IMAGING Management

Promoting Management and Leadership in Medical Imaging

Volume 9 Issue 3
2009 - €22

ISSN = 1377-7629

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

SCHEDULING & APPOINTMENT MANAGEMENT IN THE MEDICAL IMAGING DEPARTMENT

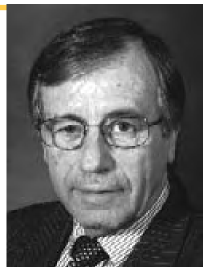
Business Process Engineering & Medical Imaging

Quality Standards in Paediatric Echocardiography

Radiation Exposure in Computed Radiography

Medical Imaging in Poland

www.imagingmanagement.org



Prof. Iain McCall

Editor-in-Chief

editorial@imagingmanagement.org

Dear readers,

More and more medical imaging department managers are scrutinising the process by which appointments with patients are being made, for the simple reason that it represents one clear method of increasing productivity and optimising patient flow in the department.

So, what are the first steps to generating an overview of the potential for improvement? Firstly, each department must monitor ongoing levels of demand, and try to predict the unpredictable: the influx of emergency patients requiring urgent imaging examinations. Secondly, existing patients within the hospital structure, that core group of radiology customers, must be prioritised, since they represent the 'bread and butter' of the department's earning power.

Thirdly, the exponential increase in demand for certain medical imaging exams has undoubtedly placed an increased burden on the administrative side of life in the department. Over the past 30 years, MRI has earned its reputation as one of the safest imaging modalities available. Without ionising radiation, concerns with repeat imaging studies, even for high-risk patients, are largely absent – as patients and referring physicians become more aware of these non-invasive and highly accurate imaging options, demand has shot up in both Europe and the US, where it is practically the first line of medical enquiry for a wide range of conditions.

In this edition's cover story, on the topic of "Scheduling & Appointment Management in the Medical Imaging Department", we round up a number of expert authors who have each closely examined the process by which each patient contacts the department to use its services – from looking closely at how long the average call lasts, to how long, on average, each call centre operator spends with each potential patient, no detail is too small for closer examination.

Even in those departments already implementing centralised call centre services, and paying close attention to the information available on the RIS/PACS system concerning demand peaks and troughs, there is always room for improvement, by encouraging call centre staff to be more productive, rewarding that productivity and cutting service costs, for example. As well as thinking of this bottom line, the department manager must guarantee that patients initiate contact with the department, in the most positive and efficient manner.

Thus one must employ a multi-facetted approach: it is not simply a question of purchasing larger number of scanners and employing new imaging professionals to take care of e.g. the increased demand for these exams, but of scheduling the influx of patients in the most efficient and organised way.

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

Prof. Iain McCall

CONTENT

IMAGING Management
Volume 9 Issue 3, 2009

Cover Story: Scheduling & Appointment Management in the Medical Imaging Department

Healthcare Economics

Features

Medical imaging is a large contributor to public radiation exposure and parameters for patient protection have yet to be concretised. A variety of key questions remain unanswered: how great is the radiation-induced cancer risk, and what is the risk of low-level radiation exposure? This article documents the organisations that are galvanising the drive to develop these standards and focuses on the evidence to date regarding health risks.

CONTENT

IMAGING Management
Volume 9 Issue 3, 2009

Country Focus – Radiology in Poland

Prof. Dr. Jörg F. Debatin, 47, is Medical Director and CEO of the University Medical Centre Hamburg-Eppendorf since 2003. Here, the author of 30 reviews, 6 books, 1,000 scientific presentations, and more than 300 invited lectures, tells us about life as hospital CEO. We also learn about the five-year restructuring project he engineered at Hamburg.

IT@NETWORKING

WINNING PROJECT GETS EXTENSIVE PRESS COVERAGE AND €5,000 CASH

The IT @ Networking Awards 2009 will select outstanding European healthcare IT solutions in hospitals and healthcare facilities and bring them to the pan-European stage.

WHERE AND WHEN

Brussels, the centre of European decision-making, will be the location for the IT @ Networking Awards 2009 *(IT @ 2009)*. It will be held from 29 - 30 October 2009 during the European Summit in October at Square, Brussels' hottest new meeting centre ensuring international attention.

WHO

The event will be organised by the *European Association of Healthcare IT Managers* (HITM) and the *European Association of Hospital Managers* (EAHM), the largest interest representations of their kind in Europe.

The attendee roster will include radiologists, hospital CEOs, CIOs, CMIOs, hospital and healthcare IT managers, other physicians with an interest in IT, members from European and national institutions whose mandates cover healthcare IT and members from the pan-European Press.

WHY

Behind its fragmented façade, European healthcare IT includes a number of world-class jewels: cutting edge IT solutions that meet real-world challenges, efficiently and cost-effectively, and not rarely, in an elegant fashion. Unfortunately, many such jewels remain unknown to the outside world – not just to the general public, but ironically, to the healthcare IT community as well.

So too do their users, designers and architects, unsung heroes who have often invested their creative talents, and dedicated months and years of hard work – to create, build and implement something good, something better, all the way through to the very best. But many such efforts extend beyond job descriptions, stretch far above the call of duty.

These pioneers need recognition! Their stories will inspire others. The lessons they have learned can help both avoid mistakes and transform healthcare IT challenges into opportunities, into "Made-in-Europe" success stories. This is the goal of *IT @ 2009*.

HOW

HITM and EAHM believe that peers will make the wisest decisions in respect to their own needs. As far as healthcare IT is concerned, the Associations consider it to be self-evident that senior healthcare professionals will know what is the best solution for them and their challenges they face.

To use familiar terminology for IT professionals, *IT @ 2009* is built on the principles of best-of-breed and peer-to-peer networking.

An on-the-spot, one-person = one-vote novel voting electronic system will be used to enable attending CEOs, CMIOs, CIOs, hospital and healthcare IT managers as well as department heads to make their choices. Only they are eligible to vote.

ORGANISERS:

European Association of HEALTHCARE IT MANAGERS

MEDIA PARTNERS:

HEALTHCARE IT MANAGEMENT

Hospital

G AWARDS 2009

ROLLOUT: FROM MINDBYTE TO WORKBENCH

FIRST DAY: MINDBYTE

All successful submissions for the *IT @ 2009* will be allocated 10 minutes for a Mindbyte (a short presentation) on what differentiates their solution and makes it special.

SECOND DAY: WORKBENCH

Finalists of the *IT @ 2009* will be given 45 minutes to provide an in-depth presentation, followed by a 1/4 hour Q&A session with the specialist audience.

THE IT @ Networking Awards 2009 CEREMONY

Out of the finalists, the 3 top rated IT solutions will be awarded a prize.

The winning project will:

- receive the IT @ Networking Awards 2009 trophy;
- have a detailed presentation of their solution in Europe's leading healthcare management media, and
- be awarded a cash prize of Euro 5,000.

REGISTRATION

- Full Members of the HITM and EAHM	Euro 300,-
- Other CEOs, CMIOs, CIOs, hospital and healthcare IT Managers	Euro 400,-
- Other professionals working in hospital and healthcare facilities	Euro 400,-
- Other industry professionals not employed by a healthcare facility	Euro 1000,-

WHO SHOULD PARTICIPATE

Designers, users and vendors of imaginative, innovative healthcare IT solutions. Solutions can be built on both COTS as well as bespoke designs. However, all entries have to demonstrate a considerable degree of customisation and show ingenuity. All entries must be already implemented in at least one site.

SUBMISSION DEADLINE

We are sure that your project will make a difference. Submissions must be received by **25 September 2009** and must be entered through **www.conftool.com/itawards2009/**

For further information on IT @ Networking Awards 2009 of for your project submission please visit our website ***www.hitm.eu****, contact our General Secretariat via email* ***awards@hitm.eu*** *or call* ***+32 / 2 / 286 8501****.*

REGISTER NOW!

CARDIOLOGY MANAGEMENT

IMAGING Management

ICU MANAGEMENT

KRANKENHAUS-IT Journal

CyberTherapy & Rehabilitation

EUROPE

EC-Funded e-Health Study Looks at Progress and Barriers

A new study funded by the European Commission is assessing the progress made to date, towards the realisation of European e-Health Action Plan goals. Good practices and lessons learned constitute the study's key elements. The results will be fed into policy recommendations for further accelerating e-Health implementation.

The study has been assigned to a consortium consisting of empirica Communication and Technology Research (Germany), The National Institute for Health and Welfare (Finland), Time.lex (Belgium), Prof. Denis Protti of the University of Victoria (Canada) and University College, London (UK), and EMC Consulting Group (Belgium). The European Commission and EU Member States have long recognised the potential of ICT-enabled applications to improve citizens' health, healthcare delivery as well as public health services or medical research.

The e-Health Strategies study will take a closer look at policy documents, concrete e-Health implementations and national-level legal and regulatory as well as administrative support mechanisms. In addition, it will also deal with financial and reimbursement issues. The research effort draws upon earlier projects funded by the European Commission. In particular, these include the e-Health ERA study and the "Legal Framework of Interoperable e-Health in Europe" study. A network of National Correspondents will raise data on new developments and validate existing information for each country.

The final project report - based on individual country briefs - will provide a summary of e-Health progress at a European level and information regarding the spectrum of e-Health solutions available in each country, the degree of administrative and legal support and financial incentives for promoting the use of e-Health applications.

For further information, please visit: **http://www.e-health-strategies.eu**

Results Published on EU RFID Project

The first results of the EU's RFID (Radio Frequency Identification) and Health project have been published. The report presents the findings of the first phase of a study to identify the policy options that can help the development and application of RFID in healthcare. The objectives of the study were:

- To identify and discuss the most relevant areas for deployment and use of RFID in healthcare;
- To identify the most important enablers, obstacles and uncertainties, and
- To discuss other alternatives to RFID technologies.

The report found that tracking is the key RFID-enabling function in use. Applications include identification and authentification of patients as well as automatic data collection and transfer in clinical trials.

The key barriers and obstacles to RFID's wider-scale implementation, include:

- Direct RFID costs;
- Privacy, security, data integrity and legal issues;
- Technical issues;
- Operational/managerial challenges, and
- Cultural and ethical concerns.

The Prague Declaration: Spotlight on e-Health

The e-Health Conference 2009 in Prague (e-Health for Individuals, Society and Economy) has been followed by the release of the Prague Declaration. This emphasises the progress already made in e-Health by both Member States and the European Union. It also notes that the benefits of e-Health for a safe and efficient health sector have long been recognised by expert stakeholders.

The Prague Declaration states that the benefits of e-Health applications and services must be enhanced and evenly distributed among all stakeholders, as follows:

1. Benefits for Individuals, Society and the Economy

For individuals, e-Health can increase quality and effectiveness of services. It is of immense benefit to those with chronic illnesses, and can improve continuity of care and facilitate cross-border healthcare. For society, e-Health is about interoperability, e-literacy and the accessibility of new technologies. It is also a great opportunity for research and development with high growth and innovation potential. As far as the economy is concerned, e-Health can offer enormous savings by enhancing reach, access and effectiveness.

2. Call for Building Further on Achievements

Considerable progress has already been made since the last e-Health conference, but the general consensus is that progress must not stop there. It has been decided to move forward and concentrate on the areas important for the full utilisation of e-Health potential. Consequently, EU Member States have been encouraged to take actions concerning telemedicine, interoperability and exchange of best practices.

3. Telemedicine Deployment

The November 2008 communication from the Commission on telemedicine highlights areas for improvement and provides an action plan for the full exploitation of opportunities offered by telemedicine. Both patients and healthcare professionals must build their confidence in telemedicine services. In order to increase the level of confidence, technical issues need to be resolved and legal clarity must be achieved.

Another challenge facing telemedicine is market development. Once these challenges are overcome within Member States the market will become less fragmented and not limited to one-off and small-scale projects.


HI VISION
Preirus
Discover new dimensions.
HI VISION Preirus
A compact premium ultrasound platform that adapts to your environment
The platform architecture of HI VISION Preirus has been designed to meet the needs of the next generation.
Choose HI VISION Preirus for the latest advanced technology:
• Unique ergonomic design for maximum comfort in diagnosis
• Smart Touch graphic user interface for intuitive operation
• PSS (Patient Scanning Selector) to optimise patient specific scan parameters
• Enhanced image quality and diagnostic performance using HI-RTE and Fine Flow Doppler
• Maintains compatibility with our diverse range of transducers
Hitachi Medical Systems Europe Holding AG · Sumpfstrasse 13 · CH-6300 Zug
www.hitachi-medical-systems.com
HITACHI
Inspire the Next

4. Interoperability and the M403 Mandate

In order for e-Health to expand and reach its full potential, a common set of standards for electronic health records, patient summaries, emergency data and other services must be developed. There is a clear lack of interoperability, which has already been highlighted in the existing EU action plan on e-Health.

Harmonised standards would facilitate access to healthcare for all EU citizens wherever they happen to work or travel. Key elements in interoperability are semantic and technological standards. The Declaration states that the implementation of the e-Health Interoperabilty Standards Mandate M403 is an initiative that should be widely supported for enabling interoperability of e-Health systems and services in Europe.

5. European Cooperation and Exchange of Best Practices

e-Health high-level conferences are great opportunities to exchange best practices between Member States. Studies have shown that there is a large gap between Member States and between readiness and actual use of e-Health. Although most healthcare professionals are now using IT, there is room for improvement concerning the interconnectivity of electronic networks of different health actors. Further development is therefore required.

Next Steps on the Agenda

In order to facilitate the development, implementation and use of new e-Health services the declaration highlights three focus areas:

1. Fulfilling Existing Strategic Goals and Developing New Ones

The Member States declare their intent to fulfil the goals of the i2010 initiative, e-Health action plan and specific national strategies already in place to promote e-Health in the EU.

2. Patient Safety and Empowerment

IT usage in the health sector has already had a positive impact on patient safety. Future actions must include strengthening patient involvement through the communication of targeted patient safety policies and solving legal and ethical issues. Privacy and data protection must also be high priority, including developing a common approach to optimising existing directives on data protection and privacy.

3. Governance Structure for e-Health

Due to its increased importance and use, arrangements for Europe-wide governance are needed. This will be discussed by all Member and partner European states in order to achieve interoperability and facilitate faster deployment so that patient safety and continuity of care is ensured within Member States as well as on a cross-border level.

Conclusion

The Prague Declaration serves as a call for action on building an e-Health area for European citizens. Member States and the Commission must work together to build this area, which will enable all citizens access to healthcare. National strategies must be adapted so that individuals, society and economy receive the benefits of e-Health and Member States must work together to create a European-wide governance structure to facilitate the implementation of new services as well as the removal of existing barriers.

For more information, please visit: **www.ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display &doc_id=590**

CORPORATE UPDATE

Carestream Laser Imager Approved by FDA

The US Food & Drug Administration (FDA) has given marketing clearance to a tabletop laser imager from Carestream Health for digital mammography and general radiography applications. The company will begin taking orders immediately for its CARESTREAM DRYVIEW 5850 Laser Imager and has already begun shipments in the US and other countries.

The new laser imager - featuring 508 pixels-per-inch output - addresses the need for affordable laser-quality film output from full-field digital mammography (FFDM) and CR-based mammography systems. The imager, with two on-line film trays, supports DICOM printing for mammography and general radiography. Carestream Health's laser imagers are available in three models that range from tabletop systems designed for imaging centres, small hospitals and clinics to fully featured units designed for high volume, multi-modality output for hospitals of all sizes.

Siemens Install Digital Mammography Solution

A MAMMOMAT Inspiration™ Full-Field Direct Digital Mammography system from Siemens Healthcare has been installed at Worcestershire Royal Hospital, part of the Worcestershire Acute Hospitals NHS Trust, to enable symptomatic patients to be imaged with the latest technology. The Inspiration was installed to replace an existing analogue system, as part of the Trust's long-term Managed Equipment Service (MES) contract.

Louisiana State University Install GE RIS/PACS

Louisiana State University (LSU) Health System, which includes 10 public hospitals and more than 500 clinics in the area, will deploy GE Healthcare's RIS, PACS and diagnostic reporting system, as part of a 12.5 million dollar contract to create a filmless and paperless central database and radiology image repository for sharing patient imaging. Implementation of GE's Centricity RIS/PACS system is expected to be live at all 10 hospitals within one year, according to the company.

Hypothermia Company Acquired by Philips

Philips has agreed to acquire the assets of InnerCool Therapies Inc., a therapeutic hypothermia company, and wholly-owned subsidiary of

Cardium Therapeutics, Inc. It will be acquired in an asset purchase transaction for 11.25 million dollars, and the transfer of around 1.5 million dollars in trade payables. The transaction will reinforce Philips' leadership position in the emergency care market by adding body temperature management solutions to its existing product offering in this field.

Sectra Appoints Senior Business Manager

Sectra has announced Chris Varian as Senior Business Manager in international business development. Chris Varian joins Sectra from Carestream Health where he was director, worldwide business development for mammography solutions following more than 15 years of international business development experience in PACS and digital imaging in a variety of roles with 3M, Imation and Kodak.

Hologic Announces Financial Results

Hologic has booked a third quarter 2009 net income of 41 million dollars, compared with 61 million dollars in the year-ago quarter. Included in third quarter fiscal 2009 results were charges of 48 million dollars attributable to the amortisation of intangibles relating to the Cytyc merger and the Third Wave acquisition and, in addition, a full quarter of costs and expenses from Third Wave.

Hologic said the charges related to the Cytyc merger were attributable to the amortisation of intangibles and a restructuring charge in connection with the resignation of the company's executive chairman in May 2008, but there were no expenses attributable to Third Wave in the third quarter of fiscal 2008.

Third quarter fiscal 2009 revenues totaled 403.1 million dollars, a 6.1 percent decrease when compared with revenues of 429.5 million dollars in the third quarter of fiscal 2008.

Hitachi Introduce New Medical Display

Hitachi's new display implements in-plane-switching technology, called IPS-Pro, which is said to provide a stable colour image from any viewing angle, good colour saturation and a very high contrast ratio, according to the company.

When viewed from an acute angle, a conventional TFT display will exhibit a loss of brightness and display image colors become inverted. In certain applications this performance limitation is not critical, such as a laptop PC where the user is situated perpendicular to the TFT display. Hitachi said its IPS-Pro TFT technology overcomes the limitations of conventional TFT display technology.

RESEARCH

EIBIR Announces New EuroAIM Leader

EIBIR has named Dr. Francesco Sardanelli from Milan, Italy, as the new lead of the EuroAIM initiative, a network to assess radiological technology. EuroAIM was set up to assist in the formation of consortia to perform meta-analyses, i.e. pooled analyses of existing prospectively collected datasets using individual patient level data from completed studies. Data that have been collected in studies in the past are re-analysed under different aspects and in correlation with data from other studies. This can be helpful to improve the power of studies, to improve the generalisation of results, to explore differences across settings, and in forming collaborative teams for future prospective studies.

EU Adopts Legal Framework for European Research Infrastructures

An agreement has been reached on a legal framework for the establishment of European research infrastructures. Currently, national and EU laws do not meet the needs of complex research infrastructures with partners in many countries. Under the new legal framework, Member States wishing to host a European research infrastructure will have to declare in their application to the Commission that they recognise the new infrastructure as an international organisation.

For more information visit: (http://cordis.europa.eu/esfri/)

ASSOCIATION NEWS

MIR Annual Meeting: Last Call for Participants!

The 'Making Imaging Relevant' Management in Radiology (MIR) Annual Scientific Meeting 2009 takes place this year in Riga, Latvia, from September 30 – October 2, 2009, organised and chaired by Dr. Nicola Strickland. The congress, which covers topics such as "How to Manage Imaging in a Recession", "Managing Reporting Performance" and "Managing Hybrid Imaging", is now in its 11^{th} year, and boasts a multinational roster of experienced presenters, including Prof. Jim Thrall (US), Prof. Maximilian Reiser (DE) and Prof. Luis Donoso (ES).

The MIR Annual Scientific Meeting 2009 was accredited with 12 European CME credits (ECMEC) by the European Accreditation Council for Continuing Medical Education (EACCME). A special registration fee exists for junior radiologists, providing conditions outlined on the MIR website (http://www.mir-online.org/scientific_congress_2009.shtml) are met.

Junior Workshop a Success: 2010 Edition Confirmed

In other MIR news, the association held its first junior workshop in late July 2009. The course is aimed at new consultants, or those about to seek or take up a consultant post. A "consultant" is a British term equivalent to the North American staff grade post, which means a definitive, substantive medical appointment: the highest grade of doctor within the National Health Service hospital-based practice in the UK.

The course was entitled "What you Need to Know at the Start of Your Consultant Career", and lectures were general rather than imaging-specific, and thus applicable to consultants in any medical or surgical discipline, wishing to learn about key management issues they will encounter from the start of their consultant careers.

The course dealt with issues including:
• How to organise your professional working life: negotiating your job plan, improving your curriculum vitae, dealing with being on-call, reasons for doing research;
• Departmental issues: departmental timetabling, avoiding a dysfunctional department, appointing a new colleague;
• Issues with a heavy managerial administrative component: setting up a new service, writing a business case;
• Issues involving colleagues: disciplinary issues, responsibilities involved in training junior doctors, what the family doctor/general practitioner is looking for from a referral service;
• Private practice: building up a personal private practice, what to do and what not to do in private practice;
• Broader, more general issues affecting consultants: medico-legal practice - how to avoid being sued on the one hand, and choosing to engage in medico-legal work on the other and what this entails; reasons for involving oneself in medical politics, and the consequences if you don't, and
• Teleradiology and telemedicine and their increasing impact on modern imaging and medical practice: how medical imaging professionals can protect their careers from it, and how to provide the added value necessary to remain competitive.

The course proved successful and popular. The speakers, all experienced, well-established consultants, were outstanding. They included heads of departments, medical executives and business managers, and current and past officers of the Royal College of Radiologists of the UK, as well as 'jobbing' radiologists with a wealth of practical experience of the real world at consultant level.

The course is to be repeated in 2010 by popular demand, and further information will be forthcoming in IMAGING Management as well as on the MIR and ESR websites: **www.mir-online.org, www.myesr.org**

CARS Congress 2010 Announced (June 23 - 26, Geneva, Switzerland)

The next edition of the Computer Assisted Radiology & Surgey (CARS) congress will be held from June 23 – 26, 2010 in Geneva, Switzerland, in conjunction with the annual meetings of ISCAS, EuroPACS, CAR, CAD and CMI societies.

The CARS congress organising committee invites you to be part of this scientific and medical community, which gives medicine a new perspective. The congress is of interest to those involved in radiology, surgery, engineering, informatics and/or healthcare management and those with an interest in topics, such as:
• Image-guided interventions;
• Medical imaging;
• Image processing and display;
• Computer aided diagnosis;
• Surgical simulation;
• Surgical navigation and robotics;
• Model-guided therapy, and
• Personalised medicine.

Of note to those who may wish to make a presentation at these meetings, is the paper and abstract submission deadline, which is January 11, 2010. For further information, please visit **www.cars-int.org.**

UEMS Vote Officially Recognises Interventional Radiology

A recent vote taken by the UEMS Radiology Section has officially recognised interventional radiology as a distinct medical specialty.

Until recently, interventional radiology was a self-declared medical subspecialty of radiology. Although recognised in some countries and embedded in the European Society of Radiology (ESR), it was not seen as a clearly defined profession by numerous authorities. In this context CIRSE proved that it has grown to become a powerful political organisation able to play a strong role at a European level.

With its positive vote on the establishment of an IR division within the UEMS Radiology Section, interventional radiology has been officially recognised as a medical specialty in Europe and by the same token interventional radiologists as distinct medical specialists. The national implementation of this decision, in the form of national accreditation, is the next step. (**www.cirse.org**)

Patient Safety Organisation Listed by US Government

The ECRI Institute Patient Safety Organisation has been officially listed by the US Department of Health and Human Services as a federal Patient Safety Organisation under the Patient Safety and Quality Improvement Act of 2005. ECRI Institute Patient Safety Organisation will serve nationwide as a PSO directly for providers, hospitals, and health systems as well as provide support services to state and regional PSOs. (**www.ecri.org**)

Newly-Elected Co-Chair Joins IHE-Europe

Jacqueline Surugue, a hospital pharmacist who played a key role in the creation of the pharmacy domain for Integrating the Healthcare Enterprise (IHE), was elected the Co-Chair for Users of IHE Europe Steering Committee in June this year.

Since 2007, Surugue has served on the Steering Committee of IHE, representing the European Association of Hospital Pharmacists (EAHP). As Co-Chair for Users, Surugue joins Peter Kuenecke, the elected Co-Chair for Vendors, in co-directing the activities and operations of the not-for-profit organisation IHE-Europe. Please go to **www.ihe-europe.net** for more news.

RESTRUCTURING RADIOLOGY SCHEDULING IN A HOSPITAL ENVIRONMENT

Pearls and Pitfalls

Authors
Elisabeth Schouman-Claeys
Gilles Pegon
Sylvie Decourdemanche

Medical Imaging
Radiology Department
Bichat Hospital
Paris, France
elisabeth.schouman-claeys@bch.aphp.fr

François Richou

Project Manager
Mission Nationale d'Expertise et d'Audit Hospitaliers (MEAH)
Paris, France
francois.richou@fr.oleane.com

Frédéric Gallois

Consultant
gallois@management-radiologie.fr

Hospital physicians are under growing pressure to reduce the average duration of hospital stay of patients. They require a fast, top-quality response and expect radiology to continually improve its performance in this area. In this article, we describe how radiology can improve the organisation of its appointment and scheduling management to optimise its resources.

Calculating the Volume of Emergencies

The first difficulty our department faced was that of accurately gauging the volume of last-minute examinations that we process. This problem is considerable in our facility (53% of scanners, 27% of MRIs), and related to our low ratio of outpatients (15% for CT-scanners, and 30% for MRIs). The chaotic impact of these sudden emergencies is well known.

Hypothetically, the more resourceful appointment scheduling is, the less likely it becomes that pre-scheduled cases will be disrupted by the flow of emergency cases. A high volume of emergencies is thus an additional argument for radiology to improve its organisation.

Defining Priorities

Another question concerns the definition of priorities. It is obvious that the first priority must be those patients already existing in the hospital structure, namely ER and hospital patients. But it is also essential to open up to outpatients. Not only because the current financing system encourages the performance of imaging exams prior to hospitalisation, but also because one must offer outpatients the possibility to benefit from a reference pathway, and that subcontracting is not without risk.

Indeed, a patient that turns up to a hospital's consultations who can't get their imaging procedures carried out then and there could be tempted to turn to another healthcare provider. Consequently the global imaging service offer must be improved and developed according to the hospital's needs.

Consideration was therefore given to this core group of inpatients when organising appointments – after all, they make up most of our patient cohort. It was done without altering the request system, which, in the absence of electronic prescriptions, is done systematically by fax, in order to assure traceability.

A Time for Observation and Questioning

Before taking action, the first step involves observation and questioning, by putting oneself in the clinician's and/or the patient's shoes. Some questions we developed to inform our appointment organisation process were:

- Are adequate responses made available to referring physicians by the existing administrative structure?
- Are the opening hours appropriate?
- Is the service unbroken or interrupted on certain days?
- Is phone accessibility satisfactory?
- Do we provide a quality response?
- Are the machines' time slots filled in the best way?

Feedback from the hospital system can reveal considerable potential improvements. In this way, we discovered that 56% have poor satisfaction with phone reception, 59% with scanner appointment deadlines, 64% with MRI and 82% with phone accessibility rate.

Three Action Points

Given these results, we have, using the same resources, focused our work on three action points, described below.

First Action Point: Improve Accessibility of Reservations Services
The objective was to extend the scheduling office's opening hours, to harmonise them for all modalities, to limit low-staffing days and to reduce request processing time limits. Several measures were set up:

- Establishment of a scheduling call centre, regrouping appointment scheduling areas, which were previously spread out across three zones within a 2,500m² depart-

ment. This regrouping was organised in stages, taking architectural constraints into account. The final goal was to organise a single area differentiating between a "front line" for the physical reception of people (patients or staff coming to discuss appointments), and a "back line" for the processing of phone calls and faxes;
- Increase the number of trained staff, e.g. integrating secretaries previously dealing with records processing into the scheduling pool, who gained time through the introduction of voice recognition;
- Improvement of training with the objective of becoming multi-functional in order to make every agent able to make appointments on all imaging modalities and,
- Installation of a mini switchboard, diverting unanswered calls towards other extensions.

Second Action Point: Improve Scheduling Office Efficiency
- Formalisation of a written handbook, dealing extensively with appointment allocation rules (e.g., list of questions to ask patients and referrers, specific authorisations for different radiologists given their increasing imaging specialisation by organ, listing of non-feasible tests with alternative solutions, etc.);
- Improvement of our anticipation of closing jobs;
- Streamlining the processing of requests by moving to a drop-in system for certain short standard radiology tests, in order to alleviate the workload;
- Centralised management of the different research protocols and,
- Authorisation to reject non-compliant requests in the administrative system.

Third Action Point: Maximising the Use of Scanners & Equipment
- Review of opening hours, of reserved time-slots for emergencies and of exam duration, taking into account technological developments;
- Anticipation of show-up time (30 minutes for CT-scanner and MRI, to take into account preparation and transportation time);
- Re-direction of underused time slots (in our case, 7 - 8 AM and 1 - 2 PM) and,
- Spotting services with a high rate of missed appointments, and collaboration on their re-organisation (e.g. lapses in transportation and cancellations orders, etc.).

An essential factor in the success of this work was to acquire a Radiological Information System (RIS) interfaced with inbuilt appointment scheduling software.

These actions were undertaken because scheduling was considered a major challenge. A manager was appointed working closely with the head of department, and accompanied by a consultant working in joint agreement with the MEAH. Our mid-term review is positive, with a net activity increase (+15% in CT scanners, for instance) and a halving of the number of unanswered calls, while the total number of calls through the call centre went up by a third.

Vigilance is Essential

Difficult aspects remain, among which first is the education of referring physicians, since the non-compliance of requests is very frequent and can cause time loss and tension. Furthermore, since the scheduling office is an essential link, it must be properly manned, and not used to fill-in other functions in the department.

> **"Our mid-term review is positive, with a halving of the number of unanswered calls, for example"**

Indeed, any organisational malfunction results in unfilled seats and a permanent loss of time. Vigilance is thus in order. A final step, to ensure your service is sustainable, is to integrate the collection, follow-up and regular restitution of performance indicators.

Preventive Actions Necessary

There remains the crucial question of the relevance of requests and medical justification of imaging tests. In order to save time and avoid having to refuse customers, it is useful to develop preventive actions: structured requests reminding of indications/non-indications, education of the referrers through weekly meetings, and definition of tests that require prior medical validation by the radiologists.

This type of organisation cannot be simply transferred to out-of-hospital requests whereas in fact this category of patients needs the correctness of referral questioned the most. We have therefore adopted the following rule: except in particular circumstances, these requests have to be made by a written request. If the relevance is not obvious, the request is followed by a phone conversation with the referrer.

University Hospital Lapeyronie of Montpellier **Adds Tomosynthesis to Its Suite of State-of-the-Art Digital Mammography Technologies**

One of the largest teaching hospitals in France, the University Hospital of Montpellier prides itself on utilising state-of-the-art technology to provide the highest levels of patient care, teaching, and research. Its radiology department is the major imaging resource for women's health in the area, supporting the University Hospital as well as a second local hospital and two groups of affiliated surgeons. Six years ago, the hospital replaced its analog mammography system with a Hologic Selenia digital mammography system. More recently, the hospital added a Hologic Selenia Dimensions tomosynthesis (2D and 3D) mammography system.

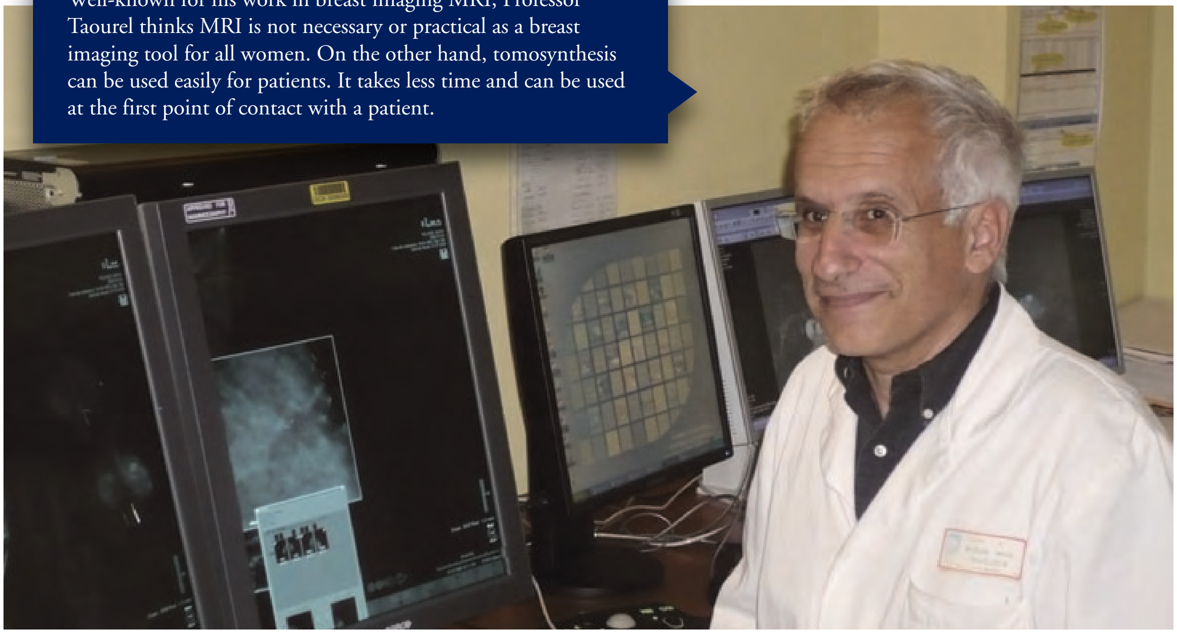
"Tomosynthesis adds to our ability to detect breast cancer," explains Professor Patrice Taourel, head of the Radiology Department. *"It increases specificity. We can see more and be more exacting in our diagnosis. It increases radiologists' confidence in their diagnosis and reduces the number of unnecessary recalls."*

Technology Enables Better Visualisation

The hospital radiology department offers comprehensive care for breast cancer detection, performing approximately 6,500 mammograms, 150 stereotactic breast biopsies, and 50 MRI breast biopsies a year. The transition from analog to digital mammography enabled the seven radiologists specialising in breast imaging to see more during the exam. *"Digital technology provides much better image clarity and higher quality images than analog technology, which makes it easier to identify abnormalities, especially microcalcifications,"* explains Professor Taourel. *"It gives us a new way of interpreting the mammogram; we can increase contrast, magnify an area, or alter the brightness of an image."*

The difference in the quality of images between analog and digital mammography is dramatic, and digital mammography has proven to be a superior modality for detecting breast cancer. But 20 – 30% of cancers remain undetected even with digital mammography, and a significant number of women receive a call back for a second exam. So, when Hologic's tomosynthesis three-dimensional technology became available, the University Hospital of Montpellier became one of the first sites in France to implement the technology. *"Tomosynthesis supplements mammography,"* states Professor Taourel. *"It is proven to improve sensitivity and specificity ... It works, and it is available."*

Well-known for his work in breast imaging MRI, Professor Taourel thinks MRI is not necessary or practical as a breast imaging tool for all women. On the other hand, tomosynthesis can be used easily for patients. It takes less time and can be used at the first point of contact with a patient.



Looking much like a digital mammography system, the x-ray tube of the Selenia Dimensions digital breast tomosynthesis system rotates around the breast taking 15 images from numerous angles in an exam that takes less than 4 seconds.

2D and 3D Technology: Better Views of the Breast

Tomosynthesis technology provides major improvements over digital mammography. First, tomosynthesis systems reduce the interference of overlapping tissue, leaving cancer undetected.

Second, tomosynthesis systems provide three-dimensional views of the breast making it easier for doctors to see cancer, especially in higher-risk women with dense breasts. Digital mammography systems take two-dimensional views of the breast by projecting all the breast tissue into one image. With tomosynthesis, the x-ray tube rotates around the breast taking 15 images breast with a limited angular scan, enabling doctors to see much more of the breast and identify abnormalities that may be hidden by dense or overlapping tissue.

The University Hospital's imaging department uses a wide range of modalities, including X-ray, ultrasound, MRI, and a combination of two-dimensional and three dimensional imaging. *"Tomosynthesis supplements mammography,"* states Professor Taourel. *"We use it on a systematic basis for patients who need more detailed views. From the beginning, we established a protocol to use tomosynthesis for all women who fit the stereotype of:*

- *It is their first mammogram and they do not have comparison films;*
- *They have risk factors, such as family history;*
- *They have a history of breast cancer and are looking for other lesions, or*
- *They want a second opinion."*

"However, use and benefits of tomosynthesis in a systematic way for well defined cases still need to be evaluated," continues Professor Taourel.

"Our workflow has not changed with tomosynthesis; it only requires several more seconds. For the patient, the change is almost transparent. For our radiologists, they need only to familiarise themselves with the new images they can see with tomosynthesis. It was the same when we went from analogue to digital technology. The images are different, you see a lot more, and radiologists need to be properly trained to become familiar with these new images."

Tomosynthesis Saves Time

Well-known for his work with breast imaging MRI, Professor Taourel thinks MRI is still the best imaging modality, but it is not necessary or practical as a breast imaging tool for all women. *"Tomosynthesis can be used easily for patients. It takes less time and can be used at the first point of contact with a patient. It is very helpful for breast health."*

"The main advantage of tomosynthesis is you can see more," concludes Professor Taourel. *"It is fantastic. The increased specificity reduces the number of women we recall and the increased sensitivity increases our level of confidence. My dream is to use tomosynthesis to guide biopsies."*

OPERATING A CALL CENTRE FOR SCHEDULING & APPOINTMENTS

A Management Model for Medical Imaging

Author
Alain Dana

Former Deputy Head
of Department
Paris Radiology Institute
Paris Hospitals
Paris, France

Also,
Hôpital Américain de Paris
Neuilly sur Seine, France
dana@idrdp.org
a.dana@dial.oleane.com

The call centre for scheduling and appointments in an imaging department is a strategic operational element of the unit. Imaging patients generally make their appointments either by phone or on the spot. Emails are an occasional alternative, but a phonecall remains essential for confirmation purposes.

The speed and quality of the phone response are essential elements in the patient's perception as well as for the doctor or his/her assistant requesting the test. Many opportunities exist to tighten the managerial control of operational effectiveness. Here, we shed light on the issue.

Analyse Your Scheduling Service

The first step is to analyse the real usage and functioning of your call centre set-up, or to monitor how appointments are being made in the department before centralising your scheduling service. As an example of the kinds of calculations you may need to make to improve your call centre, we analysed the July 2008 statistical results of the call centre of the Paris Radiology Institute. There are several elements that you can use to break-down and analyse your own working time, such as:

- Connection time and conversation time;
- Percentage of connected time per working time;
- Percentage of conversation time per connection time;
- Percentage of conversation per working time;
- Total number of calls;
- Number of appointments scheduled;
- Number of appointments per hour of presence of each operator and,
- Average call duration.

Our analysis showed the following results for us:

- Connection time compared with working time was approximately 75%;
- Conversation time compared with connection time was about 35% and conversation time compared with working time was about 27%;
- The total number of calls was 10,882 with 10,946 appointments (each call can lead to several appointments);
- The number of appointments per working hour was eight and,
- Average call duration was 2.03 minutes.

This sort of assessment can greatly inform us when planning improvements to the scheduling system for radiology. The next elements we must examine are operational parameters.

Operational Parameters

In our experience, the non-stop functioning of a call centre requires a halving of the number of operators present between noon and 2 PM, which may lead to an excessive dissuasion rate (see page 19 for glossary). Our call centre is thus open eight to nine hours a day, with a break between 1 and 2 PM. Opening days and hours must be specified on the answering machine. The switchboard operator should be present non-stop, and his/her slots are flexible in the following way:

- Automated sorting of responses to urgent calls during the call centre closing time, based on the caller's selection;
- Call transfer to doctors or staff and,
- Cancellation or confirmation of appointments.

> **"The speed and quality of the phone response are essential elements in the patient's perception"**

Transfer of Calls

Another important factor is how each call is processed. In our case, incoming calls are integrated into the "loop" with varying choices offered to the caller. Our operators then receive calls directly, based on this. Pending calls are transferred to the first operator available. Call distribution is random or oriented towards specialised operators.

At any given time, only one operator may take a break; this element is essential as the simultaneous disconnection of several operators generates major problems within the system, such as increase of waiting times or an erroneous projected waiting time. Indeed, projected waiting time is based on the number of operators connected when the call is made. A call centre supervisor is in place to check the state of operator connection levels in real-time.

Training for Medical Imaging Call Operators

Every new operator receives an explanatory handbook with instructions related to tests, e.g., specific scheduling of multiple tests, contrast agent prescriptions, etc.

Moreover, systematic training via tutoring is provided. Continuing education is given every week by the call centre using actual errors noticed, e.g., errors and improvements records, phone conversation recordings. Training scheduling operators "on the ground" enables operators to get a better knowledge of test procedures, which in the long-term optimises their scheduling.

Evaluating Operators

A review of objective monthly indicators is carried out for every operator. It specifies: number of calls per working hour, connection time compared with working time and average call duration.

The quality manager compares the operator's indicators with the group average. These data are used for bonus and salary review and for "people review", a staff appreciation procedure with indication of competence, motivation, and scope of knowledge.

Functioning Verification

The dissuasion rate is presented every day to the medical or administrative head of department, with a segmentation per half day. Three colour codes can be used :

- Green when the dissuasion rate is inferior to 1% of the calls;
- Orange when the dissuasion rate amounts to between 1 and 2% of the calls and,
- Red when the dissuasion rate is superior to 2% of the calls. A red code represents a real operational problem, which triggers an investigation.

The dissuasion rate is the first area where major change can be instigated, when starting a call centre. Our own dissuasion rate was 11% in 2007, but this rate went down to 1% in 2008, and the average waiting time here is about one minute at our institute.

Evidence-Based Data

Fifty calls can be processed by one operator in a four-hour half-day. Connection times should be checked against this. If the number of calls per half day is inferior or equal to fifty times the number of operators, no dissuasion is to be noted. Systematic recording of phone calls has many advantages.

- Random eavesdropping on phone conversations allows a control on individual or collegial malfunctions. It is important to check that the content of phone conversations allows the patient to benefit from all necessary indications before his/her arrival at the department.
- Conversation recording is also useful in case of litigation. It appears that complaints based on patient allegations are rarely confirmed by phone recordings.

Scheduling Aids

A review of the previous weeks' call centre results allows a modification of the number of operators, if need be. The number of calls is very high on Mondays and days after holidays. On the other hand, the number of calls is lower on Fridays or "bridge" days. Call volume data allows the elaboration of holiday plannings through the establishment of the number of operators necessary week by week.

Goal-Linked Bonuses

Generally, awarding goal-linked bonuses should not primarily take into account activity volume, since non-medical staff are not in charge of recruitment. On the other hand, quality is an essential element conditioning the distribution of bonuses based on efforts made. For the call centre, a goal-linked bonus was set up in connection with a 10% reduction of the average waiting time for patients in a year.

Glossary or terms used in this article

Average call duration:
- Average duration: Average call duration of all operators.
- Average duration per operator : Average call duration per operator.

Dissuasion: System asks the interlocutor to call again when the expected waiting time exceeds five minutes.

Average estimated time: Calculated according to the number of connected operators and the average call duration entered into the database.

Average waiting time: Average calculated connection time with operators.

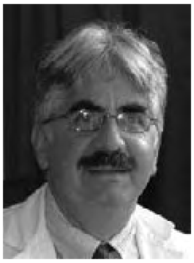
Indicators: Number of calls processed by operator and by working hour, dissuasion rate per half day, per day, per week, per month.

Give up rate: Number of hang-ups, apart from dissuasion, compared with the total number of calls.

WORKFLOW SCHEDULING

WITH MULTIPLE EQUIPMENT REQUIREMENTS

The Case for MRI & CT Scanning



Authors
Prof. Fred E. Avni

Head of Department
Free University of Brussels
favni@ulb.ac.be

Prof. Daniel Van Gansbeke

Radiology Professor
Free University of Brussels

Ms. Lisiane Rossignol

Head Nurse
Medical Imaging Unit
Érasme Hospital (ULB)
Brussels, Belgium

Scheduling appointments plays a crucial role in the smooth administration of the radiology department, particularly when multiple pieces of equipment have to be managed simultaneously. Access to modalities is assigned according to different sectors' requirements and volume of activity. All radiological appointments are made directly via the radiology department by phone or fax, seldom by email.

RIS Provides Better Scheduling Capacities

In 2004, the introduction of a dedicated administrative IT system in the radiology department gave the opportunity to partially redefine the scheduling system. At first, the new RIS system calibration was based on the existing appointment roster (one roster per testing room) while taking clinical sectors heads' wishes into account. It also allowed the possibility of adding urgents tests, multiple appointments for the same day or for a series of different days, tests carried out for experts' reports or clinical studies or customised slots. Absences of doctors in charge and of staff, or maintenance breaks could also be entered into this new system.

The parameters made it possible to differentiate between scheduling slots for hospital patients and those for outpatients. Previously, when an appointment was made, secretaries were instructed to favour hospital patients' requests: in the RIS agenda system, appointments are set according to a search for the first slot available.

The implementation of a RIS system has many advantages. As foreseen, the system manages schedules and generates work lists transmitted electronically to testing rooms. Therefore rooms are managed, activity and missed appointments monitored, statistics are produced and access to the rest of the administrative chain (e.g., test reading, billing, link with PACS, etc.) is secured.

Optimising the RIS Scheduling System

With use, we noted that the elements that need improving are linked to the RIS system itself, to the hospital's evolution, to health policy in general and to radiology in particular. Firstly, RIS efficiency requires an operational connection with the HIS in order to achieve a bi-directional transfer of patient administrative data. This interface must be optimised continually. Furthermore, RIS systems are complex and require experienced users and a good knowledge of their potentialities. Receptionists using RIS must be trained and able to use it in the most efficient manner. Their skills must be regularly updated.

At a hospital level, however, changing health policies have disrupted and challenged our administrative organisation. For example, hospital beds used to be accounted for by mutual agreement where the hospital had a certain number of agreed-upon beds - but these beds must now be justified by type of pathology and duration of stay. The duration of hospital stays must consequently be limited as much as possible, so that the hospital is not penalised for overstays.

Moreover, part of the reimbursement for radiological exams by social security is done in the form of a lump sum for hospital patients, but not for outpatients. Rather than extending a patient's hospital stay, it is thus now more appropriate to conduct tests in an outpatient context.

Finally, in the last few years radiology departments have experienced a net increase in demand for MRI and CT scans. At Erasme hospital, 30% of the CTs done in one day (approx. 90) come from the emergency department. They have to be inserted into the schedules. On top of this, one has to take into account the fact that 5 - 8% of patients do not show up for appointments.

Advice for Optimising Scheduling Systems

Experience shows today that an increase of RIS efficiency involves bypassing some rigid rules, such as "one slot = one appointment". There are several ways to achieve this :

- Train receptionists towards a more flexible scheduling policy,
- Appoint a manager for each heavy equipment section, in charge of appointments, whose role is to manage requests as they come in and to find a slot quickly;
- Create a "virtual waiting room", namely a screen of additional appointments on top of the three CT scanner and four MRI schedules. All additional or urgent requests must be pre-recorded there. Consequently, in every test room, the technician and the doctor in charge of the programme see their own schedule on the screen and the virtual waiting room where they can select patients as soon as a slot becomes free in their initial schedule, and finally,
- Promote the integration of computed requests/prescriptions, to be introduced by prescribing doctors and forwarded electronically.


ITa
NETWORKING AWARDS 2009
WINNING PROJECT GETS EXTENSIVE PRESS COVERAGE AND €5,000 CASH
SUBMIT YOUR PROJECT SUMMARY
NOW!
More Information on www.hitm.eu

MANAGING MEDICAL **IMAGING APPOINTMENTS**

Case Study - The Curie Institute

Authors
Dr. Sylvia Neuenschwander
G. Scamps
A. Livartowski
Ph. Rizand

Medical Imaging Department
Curie Institute
Paris, France
sylvia.neuenschwander@curie.net

The Curie Institute enjoys a relatively privileged situation, as a medium-sized establishment, with an efficient computer system, a large majority of planned patients and a low amount of emergencies. Notwithstanding this, we are not immune to the difficulties that can emerge in the management and scheduling of appointments. These difficulties are common to many other institutions, and the prescribed procedures facilitating an optimised organisation of imaging appointments can be applied anywhere. Here, we share our experiences in this area.

This first step, to have a good knowledge of your facility and its evolution, might seem obvious, but although it is easy to generate yearly activity reports, it is much more difficult to obtain more refined and essential indicators, such as the weekly distribution of consultations or the proportion of patients undergoing different procedures in a single day. These are the sorts of elements it is necessary to delineate, in order to streamline department management.

Our institution is a private hospital integrated into the public hospital system (PSPH) specialised in cancer treatment. Outpatient and ambulatory activity is predominant: 110,000 consultations take place per year with approximately 25,000 hospital stays in medicine, surgery, paediatrics and support care. Emergencies only refer to patients treated within the centre. Consequently, 80% of imaging patients are outpatients or ambulatory patients, mostly present for the day. 10% of them are unplanned. Another feature is the frequency of repeated exams, the timing of which depends on therapy requirements.

Optimise Capacities

Any optimisation of the imaging department's capacities is only as good as its internal organisation: opening hours, the real duration of machine usage, and the theoretical and real duration of exam protocols are all essential parameters that should be reviewed regularly. This information allows one, on one hand, to plan realistically, and on the other, to evaluate global capacities and consequently to know how many patients can be taken on in the department. The debate around the typology of patients that can be treated within the establishment or referred to other centres cannot take place without the input of senior clinicians. In this delicate situation, data and figures can be convincing.

Selecting a System

Since the 1980's, our institution chose a centralised appointment management system accessible by all secretarial staff. This is how successive electronic developments went by without meeting reluctance on the part of the users, since a global and centralised process "culture" was already integrated. The principle is that of the visibility of all planned requirements for a patient, in order to avoid making incompatible appointments, even though each department autonomously sets its own parameters.

Our procedure for booking appointments is set in stone: for imaging appointments, planning is established by managers, exams requiring a radiologist's approval or overbookings can only be entered by department secretaries, while all the other appointments are made by hospital secretaries. Planning takes into account the estimated exam duration for each protocol, medical presence for specialised acts, maintenance or special periods (e.g. summer holidays). Scheduling also takes into account the unavailability of the patient after certain exams (general anaesthesia, PET scan). It attaches written information on the exam which will be sent to the patient along with a confirmation of their appointment.

Interoperability with other computer applications is an essential component for smooth information flow. Each night, the appointment system generates a RIS (radiological information system) worklist for planned patients. All upcoming appointments, whether clinical or paraclinical, are visible in the electronic medical record, which facilitates follow-up care if an anomaly is spotted during an imaging exam. An ideal flow must take into account all the steps of the process, from the request to the transmission of exam results. For this reason, we ideally expect interaction between the electronic exam request and the appointment software.

Main Difficulties

- **Missed appointments:** Even if, as in our case, there are not many, it is useful to detect their cause (in this case, it is generally a change of address which was not updated). It is also necessary to follow up on them to keep the clinician informed.

- **Emergencies:** Their potentiality is assessed according to activity statistics. Consequently, time slots are reserved for them on heavy equipment. However, their random nature and competing exam requests add to the disorganisation that can happen with overloaded equipment, e.g. MRIs.
- **Clinical trials:** These can cause problems if accurate information on their activity and additional workload for the department has not been anticipated by the clinician in charge.
- **Repeated exams:** These constitute the main difficulty - the planning of follow up exams clog up time slots in the mid-term and limit appointment possibilities in the short-term. One solution is not to allow the scheduling of long-term appointments and to block off a certain number of mid-term time slots. However, this method might be outpaced eventually, by the constant growth in a patient cohort. In our establishment, one example is the yearly follow-up MRI for high-risk breast cancer patients: a quick calculation of patients joining the cohort every year and of the percentage of close follow-up exams generated by screening programmes anticipates that by 2010 all available breast MRI slots will be filled by these patients.

Checklist for Successful Planning

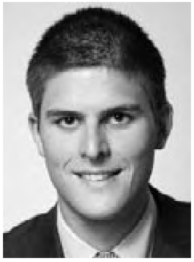
Two essential requirements are outlined here:

- Define at the outset, and in collaboration with clinicians, those exams that must be carried out in a specialised centre and those which can be delegated to non-specialised facilities, and be familiar with patient flows and procedures for planning those appointments.
- Acquire tools for exam planning/performing processes. These are essential for process regulation. This operation should be easy to achieve through pre-established automated requests, for example:
    - Time limit to get a response for an exam requiring a radiologist's approval;
    - Appointment time limit;
    - Patient waiting time in the department;
    - Number of delays and consequences on shifts, and
    - Number of missed appointments and causes.

New conditions on the allocation of resources have put increased pressure on all imaging facilities to optimise their equipment usage. It is up to us to devise appropriate tools for the regular assessment of those factors that can optimise appointment and scheduling management, to adapt our services.

APPLYING A "BUSINESS PROCESS REENGINEERING" MODEL TO RADIOLOGY

Part I: Six Steps for Streamlining Exam Processes



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

Business Process Reengineering (BPR) is a philosophy that advocates restructuring an organisation, based around processes rather than the individual tasks that take place in the organisation. The idea is that by approaching workflow without deference to traditional business models, one can analyse and redesign the organisation into a system of more efficient processes for greater competitiveness, with a focus on serving the customer.

The term "process" encompasses the whole chain of service delivery from referral to completion of diagnosis or therapy, if required. Older, heirarchical and task or function-based structures are replaced with a systematic approach that, if applied correctly, can bring significant results. Taking on the perspective of the customer and thinking in a more solution-oriented way empowers radiologists to deliver healthcare more efficiently.

Three Objectives of BPR

Hammer et al. (1993) name three economic objectives aimed at by BPR: reduction of cost, quality improvement and acceleration of processes. What are the six major measures for this improvement?

1. Eliminate non-economic-value-added activities
BPR advocates that work that is not of positive impact to the patient should be eliminated, rather than merely added to the list of functions a RIS/PACS or other IT system performs. Within the context of radiology, defining "economic value" is less straightforward due to intangibles such as patient satisfaction as well as performance measures, like time-per-examination, and financial indicators, such as reimbursement.

2. Reduce the number of interfaces in your workflow
In radiology, the process of diagnosis delivery begins and ends at "interfaces" with the referring physician. The outbound interface is the report, e.g. the diagnosis. The inbound information is commonly contained in plural documents, such as health records, the case history, and additional forms. We can economise on the number of "interfaces" when redesigning workflow by reducing information 'interfaces' that reoccur between admission, assistant medical technicans, physicians and pre- or post-examination steps, such as read and co-read activities.

3. Reduce the division of work in your department
Another BPR technique foresees the reduction of the division of work. For radiology, this is not as applicable a step as in the corporate world. A high degree of specialisation makes it necessary to divide the work of assistant medical technicians according to the scanner they are trained on. Managers need to, instead, reorganise workflow taking a customer/patient perspective to combine work steps so that the exam process is smoother.

4. Reduce redundant steps
At first glance, "redundancies" may seem a subgroup of the above-mentioned non-economic-value-added activities. In radiology however, redundancies can be of vital importance - they preserve a certain degree of additional safety. Hence, it is important for leaders to neither blindly cut back on those safety-enhancing steps that seem to be non-economic-value added, such as co-read steps, nor overlook the saving potential of redundant activities that are not safety-relevant, such as multiple requests of the same patient data prior to the exam.

5. Increase efficiency
Again, the tradeoff of efficiency vs. security arises. From the patient's perspective, increased efficiency during the exam may be valued positively in terms of time-saving as well as negatively in terms of being stressed. Given these issues, the optimal degree of efficiency may differ in radiology compared to non-healthcare entities.

6. Delegate competencies
Empower staff to use their initiative and tell you what they think about how the department can provide a broader range of activities – and what extra tasks they can realistically take on. In any industry this is a matter of training and qualification. Within BPR the establishment of different processes, depending on the degree of complexity, is outlined (see action point 3). For radiology, regulatory requirements limit the degree of competencies that can be delegated, as some decisions can only be made by physicians or medical directors. Nevertheless, it is of interest to design the exam process in a manner so that there are clearly defined decision gates and backup processes for critical cases.

Part II of this article will appear in issue four of IMAGING Management, and will explore this subject in greater detail, focusing on redesigning IT systems from a BPR point-of-view.

IMAGING Management

Subscription Form

for IMAGING Management

FAX BACK TO +32 2 286 8508

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

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

www.imagingmanagement.org

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

SCANNING SYSTEMS, MAGNETIC RESONANCE IMAGING

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

	ECRI INSTITUTE'S RECOMMENDED SPECIFICATIONS<1>	TOSHIBA MEDICAL SYSTEMS EUROPE www.toshiba-europe.com/medical	TOSHIBA MEDICAL SYSTEMS EUROPE www.toshiba-europe.com/medical
MODEL	High Field Strength Closed MRI Systems	1.5T Excelart Vantage	1.5T Excelart Vantage Atlas
WHERE MARKETED		Europe, Japan, US	Europe, Japan, US
FDA CLEARANCE		Yes	Yes
CE MARK (MDD)		Yes	Yes
CLINICAL APPLICATION		Whole body	Whole body
MAGNET			
Configuration	Closed	Ultra-short-bore	Ultra-short-bore
Strength	1.5 T	1.5 T	1.5 T
Homogeneity, ppm V-RMS	0.45 50	"DSV 50 x 50 x 50 <2 ppm Guarantied (<1.7 ppm Typical) Static V-RMS with 24 plains & 24 plot/plane	"DSV 50 x 50 x 50 <2 ppm Guarantied (<1.7 ppm Typical) Static V-RMS with 24 plains & 24 plot/plane
Dimensions of maximum useful FOV and homogeneity, (x, y, z), cm		55 x 55 x 50 cm at ≤2 ppm	55 x 55 x 50 cm at ≤2 ppm
TABLE			
Detachable		Optional	Optional
Dimensions, L x W, cm		242 x 57.5	242 x 57.5
Horizontal speed, cm/s		2 / 15 / 20	2 / 15 / 20
Elevating		Standard	Standard
Retractable armrest		Left & right side	Left & right side
Minimum height, cm		42	42
Load limit, kg (lb)		200 (440)	200 (440)
Limited mobility		200 (440)	200 (440)
Fully mobile		200 (440)	200 (440)
ACOUSTIC NOISE			
Sound pressure level (SPL) at peak gradient amplitude and slew rate, dB(A)		< 99	< 99
Reduction technology		Vacuum enclosed gradient coils (Pianissimo)	Vacuum enclosed gradient coils (Pianissimo)
GRADIENT SYSTEM			
Standard name		AGV, MGV*, XGV, ZGV (MGV for US market only)	XGV, ZGV
Standard strength, z-axis, mT/m	20, 40	"30 (AGV, MGV, XGV) 33 (ZGV)"	"30 (XGV) 33 (ZGV)"
Standard slew rate, z-axis, T/m/s	150	"50, 86, 130 (AGV, MGV, XGV respectively) 200 (ZGV)"	"130 (XGV) 200 (ZGV)"
RF SYSTEM			
Power output, kW		20	20
Amplifier type		Solid state	Solid state
Standard number of channels		4 or 8	16, 32 prepared
Number of channel elements		Coil dependent up to 32	128
Optional channel configurations		8	32
Receiver bandwidth, kHz		1,000	1,000
Location of coil connector (plug)		Gantry	Gantry
Standard length of coil cables, m		1.5	1.5
Number of coil connectors (plugs)		3	9
Coil tuning technique		Automatic	Automatic
LAST UPDATED		Aug-09	Aug-09
OTHER SPECIFICATIONS		Vantage systems are short (1.49 m), large clinical FOV (55 cm x 55 cm x 50 cm), possesses high homogeneity at <2 ppm over a full 50 x 50 x 50 DSV.	Vantage Atlas systems are identical to the standard Vantage systems that has a short (1.49 m) magnet and a large clinical FOV (55 cm x 55 cm x 50 cm). It possesses a high homogeneity at <2 ppm over a full 50 x 50 x 50 DSV. The Vantage Atlas system has the most sophisticated matrix coils whereby the element size matches the anatomical requirements for optimal imaging. Atlas coils have a series of small elements for high resolution in the center of the coil and large element for high sensitivity on the side of the coil. The Atlas Body coil in combination with the Atlas Spine coil covers the maximal FoV of 55 x 55 x 50 cm.
Supplier Footnotes	<1>These recommendations are the opinions of ECRI Institute's technology experts. ECRI Institute assumes no liability for decisions made based on this data.		

TOSHIBA MEDICAL SYSTEMS EUROPE www.toshiba-europe.com/medical	HITACHI Inspire the Next	HITACHI Inspire the Next	HITACHI Inspire the Next	HITACHI Inspire the Next
1.5T Excelart Vantage Titan	MODEL APERTO Eterna	MODEL AIRIS Vento	MODEL Echelon	MODEL OASIS
Europe, Japan, US	EMEA/ ASIA/ JP	USA/EMEA/ASIA/JP	USA/EMEA/ASIA/JP	USA/Europe/JP
Yes	No	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
Whole body	Whole body	Whole body	Whole body	Whole Body
	1 pillar open	2 pillar open	horizontal bore	2 pillar asymmetric
Ultra-short-bore	open	open	Closed	open
1.5T	0.4T	0.3T	1.5T	1.2T
"DSV 50 x 50 x 50 <2 ppm Guarantied (<1.7 ppm Typical) Static V-RMS with 24 plains & 24 plot/plane		0.4 @ 20 cm FWHM	0.5 @ 35 cm DSV	0.3 @ 35 cm DSV
55 x 55 x 50 cm at ≤2 ppm	35x35x32	35x35x32	50x50x50	45x45x45
Optional	No	No	No	No
242 x 57.5	232 x 80	232 x 80	235 x 51	252x83 cm
2 / 15 / 20				150 mm /sec
Standard	Yes	Yes	Yes	Yes
Left & right side	Not available	Not available	Not available	Not available
42	46	46	45	49
200 (440), 250 (550) optional				
200 (440), 250 (550) optional	227	227	227	227
200 (440), 250 (550) optional	227	227	227	227
< 99	MCAN (Leq) <100dBA	MCAN (Leq) <100dBA	MCAN (Leq) <120dBA	MCAN (Leq) <113dBA
Vacuum enclosed gradient coils (Pianissimo)	Not specified	Not specified	Soft Sound	Soft Sound
XGV	Standard	Standard	Standard	Standard
30 (XGV)	22 in x, y, z axis	21 in x, y, z axis	33 in x, y ,z axis	33 in x, y, z axis
130 (XGV)	55 in x,y,z axis	55 in x,y,z axis	150 in x,y,z axis	100 in x,y,z axis
20	5	5	20	18
Solid state	Solid State	Solid State	Solid State	Solid State
16, 32 prepared	4	4	16-Aug	8
128	Not specified	Not specified	Not specified	Not specified
32	Not available	Not available	Not available	Not available
1,000	500	500	700	700
Gantry	Patient Table	Patient Table	Patient Table	Patient Table
1.5	Not specified	Not specified	Not specified	Not specified
9	1	1	4	2
Automatic	Automatic	Automatic	No tuning necessary	No tuning necessary
Aug-09				
Vantage Titan systems are short (1.49 m), with a large bore of 71 cm diameter. It is the only large bore system without any compromise to homogeneity and field of view. The large clinical FOV (55 cm x 55 cm x 50 cm), possesses high homogeneity at <2 ppm over a full 50 x 50 x 50 DSV. The Vantage Titan has the Atlas coil system, which has the most sophisticated matrix coils, whereby the element size matches the anatomical requirements for optimal imaging. Atlas coils have a series of small elements for high resolution in the center of the coil and large element for high sensitivity on the side of the coil. The Atlas Body coil in combination with the Atlas Spine coil covers the maximal FoV of 55 x 55 x 50 cm.				

MODEL	ECRI INSTITUTE'S RECOMMENDED SPECIFICATIONS<1> High Field Strength Closed MRI Systems	PHILIPS sense and simplicity Acheiva XR	PHILIPS sense and simplicity Achieva 1.5T SE	PHILIPS sense and simplicity Achieva 1.5T A-SERIES
WHERE MARKETED		United States	Worldwide	Worldwide
FDA CLEARANCE		Yes	Yes	Yes
CE MARK (MDD)		Yes	Yes	Yes
CLINICAL APPLICATION		Whole body	Whole body	Whole body
MAGNET				
Configuration	Closed	Short-bore cylindrical	Short-bore cylindrical	Short-bore cylindrical
Strength	1.5 T	Rampable 1.5 T to 3 T	1.5 T	1.5 T
Homogeneity, ppm V-RMS	0.45 50	0.5 ppm @ 40 cm, 0.12 ppm @ 30 cm, 0.3 ppm @ 20 cm, 0.004 ppm @ 10 cm	1.4 ppm @ 53 cm, 1.18 ppm @ 50 cm, 0.5 ppm @ 40 cm, 0.07 ppm @ 30 cm, 0.03 ppm @ 20 cm, 0.01 ppm @ 10 cm	1.4 ppm @ 53 cm, 1.18 ppm @ 50 cm, 0.5 ppm @ 40 cm, 0.07 ppm @ 30 cm, 0.03 ppm @ 20 cm, 0.01 ppm @ 10 cm
Dimensions of maximum useful FOV and homogeneity, (x, y, z), cm		50 x 50 x 45	53 x 53 x 48	53 x 53 x 48
TABLE				
Detachable		Trolley	Trolley	Trolley
Dimensions, L x W, cm		NA	NA	NA
Horizontal speed, cm/s		2, 8, 18	2, 8, 18	2, 8, 18
Elevating		Yes	Yes	Yes
Retractable armrest		Not specified	Not specified	Not specified
Minimum height, cm		52	52	52
Load limit, kg (lb)				
Limited mobility		250 (550) horizontal travel	250 (550) horizontal travel	250 (550) horizontal travel
Fully mobile		159 (350) vertical travel	159 (350) vertical travel	159 (350) vertical travel
ACOUSTIC NOISE				
Sound pressure level (SPL) at peak gradient amplitude and slew rate, dB(A)		<25 with headset	<25 with headset	<25 with headset
Reduction technology		SofTone	SofTone	SofTone
GRADIENT SYSTEM				
Standard name		Quasar	Pulsar HP +	Pulsar HP+
Standard strength, z-axis, mT/m	20, 40	40	33	33
Standard slew rate, z-axis, T/m/s	150	120	122	122
RF SYSTEM				
Power output, kW		18, 25	18	18
Amplifier type		Solid-state	Solid-state	Solid-state
Standard number of channels		16	8	16
Number of channel elements		Not Specified	Not Specified	Not Specified
Optional channel configurations		32	16, 32	16, 32
Receiver bandwidth, kHz		300	300	300
Location of coil connector (plug)		Gantry face	Gantry face	Gantry face
Standard length of coil cables, m		1.2	1.2	1.2
Number of coil connectors (plugs)		2	2	2
Coil tuning technique		Automatic	Automatic	Automatic
LAST UPDATED		Aug-09	Aug-09	Aug-09
OTHER SPECIFICATIONS		Rampable magnet; MultiTransmit RF upgrade optional; optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.	Available in mobile configuration; optional upgrade to A-series system; optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.	Available in mobile configuration/ I/T; optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.
Supplier Footnotes	<1>These recommendations are the opinions of ECRI Institute's technology experts. ECRI Institute assumes no liability for decisions made based on this data.	System is fully upgradable to the latest 3T platform including Multi-Transmit Technology		Elite Clinical Solutions combining coils, protocols and workflow tools for neuro, msk, breast, paediatrics, oncology and many more.

Achieva 3.0T TX with MultiTransmit	Achieva 3.0T X-Series	INTERA 1.5T	Panorama HFO
Worldwide	Worldwide	Worldwide	Worldwide
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Whole body	Whole body	Whole body	Whole body
Short-bore cylindrical	Short-bore cylindrical	Short-bore cylindrical	Open, two-post
3 T with MultiTransmit RF	3 T	1.5 T	1 T
0.5 ppm @ 40 cm, 0.12 ppm @ 30 cm, 0.3 ppm @ 20 cm, 0.004 ppm @ 10 cm	0.5 ppm @ 40 cm, 0.12 ppm @ 30 cm, 0.3 ppm @ 20 cm, 0.004 ppm @ 10 cm	1.4 ppm @ 53 cm, 1.18 ppm @ 50 cm, 0.5 ppm @ 40 cm, 0.07 ppm @ 30 cm, 0.03 ppm @ 20 cm, 0.01 ppm @ 10 cm	2.8 ppm @ 45 cm, 1 ppm @ 40 cm, 0.01 ppm @ 30 cm, 0.03 ppm @ 20 cm
50 x 50 x 45	50 x 50 x 45	53 x 53 x 48	45 x 45 x 45
Trolley	Trolley	Trolley	Yes
NA	NA	NA	80 x 240
2, 8, 18	2, 8, 18	2, 8, 18	2, 8, 18
Yes	Yes	Yes	Yes
Not specified	Not specified	Not specified	Not specified
52	52	52	57
250 (550) horizontal travel	250 (550) horizontal travel	250 (550) horizontal travel	250 (550)
159 (350) vertical travel	159 (350) vertical travel	159 (350) vertical travel	250 (550)
<25 with headset	<25 with headset	<25 with headset	<25 with headset
SofTone	SofTone	SofTone	SofTone
Quasar	Quasar	Pulsar	Pulsar
40	40	33	28
120	120	80	120
25	25	18	10
Solid-state	Solid-state	Solid-state	Solid-state
16	16	8	8
Not Specified	Not Specified	Not specified	Not specified
16, 32	16, 32	16,32	Not specified
300	300	100	300
Gantry face	Gantry face	Gantry face	Table
1.2	1.2	1.2	1.2
2	2	2	3
Automatic	Automatic	Automatic	Automatic
Aug-09	Aug-09	Aug-09	Aug-09
MultiTransmit RF; optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.	Also available in a mobile configuration; optional MultiTransmit upgrade; optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.	480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.	Optional Ambient Experience; 480 V, 65 kVA, 80 A for the system; 480V, 9 kVA, 30 A for the cryocooler compressor; 480 V, 55 A for the Schreiber chiller.
Advanced imaging available such as Arterial Spin Labeling, Non Contrast MRA, SENSE Spectroscopy, MammoTrak Breast solution and our Elite Clinical Solutions	This system is fully upgradable to MultiTransmit Technology		

	GE Healthcare	GE Healthcare	SIEMENS	SIEMENS
MODEL	Signa HDx 1.5T EchoSpeed	Signa HDx 1.5T HDx Twin-Speed	MAGNETOM Trio	MAGNETOM Verio
WHERE MARKETED	Worldwide	Worldwide	Worldwide	Worldwide
FDA CLEARANCE	Yes	Yes	Yes	Yes
CE MARK (MDD)	Yes	Yes	Yes	Yes
CLINICAL APPLICATION	High performance, whole body	High performance, whole body	Whole body	Whole body
MAGNET				
Configuration	Cylindrical high performance	Cylindrical high performance	Superconductive, short bore	Superconductive, short bore
Strength	1.5 T	1.5 T	3 T	3 T
Homogeneity, ppm V-RMS	LV-RMS: <0.05 ppm @ 10 cm, <0.25 ppm @ 20 cm, <0.50 ppm @ 30 cm, <1.00 ppm @ 40 cm, <1.25 ppm @ 45 cm, < 2.00 ppm @ 48 cm	LV-RMS: <0.05 ppm @ 10 cm, <0.25 ppm @ 20 cm, <0.50 ppm @ 30 cm, <1.00 ppm @ 40 cm, <1.25 ppm @ 45 cm, < 2.00 ppm @ 48 cm	<0.25 at 40 cm DSV, 0.8 at 45 cm DSV, 1.5 at 50 cm DSV	4.0 (typical 3.6) ppm @ 50 x 50 x 45 cm DSV, 1.6 (typical 1.2) ppm @ 40 DSV, V-RMS (based on 24-plane plot)
Dimensions of maximum useful FOV and homogeneity, (x, y, z), cm	48 x 48 x 48	48 x 48 x 48	50 x 50 x 50	55 x 55 x 45
TABLE				
Detachable	Standard, completely detachable	Standard, completely detachable	Optional	Optional removable tabletop and trolley
Dimensions, L x W, cm				
Horizontal speed, cm/s	213.4 (L)	213.4 (L)	Not specified	238 x 63
Elevating	10.26	10.26	20	20
Retractable armrest	Standard	Standard	Standard	Standard
Minimum height, cm	Standard, both sides	Standard, both sides	Not specified	Not specified
Load limit, kg (lb)	68.58 (27 in)	68.58 (27 in)	Not specified	50
Limited mobility	159 (350)	159 (350)	250 (550)	250 (550)
Fully mobile	159 (350)	159 (350)	250 (550)	250 (550)
ACOUSTIC NOISE				
Sound pressure level (SPL) at peak gradient amplitude and slew rate, dB(A)	Not specified	Not specified	102	115
Reduction technology	Vibroacoustic mat	Vibroacoustic mat, vacuum sealed gradient coil	Antivibration mounting, noise reduction, systems integration, whisper mode, others	Antivibration mounting, noise reduction, systems integration, whisper mode, others
GRADIENT SYSTEM				
Standard name	EchoSpeed	TwinSpeed	TQ gradient	VQ gradient
Standard strength, z-axis, mT/m	33	50	45, in x, y, z-axis	45, in x, y, z-axis
Standard slew rate, z-axis, T/m/s	120	150	200	200
RF SYSTEM				
Power output, kW	21 body, 4 head	21 body, 4 head	35	33
Amplifier type	Solid-state	Solid-state	Compact air cooled	Compact air cooled
Standard number of channels	8, 16, or 32	8, 16, or 32	8	8
Number of channel elements	29 (HNS array)	29 (HNS array)	Not specified	Not specified
Optional channel configurations	8, 16, or 32	8, 16, or 32	18, 32	18, 32
Receiver bandwidth, kHz	100	100	1,000 per channel	1,000 per channel
Location of coil connector (plug)	Gantry	Gantry	Patient table	Patient table
Standard length of coil cables, m	Variable	Variable	Variable	Variable
Number of coil connectors (plugs)	Dual connector port	Dual connector port	10	10
Coil tuning technique	Auto tuning	Auto tuning	Automatic	Automatic
LAST UPDATED	Sep-07	Sep-07	Nov-07	Nov-07
OTHER SPECIFICATIONS	None specified.	None specified.	None specified.	None specified.
Supplier Footnotes				

Hitachi's APERTO Open MRI Unparalleled for Patient Care & Cost-Effectiveness

There are three main reasons why Mark Sherratt, Radiology Services Manager at the Bronglais Hospital, part of the Ceredigion and Mid-Wales NHS Trust in Wales, UK, is extremely pleased with the facility's latest equipment purchase, a Hitachi Medical Systems Europe APERTO Open MRI scanner: increased patient care and satisfaction, sharp image quality and low running costs. Here, the busy manager explains how the system has boosted their business and describes how it has slotted seamlessly into the department workflow.

Patient Care a Key Decision-Making Factor

Mr. Sherratt says that, *"We chose the APERTO Open MRI system because patient care is the key philosophy here at BGH, and it was felt that an open scanner provides the best patient experience without compromising image quality. We had a visiting van service prior to the APERTO. Connectivity has been seamless. Now we have seen huge improvements compared to the van".*

> "The scanner is capable of performing more scans that we currently have reporting capacity to deal with."

The APERTO permanent open MRI system is the most open MRI system on the market, designed with the patient experience as a focus, drawing on over 25 years of open MRI experience in the HITACHI Medical Corporation Group.

For Bronglais Hospital, this has meant that they have benefited from a wide range of patient experience-enhancing factors, such as:

- The machine is particularly good for scanning shoulders and knees as the area can be positioned in the isocentre;
- Very silent gradient system, excellent for sensitive groups such as children and the elderly;
- The easy access allows bariatric patients to be scanned who would not fit a horizontal bore magnet;
- The open structure allows easy patient positioning in the ISO centre of the magnet, enhancing patient comfort and optimising image quality;
- Its structure allows excellent observation of patients during the scan procedure, beneficial for monitoring slightly confused elderly patients undergoing a scan, patients with ventilation support after a severe trauma or critical ICU patients. This is much less cumbersome than with a horizontal bore system, and
- Claustrophobic patients are much more at ease with being scanned on this type of open, comfortable MRI scanner.

What is APERTO Open MRI?

The Hitachi's APERTO Open MRI system is a permanent magnet 0.4 Tesla open MRI system. 90 of all routine standard examinations can be done with this system, with excellent image quality. Fast image sequences such as needed in cardiac MRI are reduced. Diagnostic confidence is equal to standard high field systems.

"We are constantly receiving positive feedback on the imaging experience. I put this down to the quality of the equipment, the room layout (we have a panoramic photograph on one wall) and the quality of the staff who run the system", continues Sherratt.

Why Choose Open MRI Over High-Field Systems?

A superconductive MRI system (horizontal bore) requires a large infrastructure, control equipment room, cold head and chiller installation, cooling/water pipes and pumps, helium, and a large power consumption to keep the system running, plus a 24/7 service organisation from the OEM to repair things when needed.

Permanent Open MRI does not need a complicated infrastructure and only needs 20 square metres of examination room for installation. This makes the system very suitable for old hospital infrastructures, and due to its technical design, the operational costs are low. This makes it an excellent investment choice for small hospitals and diagnostic centres and a better alternative for more expensive high-field systems that require a minimum patient throughput to achieve break-even.

Cost-Effectiveness

The system's operational/running costs are attractive compared with high field systems, with the hospital spending just 40,000 pounds per annum on service costs.

The system also works well in existing spaces, requiring no special area to install it. Says Sherratt, *"It was a new build in an old screening room. As a result we were able to build it to our requirements. Available space was an issue and we found we have a fully workable unit in just 35 m^2"*

Although the hospital has not run any official cost-effectiveness analysis, they have found that due to its unique nature (the only open MRI in the Welsh National Health System) they are getting a lot of extra contractual referrals, which brings in additional revenue. *"The scanner is capable of performing more scans that we currently have reporting capacity to deal with."*

PACS IN THE CARDIOLOGY DEPARTMENT

Report on Market Developments

Author
Ranjit Ravindranathan

Market Analyst
Medical Imaging
Healthcare (EIA)
Frost & Sullivan
London, UK

Managing cross-departmental communications in a healthcare setting has been greatly improved by the emergence of picture archiving and communications systems (PACS) as a vital supporting infrastructure, with specialists in healthcare departments like orthopaedics, neurology, oncology, histology and cardiology improving their communication and therefore patient wellbeing. The integration of all clinical specialties' images within an enterprise-wide PACS will take some more time in a majority of European and APAC practices in order to catch up to already growing US market, issues which we will explore further here.

Cardiology Second-Largest PACS Revenue Source

The cardiology department is the largest producer of images, clinical and administrative information and data, which makes it the greatest PACS revenue source outside of radiology. These results essentially rolled out to the creation of dedicated cardiology PACS systems and solutions that include PACS hardware, workstations, archiving in either VHS/DVD storage, or the more advanced SAN application with networking. Some of the other features of these systems are post-processing, analytical tools, clinical reporting, administrative modules for scheduling, patient/material management, billing, and order management.

While there are similarities between a radiology and cardiology PACS, there are also significant differences. The similarities originate in an overlap in the support requirements and infrastructure of the two PACS. In fact, the potential to share core infrastructure such as networking, archiving, digital imaging and communications in medicine (DICOM) standardisation and, to a lesser extent, front-end equipment such as workstations and modality interfaces, has considerably facilitated the adoption of cardiology modules by PACS-literate hospitals. But with the improvement in the technology, a distinction is also emerging in cardiology between the levels of sophistication of workstations with diagnostic clinicians enjoying higher resolution displays and using more exhaustive software options, encompassed within more powerful workstations.

Challenges in Handling Cardiology Data

The other advantage with cardiology PACS is that it can share storage area networks (SAN), which helps in routing through other networks for viewing by cardiovascular surgeons or referring physicians over the hospital's web browser. This integration is certainly a challenge in such a complex and interoperability-dependent environment. The dynamic nature of cardiac images makes it difficult to have sufficient bandwidth to handle cardiology data. Cardiology has unique requirements; these needs come in the form of capturing sound, certain cardiac measurements, and structured cardiac catheter laboratory (cath-lab) and echocardiography laboratory reporting. Cath-lab and echo are the chief modalities that are connected to a cardiology PACS.

Outside of these two main modalities, cardiac magnetic resonance imaging (MRI) and cardiac computer tomography (CT) are gaining rapid popularity from a low base. Cardiology PACS uses information produced by these modalities, by performing intermediate and final reporting, with capabilities for dealing with blood level and haemodynamic data, as well as analytical tools for measuring stenosis. On the administrative side, cardiology PACS handles disparate tasks like order management, patient and materials management, and scheduling. These functionalities can be accomplished by integration of cardiology information system (CIS), which brings autonomy in the hospital set-up and increases mobility of cardiologists.

This is the reason why 99% of cardiology PACS sales are accompanied by CIS sales. These systems offer workstations that can link these disparate modalities in a single location. The technical conundrum of linking all these demands in one box, and making that box function intuitively, is exacerbated by the fact that cardiology workflow is completely heterogeneous.

Cardiology PACS Market Affected by Economic Factors

The market for cardiology PACS is affected by both micro- and macro-economic factors. Technology is expected

>*Continues on page 38*

DRIVING QUALITY STANDARDS IN PAEDIATRIC ECHOCARDIOGRAPHY

How to Cultivate Leadership and Teamwork

Authors
Dr. Mark Lewin
Joel Lester, RDCS

Paediatric Echocardiography Laboratory
Seattle Children's Hospital Heart Center
Seattle, US
mark.lewin@seattlechildrens.org

Echocardiographic imaging has evolved into the key diagnostic modality in paediatric cardiac care. Its role has expanded beyond that of initial diagnosis; intracardiac echo is now used during interventional cases in the cardiac catheterisation laboratory, transthoracic echo is the pre- and post-operative modality, and transesophageal echo is utilised in the operating room (see table 1). In this article, we elaborate the new, adapted management strategies that the echo lab must adopt to achieve effective use of these diverse imaging tools.

Role of the Paediatric Echo Laboratory Manager

It is vital that the echo lab manager have an accurate understanding of the field of echocardiography. A manager who has experience as a sonographer can best understand the needs and challenges of the bedside sonographer. It is critical that the manager is engaged in day-to-day operations; this will yield a laboratory where decisions are made which correlate with effective operations.

This will also increase the likelihood of a healthy relationship between manager and sonographer, thus reducing turnover and enhancing job satisfaction. Finding skilled sonographers can be challenging enough, but retaining them in a healthy work environment is yet another matter.

Creating a culture in which teamwork is a theme is crucial in optimising employee engagement. Appointing an echo laboratory manager focused on directing the sonographer's energies towards the desired result by allowing the employees to problem-solve and divide responsibilities among themselves will empower them to work as team. The manager can then step back and develop novel methods of supporting the staff. Our hospital has gone to great lengths to ensure that management has the tools and resources to create a healthy network of team-building. For example, we arranged hour-long workshops over the lunch hour on two consecutive days to create an "Echo Lab Purpose Statement", as follows:

Table 1. Study Types in the Paediatric Echo Laboratory

Transthoracic echo (TTE)
Transesophageal echo (TEE)
Dobutamine Stress echo (DSE)
Exercise Stress echo
Foetal echo
Intracardiac echo (ICE)

Echo Lab Purpose Statement

"As an integral part of the heart centre team, we strive to provide our patients with high-quality echocardiograms in a compassionate, family-centred environment."

As mentioned, the echo laboratory spans most aspects of paediatric cardiac practice. We have assigned sonographers to develop special skills in a specific area where they have expressed interest. Again, half the battle is to ensure employee satisfaction and encourage their growth. We direct sonographers to specialise in a particular aspect of paediatric cardiology including transplant evaluation, transesophageal imaging in the operating room, cardiac imaging of the foetus, and dobutamine stress echocardiography.

Other guidelines set by our institution oblige us to demonstrate "ARTful" behaviors (Accountability, Respect and Teamwork). This is included in our work content description to emphasise this as a job requirement and a part of our yearly evaluation. Each new employee is told about these expectations from their first day of employment. Each month the hospital recognises the ARTist of the Month – one who demonstrates the highest standards as judged by their peers – an excellent way to reward those who can set an example for the rest of us.

Education in the Paediatric Echo Laboratory

Our leadership team uses diverse methods to educate staff, measure quality, and provide feedback. The echo laboratory manager and physician leader work together to develop internal education initiatives for the sonographers, such as a standardised lecture series occurring at a time of the day when as many staff as possible can attend.

Table 2. Equipment and Personnel Metrics in the Paediatric Echo Lab

Echo machines	1 per 1,000 studies
Echo machine upgrades	1 per year
Sonographer volumes	6 - 7 studies per day (avg.)
Echo physician interpretation volumes	35 per day (max)
Digital storage (SAN)	18 month short-term (min) - long term archiving thereafter
Study reporting	Paediatric-specific templates

These lectures are attended by sonographers, cardiology trainees and echo lab physicians.

Weekly case conferences discuss complex as well as straightforward cases. We en?courage our paediatric sonographers to attend these conferences. We also organise one-on-one sessions between an individual sonographer and an echo laboratory physician so that each sonographer's individualised needs can be determined. We provide these types of one-on-one interaction informally whenever a specific patient-focused question arises, but also in a more standardised setting for each of our 12 sonographers numerous times throughout the year.

> **"Members of the echo laboratory participate in more global heart centre-wide quality initiatives"**

As part of our sonographer's RDCS re-certification, CME credits are required. Our goal is to allow each sonographer to attend a national meeting every other year. This allows for CME credit accrual, and also provides a mechanism for the sonographers to stay up-to-date via interactions with nationally-recognised experts in the echocardiographic assessment of paediatric heart disease.

Quality Assurance Models

Quality assurance in the echo laboratory occurs in a variety of ways. There is the internal group review of studies for imaging accuracy as well as interpretation of the data via correlation of images to information found in the study report, and quarterly assignment of studies by the echo laboratory manager such that sonographers are responsible for individually (but anonymously) critiquing each others work.

In addition, the members of the echo laboratory participate in more global heart centre-wide quality initiatives. These morbidity and mortality conferences are often meant to address system issues, and to this end correlation of different imaging modalities often occurs (for example comparing data obtained and conclusions developed from echo studies versus cardiac catheterisation, cardiac magnetic resonance, and cardiac computerised tomography). Our goal is to ensure the highest level of accuracy and quality in an educational setting which is nurturing and respectful of the sonographer and echo lab physician.

Laboratory Accreditation

The Intersocietal Commission for the Accreditation of Echocardiography Laboratories (ICAEL) serves as the accreditation mechanism for both general and paediatric echo laboratories. Accreditation requires submission of case-based studies, data regarding the quality assurance mechanisms for the particular laboratory, data regarding standardisation of study methodology, study volumes for interpreting physician and performing sonographer, information regarding study scheduling and ordering, and criteria regarding equipment maintenance.

After initial accreditation, renewal is required every three years. While there are only a handful of insurers who have as yet adopted echocardiography reimbursement directives (including ICAEL certification), it is very likely that this will increase. This will apply not only to the technical aspect of billing, but also to reimbursement for professional fees.

Summary

The paediatric echo laboratory is unique in regards to staff-patient interactions and the skills to make these interactions successful, the methodologies by which studies are performed, the training of the sonographer performing the paediatric echocardiogram, laboratory accreditation, and the methods of study reporting. This results in the need to organise and manage the paediatric echo laboratory differently than the general laboratory.

The interaction between the laboratory, the members of the cardiac team, and the other paediatric providers results in the echo laboratory serving in many ways as the focal point of paediatric cardiac care. Without effective strategies in place to develop sustainable standards of quality, outcomes associated with paediatric cardiac care would most certainly be compromised.

RADIATION EXPOSURE IN COMPUTED RADIOGRAPHY

How Can Patients be Protected?

Author
Terri L. Fauber

Virginia Commonwealth University
School of Allied Health Professions
Department of Radiation Sciences
Richmond, Virginia, US
tfauber@vcu.edu

Medical imaging is a large contributor to public radiation exposure and therefore is of international concern. Even the lowest amount of exposure to ionising radiation has some risk. According to Prasad et al. (2004), accurately determining radiation-induced cancer risk in humans is difficult due to biological variability, environment, and lifestyle related factors. Consensus has not been reached over the risk of low-level radiation exposure, though it is a legitimate concern. According to the most recent controversial report (No. 160) by the National Council on Radiation Protection and Measurements (NCRP), since 1980, there has been a seven-fold increase in public medical radiation exposure in the United States (US) (NCRP, 2009).

Creating Reference Values

Although the US has no current national standards regarding medical imaging exposure techniques, many organisations are involved in making recommendations and overseeing trends in patient radiation exposures.

The US Food and Drug Administration's (FDA) Center for Devices and Radiological Health (CDRH) is responsible for ensuring the safety and effectiveness of medical devices and eliminating unnecessary human exposure to man-made radiation from medical, occupational and consumer products. The CDRH's Nationwide Evaluation of X-ray Trends (NEXT) survey programme selects a particular radiological examination for study and captures radiation exposure data from a nationally representative sample of US clinical facilities. As a result of these surveys, reference exposure values are being developed for routine diagnostic exams.

The American Association of Physicists in Medicine (AAPM), the American College of Radiology (ACR) and the American Society of Radiologic Technologists (ASRT), are professional societies concerned with ionising radiation patient exposure and are founding members of the Alliance for Radiation Safety in Paediatric Imaging, a coalition of healthcare organisations dedicated to providing safe, high-quality paediatric imaging nationwide.

The Role of CR in Radiation Exposure

Although digital imaging has been shown to reduce the number of repeat images, according to Willis (2004), the amount of radiation needed to produce a computed radiography (CR) image of similar quality to film-screen is higher. Additionally, Vano et al. (2002) believe that radiographers have realised that increasing the quantity of radiation reaching the image receptor leads to improved CR image quality. This, in turn, has raised concern in the industry of the need to better educate radiographers, radiologists, and physicians on the potential for increased radiation exposure to patients with CR.

This led to a study to evaluate the effect of a wide range of exposure techniques on the overall quality of the CR image. The research study used an experimental design to investigate the effect of varying the quantity of radiation exposure (mAs) on CR image quality. A Fuji FCR 1 Shot QC Phantom was exposed to mAs values ranging from 1 to 125. Five CR imaging plates were exposed, processed, and printed for each exposure group. Image quality was evaluated by measuring the optical density, low and high-density differences, and the number of line pairs visualised.

The findings indicate that variability in radiation exposure to the CR imaging plate does not adversely affect the quality of the digital image. Optical density and low-density differences were stable throughout the wide range of exposures. Consistent with Don (2004) regarding digital exposure latitude, the optical density was stable over radiation exposures that range from 300% lower to 400% higher than the optimal baseline mAs exposure. Radiographic contrast appeared to decrease slightly for the high-density differences when exposed to higher-than-needed exposures and resolution appeared to be compromised at extreme low radiation exposures as a result of quantum mottle (Fauber, 2009). This study confirms that excessive over-exposure to the CR imaging plate can produce quality images.

Strategies for Reducing Patient Radiation Exposure

Because of wide exposure latitude capabilities in digital imaging, a common practice known as exposure factor creep (Warren-Forward, et al., 2007; Willis, 2004) has become an international area of concern. The use of higher kilovoltage (kVp) techniques along with lower mAs values will notably decrease patient organ dose. However, in film-screen imaging, the choice of kVp is limited due to the need for an appropriate scale of contrast. Warren-Forward et al. (2007) believe the impact of kVp on image contrast has become less of a concern in digital imaging due to the ability of the computer to process the digital image and alter the visibility of anatomic structures. When producing


L'imagerie au cœur de la prise en charge des patients
16 - 20 octobre 2009
Journées Françaises de Radiologie
JFR
Paris - Palais des Congrès
16-20 Octobre 2009
Programme & Inscription
www.sfrnet.org
JFR
2009
57e Journées Françaises de Radiologie

digital images, using a higher kVp and lower mAs technique appears to be warranted.

Automatic Exposure Control (AEC) devices have long been utilised in film-screen imaging and should equally be used in digital imaging. Because the AEC device terminates the exposure time once a predetermined amount of radiation exposure has been reached, it should limit the patient's dose to a reasonable amount of radiation exposure. Radiographers must accurately and consistently use AEC devices in an effort to limit the amount of patient radiation exposure. Additionally, radiographers need to critically evaluate the appropriateness of anatomically preprogrammed radiographic exposure techniques.

There is also a renewed interest in utilising technique charts for digital imaging. Because overexposure errors are not easily detected in digital imaging, techniques charts provide a reference that will produce acceptable quality images. Techniques charts should be experimentally developed, clinically tested, and revised for each x-ray tube.

Given that digital images don't provide the same visual cues as film-screen imaging, over- or underexposure may not be apparent. Each manufacturer provides an exposure indicator value that is helpful in determining the level of exposure to the image receptor. Radiographers need to consistently evaluate this numerical value as an indication of the amount of radiation exposure to the patient. Because of variability in the manufacturer's description of the indicator value, the AAPM is calling for a standardised exposure indicator so radiographers can more easily recognise the indicator and its relationship to the amount of radiation exposure to the image receptor.

In addition to the need for radiographers to limit the radiation dose to their patients, other practitioners are calling for guidelines to limit the number of high-quality images. Vano (2005) believes that reducing exposure technique in cases where the exam doesn't require a high level of image quality, such as routine follow-up exams, can result in a decrease to overall patient exposure.

"The US has no current national standards regarding medical imaging exposure techniques"

Management's Role

Managers in radiology have an important role in limiting patient radiation exposures. High standards must be departmentally agreed on and communicated to imaging staff. The environment must respect the independence of the radiographer in selecting radiation exposure techniques along with the expectation that those departmental standards will be met. This can be accomplished, in part, through continuing education activities. Additionally, the performance of the imaging equipment must not be overlooked. A good quality control (QC) programme must be implemented to detect potential equipment malfunction. Several simple and noninvasive QC tests can easily be performed by the radiographer to isolate equipment error that may ultimately affect patient radiation exposures.

References are available on request to the Managing Editor: editorial@imagingmanagement.org

---

> Continued from page 32

to exert a great influence on the state of this market, as the level of investment needed by end users to acquire cardiology PACS decreases, while the number of options open to them increases. Advances in connectivity standardisation form the bedrock of this technological progression, as these available solutions will continue to be problematic to interface.

Some of the factors helping market growth for cardiology PACS are the high incidence of cardiovascular disease, which encourages the need for better management of cardiac examinations and information, and the increasing benefits of PACS, which encourages hospital investments in IT solutions for cardiology. The other factors driving the market is the increase in adoption rates of DICOM with development of cardiology-specific tools.

Pricing and Implementation Times a Negative Factor

These associated emerging advantages help enterprise-wide PACS to grow and bring greater workflow efficiency. The issues that impact market growth negatively at the moment are pricing factors and implementation times. In a typical situation, the cost of cardiology PACS installations goes up due to certain mandates like revamp of existing legacy systems, infrastructural costs and the reliability of the vendors, given the large outlay of capital involved.

This increases the decision-making time and delays sales of these systems. Financing and leasing options, training and ongoing support services represent other key factors that the end-user seeks in the package.


October 2-6
Valencia, Spain
CIRSE 2010
INNOVATION
EDUCATION
INTERVENTION
Mark your Calendar !
CIRSE 2010, Europe's most comprehensive forum for minimally invasive image-guided therapy, will offer more than 100 hours of educational and scientific presentations streamlined around six major topics, hands-on workshops, foundation courses, learning centres, industry symposia, an all electronic poster exhibition and the biggest CIRSE exhibition ever.
www.cirse.org
MAIN TOPICS
· Vascular Interventions
· Transcatheter Embolization
· Non-Vascular Interventions
· Interventional Oncology
· Clinical Practice
· Imaging
Cardiovascular and Interventional Radiological Society of Europe
CIRSE

INTERVIEW WITH
DR. JÖRG F. DEBATIN

Prof. Dr. Jörg F. Debatin, 47, is medical director and CEO of the University Medical Centre Hamburg-Eppendorf since 2003. Here, the author of 30 reviews, 6 books, 1,000 scientific presentations, and more than 300 invited lectures, and former radiology department leader tells us about life as hospital CEO. We also learn about the five-year restructuring project he engineered at Hamburg.

Interviewee:
Prof. Dr. Jörg F. Debatin, MBA

Medical Director & CEO
University Medical Centre
Hamburg-Eppendorf
Hamburg, Germany

Professional Highlights

1992	Fellowship, Diagnostic Radiology, Stanford University Med. Centre, Stanford, CA
1993	Assistant Professor of Radiology, Zurich University Hospital, Zurich
1995	Tenure Thesis (Habilitation) "Flow Measurements with Phase Contrast MRI" & receipt of Venia Legendi (Right to Teach), Educational Commission, Zurich
1995	Associate Professor of Radiology, Senior Staff Radiologist and Chief, Magnetic Resonance Imaging, Zurich University Hospital
1997	Magnetic Resonance Prize 1997, 7th International MRI Symposium
1997	Garmisch Werblow Lecture, The New York Hospital, Cornell Medical Centre
1997	'Visiting Associate Professor' in the Department of Radiology at Stanford
1998	Jubilee prize of the Swiss Radiological Society for work on MR colonography
1999	Professor and Chairman, Dept. of Diagnostic and Interventional Radiology University Medical Centre Essen
2000	'Visiting Professor', Department of Radiology, Vienna University Hospital
2002	Olle Olsson Lecture, Lund University Hospital, Lund
2003	Medical Director and Chief Executive Officer, University Medical Centre Hamburg-Eppendorf
2003	Fellow of the International Society for Magnetic Resonance in Medicine
2005	Wilhelm Conrad Röntgen Lecture, ECR 2005
2009	Visiting Professor, University Medical Centre Zurich

What are the highlights of your typical day?

My job is centred around communication. I try to keep an hour free of meetings each day to walk around the medical centre for first-hand impressions. Beyond that, most days are filled with regular meetings, the most important of which is our weekly executive board meeting on Monday afternoon. Throughout the week, I meet on a regular basis with all professions employed in our medical centres including physicians, nurses, administrative personnel, technical support personnel as well as our researchers, teachers and students. I also represent our medical centre to the outside world and attend numerous formal functions in this capacity.

Please talk us through some of the changes you made in Hamburg.

A total restructuring of the medical centre at Hamburg was implemented, reorganising 6,500 employees, 81 departments and institutes organised in 14 centres, and ensuring optimal care for the average 60,000 in-house patients and 120,000 out-patients that walk through our doors each year. This major project re-engineered many processes and functions both practically and theoretically, such as the building of interprofessional teams consisting of nursing, technical services and physicians working beyond departmental borders, restructuring the activity portfolios of physicians and nursing services, implementing the first fully electronic patient record system in Germany and making a complete economic turnaround.

We also undertook the construction of Europe's most modern hospital, with an 85,000m^2 space, 3,500 rooms, a capacity for 860 patient beds and 150,000 outpatient contacts per annum. It also boasts a fully integrated emergency room with capacity for 80,000 patient contacts, 16 operating rooms, and a high specification infrastructure. We built a surrounding network of portal hospitals and referring physician networks, and grew our patient base by over 40% over a five-year period. We took our facility from a 36 million euro loss in 2003, to a projected profit in 2009. Not only this, but we also doubled our research output (including publications, grant support and mentoring) within this five-year period.

Why did you choose to follow an MBA?

Business has intrigued me for a long time. My decision to enroll in an MBA programme was motivated more by intellectual curiousity than the distinct plan to spend my life managing a hospital. In my current job, my management 'hobby' has evolved into my main activity. The philosophy of radiology being a secondary service provider in a hospital setting adds much to good management practices. Therefore, the transition may not have been as profound as had I pursued a prior career in, say, surgery.

Was the transition to CEO challenging?

Obviously, the characteristics of a CEO position have a lot to do with the size and nature of the managed business. I cannot think of any more complex or more interesting institution than an academic medical centre in this regard. I am convinced that such an institution with an annual turnover exceeding 600 million euros and employing close to 7,000 people requires full-time professional leadership. Even five years into the transition, the job continues to confront me with a wide array of new challenges.

Do patients take enough action regarding their own healthcare?

Due to the internet, the attitude of patients to healthcare in general is rapidly evolving. It has helped vastly in providing transparent information about the quality of medical services provided on an elective basis. This is also true for the evolving field of preventive medicine. As the health consciousness of the population continues to rise, we will see the market of preventive medicine increase proportionally. In order to preserve this market development, physicians and particularly radiologists should be careful with regard to the services they offer in this field. Thus, imaging exams with ionising radiation exposure have no place in secondary prevention.

How can other directors ease the purchasing process?

To help radiologists, we have centralised all purchasing decisions in a special department staffed with experts. The role of the radiologist is crucial in defining the specific imaging needs. We ask our radiologists to be as detailed as possible in defining needs criteria and rank them according to importance. The rest of the process is driven by our purchasing staff, who have experience in analysing all technical data and mapping it against financial ramifications. Regarding finances, we no longer focus as much on purchasing costs as we do on life-cycle costs. Prior to a final decision, each of the arguments is related to the radiologist or other physicians directly affected by the purchase. If a consensus cannot be reached, the executive board decides the issue.

What is your favourite memory from your days as a medical resident?

One of the most memorable experiences during my radiology residence training at Duke University Medical Centre in Durham/North Carolina were radiology rounds with the former chairman Dr. Charles Potman. Himself a most accomplished academic radiologist, he insisted on being presented with the clinical history of each patient prior to interpreting any imaging exam including simple exams such as a chest x-ray.

As a resident, it was my job to obtain this information from the clinical history of each patient. This experience taught me that radiologists should not limit their work to interpreting films but rather see themselves as a crucial part of the integrated medical process.

OVERVIEW OF **HEALTHCARE IN POLAND**

Portrait of a System Under Pressure

The Republic of Poland is the largest country in central and eastern Europe, in terms of both population (38.2 million) and area (312,685 km²). In 1989, Poland was the first country among the central and eastern European countries to re-establish democracy after 44 years of communist rule. After a severe economic downturn in the early 1990s, Poland's macroeconomic situation has stabilised, showing steady growth since the mid-1990s. In May 2004, Poland was admitted into the European Union (EU).

Poland has a mixed system for public and private health care financing. Social health insurance contributions represent the major public source of healthcare financing. Health insurance contributions are mandatory at a rate, in 2005, of 8.5% of the income base, which corresponds for most people to taxable income.

National Health Fund

The National Health Fund (NHF) along with its regional branches, administers the social health insurance scheme, following the demise in 2003 of a decentralised system of 17 sickness funds, after just four years of existence. The NHF has responsibility for planning and purchasing public financed health services.

Health insurance contributions for certain groups of individuals not covered by the standard scheme and specific public health activities are funded directly by the state through general taxation. Complementary sources of financing include both formal and informal out-of-pocket payments, and to a lesser extent pre-payment schemes. Private health expenditure accounted for 27.5% of total healthcare expenditure in 2002.

There is a strict separation between outpatient specialised care and inpatient care. Outpatient specialised care is mostly based on private medical practices in large cities and independent health care institutions in the other areas.

Poland's population is currently experiencing greater longevity, with life expectancy reaching 78.9 years for women and 70.5 years for men in 2003. A decrease in infant mortality and a greater focus on health prevention and promotion are also noticeable. Unfavourable trends and challenges include: limited access to care, underfunding of the public healthcare system and rising dissatisfaction with low salaries among health professionals; this dissatisfaction has given rise to the "brain-drain" of doctors and nurses to western European countries.

Current health policy reforms are primarily aimed at tackling the demographic challenges of population ageing; reducing hospital debts; restructuring the health sector; introducing alternative sources of revenue for health care financing; and improving the control of rising health expenditures. .

The Ministry of Health

The Ministry is responsible, in general, for national health policy, for major capital investments, and for medical science and education. It has administrative responsibility only for those health care institutions that it directly finances.

The Ministry is also responsible for implementing national public health programmes, for training healthcare personnel, for partly funding medical equipment, and for setting and monitoring healthcare standards. For some areas, the Ministry has kept direct managerial functions, including the State Medical Emergency Service, health resort treatment, and the regulation of the medical professions. It is responsible for coordinating health policy programmes according to cost–benefit aspects.

Facts & Figures

Full Name:
Republic of Poland

Population:
38,140,000

Capital:
Warsaw

Area:
312,685 km²

Major languages:
Polish

Major religion:
Christianity

Life expectancy:
71 years (men), 80 years (women) (UN)

Monetary unit:
1 zloty = 100 groszy

GNI per capita:
14,250 dollars (World Bank, 2007)

Total expenditure on health per capita (2006):
910 dollars

Total expenditure on health as % of GDP (2006):
6.2 dollars

Life expectancy at birth m/f (years):
71/80

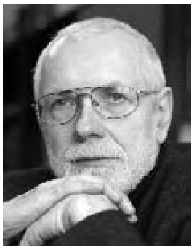
Healthy life expectancy at birth m/f (years, 2003):
63/68

Information courtesy of:
World Health Organisation (WHO)
Geneva, Switzerland

THE CONTRIBUTION OF POLAND TO RADIOLOGY

A Snapshot of its Pioneers and Inventors

The first news about Konrad Wilhelm Roentgen's great discovery in Poland was published by Kraków-based daily "Time" as early as January 8, 1896. Soon the first experiments with x-rays were begun. In Kraków between January 8 and 15, 1896 the Jagiellonian University professor of chemistry Karol Olszewski, (the man who was the first, along with Prof. Wróblewski, to liquefy air) took various experimental pictures using a Plücker tube, including that of a bronze lizard-shaped paper weight (the first Polish x-ray) and that of a human hand. Soon, Prof. Olszewski took the first Polish x-ray picture for clinical indications. On the basis of that picture, elbow joint dislocation was diagnosed. Thus, radiology was born in Poland.



Author
Prof. Andrzej Urbanik

Chair
Department of Radiology
University Hospital
of Kraków
Kraków, Poland
aurbanik@mp.pl

Also,
Vice President
Polish Medical Society
of Radiology

The first scientific article on x-rays ("On the use of roentgen rays for diagnostic purposes") in a medical magazine ("Medical Review") was published in Kraków (21 February 1896) by the surgeon Prof. Alfred Obalinski.

First Brush with Contrast Media

At the beginning of February 1896 the first Polish roentgen laboratories were established (Warsaw and Kraków). In Warsaw, the first one was a private laboratory belonging to Mikolaj Brunner. In Kraków the first roentgen laboratory was established in the local University Clinic; it was headed by Dr. Walery Jaworski, the later professor of the Jagiellonian University Medical Clinic an eminent gastrologist who discovered Helicobacter pylori). He had considerable achievements using radiological investigations in internal diseases. The most spectacular fact of his career, placing him among the pioneers of the world radiology, was the first stomach examination with the use of a contrast media - carbon dioxide.

First Polish Radiology Textbook

It was in Kraków, too, that the first Polish textbook of radiology was published in 1900. In 1907 a rule of isometrics was published, which was a breakthrough in stomatological radiology that was coming into being; it made it possible to take real-size x-rays of teeth. It was developed by the Pole Antoni Cieszynski, a professor of stomatology at the Lvov University. After he graduated, he worked in the Stomatological Institute in Munich. He was the author of many technical innovations, including an x-ray cassette for stereoscopic pictures, a holder for extraoral pictures, holders for intraoral pictures, a measurement device for the direct reading of the distance between the film and the focus, and a cap with a plate making it easier to adjust the main beam for typical pictures of the skull.

First Polish Professor of Radiology

Karol Mayer was the first Polish radiologist to became a professor of radiology. He graduated from the medical department of the Jagiellonian University, Kraków. In 1914 he patented in Germany his own roentgen tube having two or more anodes. Mayer presented, as early as 1914, the principles of taking images using a tomographic technique. In his book "Radiological differential diagnostics of the heart and aorta diseases with the consideration of my own examination methods" published in 1916 (Kraków), he described the principles and practical uses of that technique, being considerably ahead of the world radiology. Unfortunately, this went unnoticed in the scientific world.

Marie Curie & Radiology

Perhaps our best known export in the field of radiology, was Maria Sklodowska-Curie. She was one of the first women scientists to win worldwide fame with degrees in mathematics and physics (Sorbonne University, Paris). Winner of two Nobel Prizes for Physics in 1903 (with her husband Pierre Curie) and for chemistry (alone), she performed pioneering studies with radium and polonium and considerably contributed to the understanding of radioactivity.

She is the first woman in Europe to receive a doctorate in sciences, the first woman to win a Nobel Prize for Physics, the first woman lecturer, the professor and head of a laboratory at the Sorbonne University of Paris, the first person ever to receive two Nobel Prizes, the first Nobel Prize laureate mother of a Nobel Prize laureate, and the first woman who has been laid to rest under the famous dome of Pantheon in Paris.

Establishment of a Polish Society of Radiology

The Polish Radiological Society was established during the XII Congress of Polish Doctors and Naturalists (13 - 15 July 1925) in Warsaw. Professor Karol Mayer became its first president. In 1926 the society began issuing the "Polish Radiological Review". The first editor-in-chief was Prof. Zygmunt Grudzinski, an outstanding Polish radiologist. He developed a unique method of localising foreign bodies in the eyeball that was in use until now.

Second World War Cripples Polish Radiology

Polish radiology was dealt a great blow by the Second World War. Many radiologists, including eminent ones, lost their lives. Technical equipment was destroyed and radiological centres were ruined. Despite tremendous loss and unprecedented terror underground state structures were established. Education, including medical student training, was not excluded from these activities: secret medical courses were arranged in Warsaw through three centres. The radiological laboratories of most Warsaw university hospitals as well as a number of professors were engaged in radiology teaching. In total, over 3,000 students were involved in secret teaching in Warsaw during the war.

Holocaust Impacts Scientific Developments

Polish radiologists of Jewish origin did not avoid the tragedy of the Holocaust. One example was Dr Natan Mesz. Since 1918 he was the head of the radiological department of the Jewish Hospital in Warsaw. In 1940, he moved with the hospital to the ghetto. In extremely harsh conditions, he kept working until its end doing the diagnostics and teaching students of Jewish origin who participated in courses led by the Warsaw University Professor Julian Zweibaum.

Iron Curtain Dampens Radiological Growth

After the war, Poland found itself trapped behind the Iron Curtain, and in the sphere of Soviet influence. This limited contact with world science and the lack of access to modern equipment considerably hindered the development of the Polish radiology. In spite of that, it kept developing to the best of its abilities. The equipment of Polish radiological laboratories was predominantly based on home-made devices and those produced in East European countries. Films and radiological reagents, as well as contrast media, were home-made.

1970: Radiological Growth Begins Again

It was not until the 1970's that the devices and films and reagents of other foreign companies were imported. Professor Witold Zawadowski established a teaching centre in Warsaw for doctors throughout Poland who decided to specialise in radiology. During her 26 years of work in the Kraków University Hospital she created the Polish school of neuroradiology. Her successor, Assoc. Prof. Ryszard Chrzanowski was the author of the first Polish textbook of neuradiology issued in 1970.

In the years 1947 – 81, the head of the department of radiology of the Institute of Oncology, Warsaw, was Professor Janusz Buraczewski. He established the Polish school of oncological radiology. He was the inventor of the method referred to as "macroscopic tissue diagnostics". He was particularly interested in the diagnostics of bone tumours. He also established the first bone tumour register.

The first computed tomography scanner in Poland was installed in the department of radiology at the Medical University of Poznan, in 1979. In 1991, two MRI systems were installed in Warszawa as the first in Poland. MRI research began in Poland, in Krakow (Prof. Andrej Jasinski) with the first experimental MRI system in 1985. The system was based on a 0.6 T permanent magnet with a gap of 60mm with a home built MRI console in CAMAC standard, interfaced to a minicomputer with a software system developed in house.

Polish Medical Society of Radiology

At present, the Polish Medical Society of Radiology organises scientific and professional life in Poland. The society is managed by a triennially-elected board and it has branches in each province. The management of the society is assisted by individual sections (neuroradiology, MR/CT, paediatric radiology, interventional radiology, etc.) and committees for education, training or publishing). The society issues a scientific quarterly 'The Polish Journal of Radiology' and has a website www.polradiologia.org.

In 2005 the Polish Medical Society of Radiology celebrated its 80th anniversary. Its achievements and experiences were summed up during a special jubilee session that took place in Kraków, the place Polish radiology came into being.

Further Highlights in Polish Radiology

- In 1998 the first teleradiology and RIS systems (soon upgraded with PACS) in Poland were installed in Kraków University Hospital;
- In 1999 a thorough reform of the specialisation training system in radiology was implemented (among other things, a unified central exam, and since 2003 a practical exam by means of computer monitor presented pictures).

EDUCATING RADIOLOGISTS IN POLAND

How We Do It

Kindly reprinted with permission from **Polish Medical Society of Radiology**

To qualify as a radiology student in Poland, each candidate submits an application for specialisation in radiology and imaging diagnostics to the Regional Centre for Public Health in the region in which he/she intends to go into specialisation training. Submission of applications takes place twice a year. The procedure comprises formal evaluation of the application and competition procedure that takes place, for both prospective residents and non-residents, after their completion of postgraduate medical training, in two stages: a test in general medical knowledge and an interview by the committee appointed by the relevant province governor presided by the regional consultant.

Specialisation & Radiology in Poland

On the basis of the results of these procedures, ranking lists of qualified doctors are established. Qualified doctors are referred to vacant training places in authorised centres. Specialisation may be carried out:

- At the resident's job, based on an employment contract of a limited duration concluded with the centre providing specialisation training (a resident's job is financed by the Ministry of Health);
- In a job based on an employment contract of an unlimited duration or of a limited duration equal to the duration of the specialisation training, concluded with the centre providing the specialisation training;
- During training leave granted by the employer for the period of specialisation training (the doctor's employer grants a training leave for the period of the specialisation training provided by the specialisation centre);
- Within doctoral studies provided by a competent centre (the doctoral studies are extended by the specialisation programme);
- In a job based on an employment contract of an unlimited duration concluded with a centre not entered in the list of centres providing specialisation training and during the training leave granted by the employer for the realisation of part of the programme in a training centre, or
- On the basis of a civil contract.

Within the application, the doctor may select a centre that has a vacant training place that would provide training for him and present a preliminary approval of the head of that centre. Doctors qualified for training receive a referral to authorised centres to provide specialisation training in radiology and imaging diagnostics, a specialisation booklet and a list of medical procedures. The doctor selects a specialisation supervisor from among its specialists in radiology and imaging diagnostics proposed by the head of the centre to which he was referred.

The duration of training is five years for doctors immediately after postgraduate medical training and may be prolonged by the supervisor. During the five years' period it is necessary to complete the following practical training courses:

- A course in general radiology (including a minimum of six months of CT and eight months of ultrasound) - 2.5 years;
- A course in paediatric radiology - six months;
- A course in vascular and interventional radiology - five months;
- A course in oncological radiology - one month;
- A course in MRI diagnostics - five months;
- A course in the breast diagnostics - three months;
- A course in nuclear medicine - one month and,
- An additional period at the disposal of the supervisor.

The Examination Process

Prior to sitting for the exam, each doctor submits his specialisation documents to the competent centre, within 12 months of the date of the recognition of the completion of training by the supervisor. The exam takes place twice a year and is composed of two stages:

Stage One: A multiple-choice test composed of 120 questions. A passing grade is a condition of taking the second stage of the exam.

Stage Two: This takes place in selected radiological centres at the same time. It is composed of three parts, and passing one stage is the condition of taking the subsequent one.

Part I - A practical exam in US - the doctor should show the ability to perform an US examination.

Part II - The evaluation of clinical cases. Each doctor evaluates 40 cases presented on a computer monitor. The sets of examination cases are composed of a clinical description and 1 - 3 radiological pictures.

Part III - An oral exam during which three questions must be answered.

AGENDA

Key Seminars & Conferences

September 2009

30-03 **Management in Radiology (MIR) Annual Scientific Meeting**
Riga, Latvia
www.mironline.org

October 2009

1-3 **October 2nd International Meeting on Vascular Dysplasias**
Vilnius, Lithuania
www.litvasc.org/dysplasias

1-3 **ESMRMB Congress 2009**
Antalya, Turkey
www.esmrmb.org

2-4 **Aegean Postgraduate Radiology Course**
Sounion, Greece
www.aegeanradiologycourse.org

4-9 **2nd IDKD Course**
Athens, Greece
www.idkd.org

5-9 **ERASMUS COURSE Musculoskeletal II**
Bratislava, Slovakia
www.emricourse.org

8-9 **ERASMUS COURSE Cardiovascular MRI**
Leiden, Netherlands
www.emricourse.org

8-10 **ESCR European Society of Cardiac Radiology**
Leipzig, Germany
www.escr.org

8-10 **"NeuroRAD" Neuroradiologie 2009 Congress**
Cologne, Germany
www.neurorad.de

29-30 **IT @ Networking Awards 2009**
Brussels, Belgium
www.hitm.eu

31-01 **3rd Joint Scientific Meeting of the Royal College of Radiologists & Hong Kong College of Radiologists, 17th Annual Scientific Meeting of Hong Kong College of Radiologists,**
Aberdeen, Hong Kong
www.hkcr.org

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

In the next issue of IMAGING Management:

- *Clinical Audit: Update on European Guidelines & Practices*
- *Changing Role of Imaging Technologists: The Case in France*
- *Patient Safety & e-Health*
- *Impact of Medical Technology on Healthcare Delivery Systems*
- *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


Publisher and CEO
Christian Marolt
c.m@imagingmanagement.org


Managing Editor
Dervla Gleeson
editorial@imagingmanagement.org


International Editor
Edward Susman
ed@imagingmanagement.org


Editor
Lee Campbell
lc@emcconsulting.eu


Communication Director
Iphigenia Papaioanou
i@imagingmanagement.org


Global Communications
Dr. Don I. Idrees
d.idrees.cd@imagingmanagement.org


Creative Director
Aleksander Bugge
a.b@emcconsulting.eu

Subscription Rates (5 Issues / Year)

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

Production and 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 on behalf of MIR

GE Healthcare

GE is making a new commitment to healthcare

We call it healthymagination

At GE, we believe what's needed, right now, is a new mindset that embraces that health is everything. Just as we delivered innovation in environmental technology with ecomagination, healthymagination will change the way we approach healthcare, with over 100 innovations all focused on addressing three critical needs: **lowering costs, touching more people and improving quality.**

Yes, costs need to be lowered, while still delivering the best technology possible. GE's Electronic Medical Records give doctors the information they need almost instantly and could save billions in costs over the next 5 years.

Reduce Costs

Increase Access

Access to healthcare should be more available and not determined by where you live. Equipment like GE's MAC 800 brings lifesaving ECG technology to patients in a unit smaller than a backpack, accessible to the most remote hospitals and clinics in the world.

Quality healthcare empowers more people through early detection and a higher level of care at home. As people age or face chronic conditions, they need innovations like Home Health technologies that remotely monitor their well-being so they can live independently.

Improve Quality

To learn more visit,
www.healthymagination.com

GE imagination at work