has it. Learn more at gehealthcare.com/lowdoseCT

GE imagination at work

*Adaptive Statistical Iterative Reconstruction, a proprietary dose-reducing approach that subtracts noise without degrading anatomical integrity.

Ultimate power and flexibility.

OASIS™

The ultimate patient MRI – open

State of the art high field performance MRI in its most open patient friendly design.

- 1.2T field strength, 33mT/m strength, 100T/m/sec gradient system
- 8 Channel Zenith RF system and coils
- HOSS™ – High Order Shim System
- RAPID™ – Parallel Imaging

- VERTEX™ computer system and ORIGIN™ operating software
- Unique open view and patient comfort level
- Tailored customer support and service

Visit us at Medica in Düsseldorf, Booth 9D53/9E57!

Hitachi Medical Systems Europe Holding AG · Sumpfstrasse 13 · CH-6300 Zug
www.hitachi-medical-systems.com

HITACHI
Inspire the Next