IMAGING
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Prof. Iain McCall

Editor-in-Chief

editorial@imagingmanagement.org

Dear Readers,

Imaging departments are an essential component of the patient's journey and may cross the patient's path during many stages of their care. This interaction may be relatively straightforward, involving only limited resources or may be complex, requiring input from a number of members of the department and using a variety of equipment. The department's workload is substantially influenced by external forces and the delivery of the imaging service is time sensitive, with considerable financial implications.

The workforce has varying levels of training and skills that are interdependent, the majority of which are required on a 24/7 basis. The delivery of a high quality service for the patient and the referring doctors requires all members of staff to work as a team. For a team to work efficiently, there must be mutual respect regardless of the level of complexity of the individual's tasks, as each can affect the quality and efficiency of the department. Examples are multiple, from disorganisation in portering affecting the workflow, poor cleaning increasing infection rates, poor quality imaging, reducing diagnostic accuracy and failure of 24/7 service due to rota difficulties and sickness.

Good teamwork does not happen by chance. It requires recognition by all concerned that they are working for the patient rather than themselves and that a high quality of care must be the driving force. It also requires good leadership in all levels of the department, not just at the top. In professional organisations like imaging departments, front line staff, by virtue of their training and specialist knowledge, have a large measure of control over the delivery of the service and generally have a greater influence over decision-making on a day-to-day basis than staff in a formal position of authority.

Thus, leadership in imaging departments has two primary functions. The first is to ensure that the day-to-day operations are working efficiently, which requires organisational and management skills. The second is to ensure that the organisation is delivering a high quality of care, is interacting productively with other departments at a clinical level and is constantly evolving and embracing new ideas.

Leadership at this level requires negotiation and persuasion, which may often be informal, to ensure cooperation and support of clinicians. Leadership for this requires vision, tact and often a degree of persistence in order to achieve support for change. This edition of the journal has its focus on leadership and teamwork, the importance of which has long been understood in imaging but has, until now, had a lower profile in some areas of the wider healthcare community.

Prof. Iain McCall

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PRESENTATION Non-ionic, paramagnetic aqueous solution containing 287mg/ml gadodiamide (Gd-DTPA-BMA) as active ingredient, equivalent to 0.5mmol/ml. **INDICATIONS** Contrast medium for cranial and spinal magnetic resonance imaging (MRI) and for general MRI of the body after intravenous administration. The product provides contrast enhancement and facilitates visualisation of abnormal structures or lesions in various parts of the body including the CNS. For cardiac MRI, the product is indicated for the evaluation of coronary artery disease (CAD) by myocardial perfusion imaging MRI (stress/rest and late enhancement examination) for the detection and localisation of coronary artery disease (CAD) and differentiation between areas of ischaemia and infarction in subjects with known or suspected CAD. **DOSAGE AND METHOD OF ADMINISTRATION** Adults and children: Dosage varies depending on patient weight and type of examination. Angiography and the CAD indication have not been studied in children. **CONTRAINDICATIONS** Gadodiamide is contraindicated in patients with severe renal impairment (GFR < 30ml/min/1.73m²), and those who have had or are undergoing liver transplantation. OMNISCAN should not be used in patients known to have hypersensitivity to OMNISCAN or its constituents. **PRECAUTIONS, WARNINGS ETC.** The possibility of a reaction, including serious, life-threatening, fatal, anaphylactoid or cardiovascular reactions or other idiosyncratic reactions should always be considered, especially in those patients with a known clinical hypersensitivity or a history of asthma or other allergic/respiratory disorders. A course of action should therefore be planned in advance, with necessary drugs and equipment available for immediate treatment should a serious reaction occur. Transitory changes in serum iron (within the normal range in the majority of cases) have been observed. 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Haemodialysis shortly after OMNISCAN administration in patients currently receiving haemodialysis may be useful at removing OMNISCAN from the body. There is no evidence to support the initiation of haemodialysis for prevention or treatment of NSF in patients not already undergoing haemodialysis. Neonates and infants: Due to immature kidney function in neonates and infants up to 1 year of age, OMNISCAN should only be used in these patients after careful consideration. **PREGNANCY AND LACTATION** There is no experience of the use of OMNISCAN during pregnancy or lactation. The product should not be used in pregnancy unless essential. Breast feeding should be discontinued prior to administration and should not be recommenced until at least 24 hours after OMNISCAN administration. **UNDESIRABLE EFFECTS** Discomfort, with a general sensation of warmth or coolness, and pressure or pain at the injection site are occasionally seen. Less frequently reported are dizziness, nausea, headache and a perverted sensation of taste or smell. Rare reactions are vomiting, somnolence, paraesthesia, visual disturbances, diarrhoea, anxiety, dyspnoea, chest pain, tachycardia, trembling, arthralgia or allergy-like symptoms such as urticaria, itching or an irritation in the throat. Anaphylactoid reactions may occur. Cases of nephrogenic systemic fibrosis (NSF) have been reported with OMNISCAN. In very rare cases convulsions have been observed after the administration of OMNISCAN as is the case for other paramagnetic MR contrast media. However, a causal relationship seems to be questionable. Transient renal failure was observed in one patient included in the clinical trials. The patient had received an X-ray contrast medium for myelography 22 hours prior to the injection of OMNISCAN. The causality for the reaction has not been established. **INSTRUCTIONS FOR USE AND HANDLING** The product should be drawn into the syringe immediately before use. Containers are intended for single use only, any unused portions must be discarded. The product in glass vials and polypropylene bottles should be drawn into the syringe immediately before use. **MARKETING AUTHORISATION HOLDER** GE Healthcare AS, Nycoveien 1-2, Postboks 4220 Nydalen, NO-0401 Oslo, Norway. **CLASSIFICATION FOR SUPPLY** Subject to medical prescription (POM). **UK MARKETING AUTHORISATION NUMBERS** 00637/0015 (glass vials), 00637/0025 (polypropylene bottles), 00637/0030 (pre-filled syringes). **PRICE** 20ml: £59.24. **DATE OF REVISION OF THE TEXT** 13 April 2007.

Adverse events should be reported. Reporting forms and information can be found at www.yellowcard.gov.uk. Adverse events should also be reported to GE Healthcare.

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www.gehealthcare.com

Reference: 1. Pharmacovigilance data on file available from GE Healthcare.

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FDR Velocity Unity

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FCR GO

FDR Velocity Unity is a recent extension of Fujifilm's DR product line. This single-detector, motorised, U-arm system performs a full range of radiographic exams (both stable-based and upright, for any clinical area, from chest to extremities). It is key to providing a flexible, cost-effective alternative to multi-detector systems.

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MIR News

MIR 2008 Congress Review - Management in Medical Imaging

MIR Chairman, Dr. Nicola Strickland

The 11th edition of the annual Management in Radiology (MIR) congress, a professional meeting aimed at leaders, managers and administrators of radiology departments worldwide, was held in Vouliagmeni, Athens, Greece from Wednesday 29 until Friday 31 October 2008.

This year's edition, led by Chairman Dr. Nicola Strickland, kicked off with its traditional examination of the management challenges concerning the country in which it is held: in this case, Greece.

It addressed a variety of management problems in Greece, due to underfunding, geographical disparity and poor regulations. Some of the issues highlighted by speaker, Dr. Karantalos, for example, discussed the problems Greek radiology faces in assuring quality and implementing regulations. Disparity in holistic governance of radiology, in matters like education and quality control, are clearly not just a Greek problem and so this session segued well into remaining ones.

Debate Reveals Concern Over Harmonisation

A following session on education and training stimulated much debate following the presentations: some commented that radiology is perceived in Europe as the "poor man" – because anyone can do it, neither the best nor brightest enter the specialty. Further comments revealed concerns that cross-border migration of workers brings risks to the patients as not all have followed the same quality standard of education.

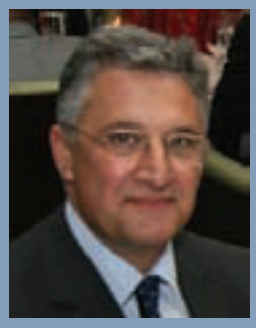
Teleradiology also continued to come under scrutiny, following last year's discussions in Oxford. A number of attendees commented that radiology is increasingly becoming a commodity, in that it can be available anywhere, any time, enabled by teleradiology – not necessarily a good thing. Others argued that increasing availability of services can only be a boon since one doesn't need to be concerned with covering the costs of full-time employees.

Congress Highlights

Other highlights included a session on management issues in ultrasound. Led by Prof. Michel Claudon, it highlighted the growth in applications for ultrasound, which is paralleled with a growing budget. This should make it more attractive for radiologists. However, it became clear during the session that ultrasound is at risk of being passed to other medical specialists. It used recent studies to highlight changing growth patterns in the use of ultrasound, showing that cardiologists are increasingly using ultrasound while use is decreasing amongst radiologists.

Conclusions

Other sessions such as managing private imaging practices, managing CD referrals and managing data security reinforced MIR's reputation for a high quality scientific programme. While it continues to focus its efforts on ensuring that management becomes a priority for radiologists, in order to avoid fragmentation of the profession, it is also increasing its focus on core management curricula such as management of financial and human resources. Next year's edition will be held in Riga, Latvia, and it is to be hoped that it will continue to successfully attract leaders in medical imaging to share and solve their concerns over the direction of imaging in the years to come.



Leadership Training - MIR Winter Course 2009

Last year, GE Healthcare delivered a well received leadership training to the MIR group and are hence looking to build on this success at the forthcoming meeting from January 15 - 17, 2009 in La Thuile/IT – again featuring last year's trainers Joanne Miller and John Wadell from the United States of America, as well as for the first time with Peter Kinhan from France.

Scientific Programme Details

The following are key components of the course:

1. Interactive sessions aimed at healthcare leaders. The approach to training will be to keep the sessions interactive and the content and discussion will be aimed at leadership level.

2. Strong focus on personal development. Most training in healthcare is dedicated to clinical skills and knowledge. Many clinical managers and leaders have only limited access to personal development where leadership skills can be refined and business acumen can be improved. Thus, the agenda is designed to reverse this trend with a focus on personal development, effective team management and driving change.

Five Dysfunctions of a Team

The course will reveal why a good team is a precious thing. The book 'Five Dysfunctions of a Team: A Leadership Fable' will bring to light how difficult it is to get a good team together and working well. This session will focus on the five elements needed to build a truly cohesive team:

1. They trust one another;
2. Then engage in unfiltered conflict around ideas;
3. They commit to decisions and plans of actions;
4. They hold one another accountable for delivering against those plans, and
5. They focus on the achievement of collective results.

Training Approach

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As a manager, imagine being able to better understand what motivates your employees and recognise how to effectively deal with them. The DISC inventory, developed by William Moulton Marston, profiles four primary behavioural styles, each with a very distinct and predictable pattern of observable behaviour. Understanding the DISC patterns has empowered millions internationally to better understand themselves and others, resulting in improved interpersonal success through more effective communication, understanding and tolerance.

Change Acceleration Process (CAP) and Lean

CAP is GE's proprietary Change Acceleration Process. CAP is a Model, Process and Tool/Skill-Set for increasing acceptance and commitment to changes. Successful changes consistently involved a high degree of acceptance or commitment to change. This session will introduce managers to use some CAP Tools and Processes that they can use with their teams to implement change projects. Lean is methodology aimed at reducing waste, eliminating bottlenecks and improving quality. Since being developed at Toyota decades ago, Lean is now a well-established approach to streamlining patient flows and improving patient experience. It has been widely embraced in the US, UK and Nordic health markets and is continuing to spread other countries. This session will introduce the key concepts of Lean to give the audience insights to breaking down and solving process related issues.

Venue

The sessions have been planned to give delegates the opportunity to spend plenty of time enjoying Austria's beautiful skiing areas. La Thuile is situated in the Alps at the extreme north-east of the country, close to the French alpine town of La Rosière, along a road going from Pré-Saint-Didier in the north-west up to the Little St Bernard Pass in the south-east linking Italy to Bourg-Saint-Maurice and the Isère Valley in France.

Registration and Accommodation

For an all-in price of 750 euros, delegates are not only registered for the MIR Winter Course, but will also be accommodated for three nights from January 14 - 17, 2009 in the exclusive first-class hotel Planibel. Additionally, a welcome dinner, a reception as well as a farewell dinner will be organised for all participants. Built in alpine style and in keeping with the landscape, it is situated only a few steps from the bottom of the ski lifts, enabling you to get to the slopes with your skis, without any other transport.

For further information, please visit our website at www.mir-online.org

Association News

CIRSE News - Studies Highlight Superiority of Embolisation

At the last CIRSE meeting in Rome, Italy, (Sept. 9 - 13) results from two randomised studies comparing hysterectomy and embolisation for treatment of uterine fibroids were presented. The Dutch study (EMMY trial, Prof Reekers, Amsterdam) and the Scottish study (REST trial, Dr Moss, Glasgow) were performed independently. The REST study shows a similar quality of life for both groups one year after the procedure (embolisation versus surgery).

The EMMY study shows that this result was also maintained after a two year follow-up period. Surgical treatments like hysterectomy could be avoided in more than 80% of all women after a successful embolisation, as the two year follow-up showed (EMMY). Furthermore, both studies indicate that embolisation is almost 40% cheaper than a surgical option.

For more information please visit **www.cirse.org**

CARS News - CARS 2009 Invites You to Berlin

The CARS congress with its associated journal, the International Journal of Computer Assisted Radiology and Surgery, is focused on research and development for computer assisted systems and their applications in radiology and surgery.

The main themes emphasised in the CARS programme are established by an interdisciplinary and international group of experts from healthcare institutions, academia and industry, world-renowned for their work on innovative methods and technologies in medicine. These are members from the ISCAS, EuroPACS, CAR, CAD, CMI and CURAC societies, who are active in the various committees of CARS, and in particular, who have successfully presented novel approaches at CARS congresses. The CARS Congress Organising Committee invites you to join us in Berlin in June 2009. Clinical specialties represented at CARS include:

- Image Guided Tumor Ablation Therapies
- Cardiovascular Imaging
- Computed Maxillofacial Imaging
- Computer Assisted Radiation Therapy
- Computer Assisted Orthopaedic and Spinal Surgery
- Computer Assisted Head and Neck, and ENT Surgery
- Image Guided Neurosurgery
- Minimally Invasive Cardiovascular and Thoracoabdominal Surgery

The deadline for paper and abstract submissions for CARS 2009 in Berlin is January 10, 2009.

For further information, please visit **www.cars-int.org**

IHE News - Connectathon Goes To Austria

The eighth annual European IHE Connectathon will be held in Vienna, Austria on April 20 - 25, 2009. At the IHE Connectathon, all companies that have implemented IHE's Technical Framework specifications in their products have the chance to test them with many other companies' products in a real interoperability environment. Vendors have the opportunity to identify and solve many 'bugs' during the event. According to vendors who have participated in previous Connectathons "the cost of identifying and solving a bug during a Connectathon is about ten times less than the cost of a bug identified on site".

The specialist of each company is present at the Connectathon, as well as standards specialists. The results of the Connectathon will be published in the "Connectathon Results Table" on the IHE-Europe website. Vendors may use the "IHE Integration Statements" to show the compliance of their products with the IHE Integration profiles. This is a clear benefit to vendors when responding to requests for proposals from users.

For further information, please visit **www.ihe-europe.net**

ECRI Institute - New Online Courses Provide Continuing Education

ECRI Institute has announced the availability of its new online education programme, e-Learn™. This catalogue of patient safety and risk management courses, is accredited by the Accreditation Council for Continuing Medical Education (ACCME).

ECRI Institute's new programme uses proven interactive learning techniques to help healthcare entities meet accreditation and regulatory requirements for staff education related specifically to patient safety and risk management issues. In 2007, the Agency for Health Research and Quality (AHRQ) conducted a meta-analysis of the effectiveness of CME in the US that found only 58% of CME courses offered appear to be effective at changing physician behaviour and patient outcomes. ECRI Institute's e-Learn courses are designed to be interactive and to incorporate other accepted adult learning principles, such as providing learners with feedback and incorporating opportunities for peer-to-peer interaction with discussion forums.

For further information, please visit **www.ecri.org**

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Dervla Gleeson
Managing Editor
IMAGING Management

INVESTIGATING THE EU LEGAL CONTEXT FOR TELERADIOLOGY
RESULTS FROM THE PORTOROZ EHEALTH MEETING RAISE QUESTIONS

During a presentation at the Portoroz eHealth Meeting, Jean Bergevin (Head of DG Internal Market and Services) addressed a number of important questions regarding the legal context for the provisions laid out by the European Community eCommerce Directive which governs teleradiology. In an interview with IMAGING Management, Mr. Bergevin made a compelling argument for the merit of the Directive. Here, we provide an overview of the pertinent issues.

There is growing concern that the EU cannot regulate teleradiology services provided to clients from service providers operating from outside the EU. This impacts greatly on legalities involved in utilising services offered by the fast-developing global teleradiology market.

According to Mr. Bergevin and other legal experts involved in the creation of the Directive, teleradiology transactions between parties within the EU are explicitly governed by Directive 2000/31/EC on electronic commerce, which stipulates that any conflicts that may arise in unsatisfactory service provision are subject to the law that governs the source country.

Mr. Bergevin acknowledges that EU legislation does not apply to situations in which the teleradiology provider is located outside of the EU's legal jurisdiction. In that case, only bilateral agreements between the EU and said country apply; which raises significant questions about how the EU can possibly cover all eventualities that may arise in the provision of teleradiology services. Where does this leave the patients whose radiologists are sending images for reporting to India, if a breach of confidentiality occurs or a case is misreported?

Key Points from the Directive

The Directive sheds light on how cross-border e-commerce transactions should be carried out. According to the Directive, it is necessary that both sides be clear on the technical steps to achieve a contract. The service provider should also register the contract and make explicit how it will be accessible to the other party, as well as how to correct input errors in the contract. Finally, it is imperative that the language of the contract be completely clear. In other words, confirmation of the contract is an obligatory step, making the contract safe.

Another issue addressed by Mr. Bergevin is the ethical integrity of radiology advertising. Given a lack of harmonisation within the EU, ethical requirements remain primarily at the hands of individual societies. Therefore regulations of what professionals can communicate about their services are very old and limited, which harms competition.

It is suggested therefore that radiologists develop a European code of practice for advertising. This code should delineate how advertising of radiology services is regulated and by whom, alleviating this dilemma.

Remaining Complications

A question remains: What if the provider is outside the EU but has offices within the EU that handles administrative matters but not the reading of reports? Will EU Directive 2000/31/EC apply in this case? Or, are there other provisions thinkable about how this teleradiology provider would be seen as a party residing within the EU?

Says Mr Bergevin: "Community law here specifically governs an "establishment", a particular legal term that governs where the centre of economic activity is. A subsidiary company can be considered as an establishment, though this cannot be a mere postal address. Legally and logically, once there is an economic activity in the EU promoting the service – then it falls under that directive for the specific services which it offers."

The point being, the service must be offered within the EU in order to qualify. He continues, "If the radiologist sends his reports to the subsidiary office in the EU, which then subcontracts to the outside EU country, and the EU centre has trained radiologists, then this would fall under the scope of the Directive. The EU office would then be responsible for enforcement of the Directive, which means that they could go to court if necessary.

"Finally, in the case where the EU-based subsidiary company advertises teleradiology services online from an operation that resides legally outside of the EU, this is an 'information society service' called online advertising. That is subject to the Directive. However, only the advertising is subject to Directive in this case."

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SKILL MIX AND TEAMWORK IN **IMAGING DEPARTMENTS**

Redesigning the Clinical Team

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Ten years ago, the concept of skill mix in UK imaging departments was conceived to address the shortages of radiographers, radiologists and oncologists as well as the increasing pressures on services. Many imaging departments were dependent on temporary and part-time staff, with relatively high staff turnover and a large percentage of the imaging workforce were approaching retirement.

The development of new, more effective career pathways for radiographers with novel teams in imaging departments was a clear mechanism to address some of the challenges facing imaging. The then Prime Minister's 'Challenging Cancer' summit agreed to develop a new model of service delivery within radiography. The government made a commitment to develop more staff, new grades of staff and to address these pressures for the benefit of patients.

Breast screening, therapy radiography and then diagnostic radiography (including ultrasound) were targeted for pilot projects. Breast screening was the first proposed skill mix project, as the NHS breast screening programme was committed to expansion both by age, from 50 - 64 to 50 - 70 years, and by adding a second view to all screening episodes rather than just the first screen. The aims for the skill mix project were to:

- Redesign the clinical team by skills and experience rather than profession;
- Introduce a tiered structure incorporating mechanisms for lifelong-learning and skills-escalation;
- Develop occupational standards for the clinical aspects of each service, and
- Review and implement learning processes to enable practitioners to develop new and valued roles within the multidisciplinary team.

These proposals led to anxiety from within the imaging community and all sought reassurance that the new roles would not dilute the standards or the scope of their professions. Reassurance that this was not the case became easier as milestones were achieved. A four-tier structure was proposed and is now successfully established in both breast screening and across radiography in general.

Non State Registered:

Assistant practitioner: Performs protocol-limited clinical-tasks under the direction and supervision of a state registered practitioner. This type of professional is regulated by the various Acts and Orders which ensure the public have access to, and are treated by, health professionals who are qualified and competent.

> "Proposals led to anxiety from the imaging community"

State Registered:

Practitioner: Autonomously performs a wide-ranging and complex clinical role and is accountable for own actions and for the actions of those they direct.
Advanced practitioner: Autonomous in clinical practice, defines the scope of practice of others and continuously develops clinical practice within a defined field.
Consultant practitioner: Provides clinical leadership within a specialty, bringing strategic direction, innovation, and influence through practice, research and education. Not as many opportunities as initially expected have developed for

the consultant practitioner role. There are now 28 consultant radiographers across England predominantly involved in breast imaging but also oncology, neuro-imaging, GI imaging, ultrasound, emergency imaging and musculoskeletal imaging.

The breast imaging department at the Norfolk & Norwich University Hospital became one of four pilot sites for the 'New Ways of Working' project. Locally, we chose to develop the Assistant Practitioner and the Advanced Practitioner roles as there was no need for the department to train a consultant practitioner.

As managers of the unit, it was our job to lead the team through this period of controversial change. It is often said that management can be taught but that leadership is a skill that can be developed but must be inherent in the team leader. Managers who are good leaders are uncommon but we focused on both sets of skills to plan our work for the project. We set ourselves four key goals:

1. Get to know the team

We identified whom we could count on for support, and which team members were likely to cause problems and could negatively influence the others. The team had been together for almost ten years with new members joining but very few leaving. Standards were high and results good. The department had expanded in terms of size and equipment and a new prone breast biopsy table was in situ. The radiographers were keen to move into film reading, ultrasound and biopsies. The team was ideal for this kind of process.

2. Get to know how to manage the team

Skill mix was viewed by most as an opportunity to develop their professional roles and most could see the benefit of the new Assistant Practitioner role. The cohort of staff that were most resistant were those who did not want to take on an Advanced Practice role and were to fill the second, pre-existing, Practitioner tier. We decided the best way to manage these members was to find them other responsibilities, with new or different roles to make them feel equally valued for their contribution.

3. Be part of the team

Never expect the team to do something you are not happy to do yourself. Communication became more important in an effort to make the team feel part of the decision-making process. The amount of work needed from the whole team to develop the Assistant Practitioner role in particular, cannot be overemphasised. Being part of a national pilot project put the whole department under a huge amount of national scrutiny. In many ways, this brought the team closer together.

4. Lead the team to the top

It was important to make the team feel special and valued. During the pilot, everyone took on additional work and responsibilities. The project unfolded rapidly and there were times we felt we were going backwards to move forwards. We successfully 'created' two excellent Assistant Practitioners capable of producing screening mammograms to a very high standard and two Advanced Practitioners with postgraduate qualifications in image interpretation and analysis, one of whom had a further qualification in breast ultrasound.

Project Undergoes Continued Growth

Completion of the pilot was only the beginning. Additional Assistant Practitioners have now joined the team. One of the original two has moved on and is now a Registered General Nurse and soon to train in midwifery. More radiographers have been trained to film read and their expertise has changed the relationship not only with the radiologists but also with the extended breast team. New team confidence has meant that members of the team have presented at national meetings, submitted posters and won several 'best poster' prizes.

Conclusions

This project taught us a lot as we have moved into new roles. The project in breast screening across three sites other than our own acted as the basis for role extension and the development of competency frameworks across imaging services. This 'case study' highlights aspects of management and leadership in a change management programme which can be transferred to many other scenarios. This is fundamental to the delivery of an effective imaging service with a motivated and progressive workforce that is able to function as an effective team.

Further Reading:

- Radiography Skills Mix. A Report on the Four-Tier Service Delivery Model. (2003), Department of Health. London
- Role Development Revisited: The Research Evidence 2003 (2003), College of Radiographers, London.

DR Productivity and Quality for All

Meet the new DRX-1 from Carestream Health

The CARESTREAM DRX-1 System is the industry's first wireless DR detector that is exactly the size of a 35cm x 43cm cassette, which means that it fits current X-ray equipment without modification. Easy to incorporate into wall stand or table-based Buckys for CR or film-based cassettes, the DRX-1 transforms workflow for a wide range of procedures with improved productivity and image quality.

As the CARESTREAM DRX-1 System requires no modifications to existing analogue equipment installation costs are very low with one detector for nearly all types of exams where a traditional cassette would be used. The system delivers high-quality preview images in under five seconds, which significantly improves productivity, even for users of CR systems.

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Blue-Sky Thinking from Carestream Health.
Diana L. Nole, President, Digital Medical Solutions, Carestream Health, with the groundbreaking DRX-1 cassette that requires no retrofitting or replacement of existing X-ray equipment.

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"The DRX-1 presents an extremely cost-effective option for facilities that want to improve productivity and image quality in existing film or CR rooms"

Diana L. Nole

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PARTNERSHIPS BETWEEN **RESEARCH INSTITUTES AND INDUSTRY**

Information & Communication the Cornerstones of Success

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In 2006, the German Cancer Research Centre and Siemens Healthcare entered into a strategic alliance to combine their expertise in oncological radiology and radiation therapy. The present six-year pilot stage aims to improve diagnostic imaging and radiotherapy technologies to provide new quality imaging information about tumours for radiotherapy planning, monitoring and patient aftercare. Siemens Healthcare contributes state-of-the-art equipment, and the centre provides its scientific know-how.

Especially given the turbulent economic situation of the present, teamwork between industry and science plays an important role by ensuring that healthcare doesn't lose ground. With this in mind, the successful strategic alliance between Siemens Healthcare and our centre has demonstrated an effective model for other institutions to benefit in a similar way.

Project Organisation

The organisational framework within the centre was established after both partners defined research areas and legal requirements of the collaboration. The centre provides scientists from five departments of the imaging and radio-oncology research programme to the collaboration. The projects have diagnostic and therapeutic research focuses ranging from radiological imaging for oncology and 7 Tesla MRI, and from molecular imaging to adaptive radiotherapy.

An integrated diagnostic and therapeutic centre links these individual projects and enables optimised workflow for the treatment of cancer patients. A key element in achieving this primary goal is a joint software platform combining all relevant diagnostic and therapeutic data.

The considerations outlined below reflect the experiences had during the development and implementation of internal project management structures and processes. There is a particular focus on interdepartmental collaboration, related issues and their solutions.

Time Management

A fundamental prerequisite for optimal project performance is time management. The majority of involved scientists only work part-time for the strategic alliance. Handling project tasks besides ordinary research and clinical routine detracts from the performance of the project, since project-related work can be considered as less important compared to department-related responsibilities. Therefore, the involved department heads agreed that all team members would be allocated enough time besides their departmental work to perform their projects and to attend related meetings.

Hierarchy

The implementation of clear hierarchic structures for the project is a second major requirement. Project managers need freedom of action and appropriate competences to lead their team and to perform their tasks successfully. To encourage collaboration and change acceptance, project managers themselves must be competent and dedicated. They have to be provided with decision-making authority for the projects, and have to be supported by the department heads and management. Finally, individuals are often acting on a different level of hierarchy compared to the position they represent within the regular department structure.

The hierarchy is organised as follows. Each project is lead by a scientist, responsible for scientific performance and team coordination, including the related subprojects. Since the contributing departments focus on different research topics like radiology, radiation therapy and nuclear medicine, the academic background of the involved scientists varies from medicine and physics to computer sciences.

Depending on the research focus, the project teams consist of medical scientists, physicists and/or computer scientists from the software team. Additionally, an administrative project manager was established for the entire collaboration, whose main responsibilities are monitoring, controlling and reporting as well as the handling of all other administrative issues.

This manager is the internal contact person for scientific project managers, department heads and the board of management as well as the external contact person for the collaboration partner.

Information and Communication

Other highly important cornerstones are a continuous flow of information and a lively and open communication. The following meetings were established to facilitate a bottom-

up and a top-down flow of information and strengthen the participants' involvement in decision and planning processes:

- Weekly meetings between scientists involved in the respective subprojects to discuss operating questions like work progress, problems and short-term action items;
- Monthly meetings between the department heads and the scientific and administrative project managers to discuss cross-project and related issues;
- Quarterly internal steering committee meetings with the board of management to discuss future projects, strategic decisions and escalating issues, and
- Every six months a joint workshop between DKFZ and Siemens Healthcare to present the project progress and to bring together DKFZ scientists with colleagues from Siemens working in research and development departments of Siemens Healthcare.

If required, meeting frequency is increased or ad-hoc meetings take place. Since passive information is closely linked with active communication, another objective is to inspire informal communication between project members by bringing them together face-to-face. Every six months, a project progress report is compiled for documentation purposes and to allow partners to inform themselves about project status.

Lessons Learned

Two years into this joint venture, the project is on the right track. In many areas the cooperation has developed successfully, some results even exceed expectations. Departments involved with the projects increased the rate of joint publications. New research opportunities arose from the fact that scientists at DKFZ can directly communicate with Siemens developers, gaining access to functionality not yet released via an official product. Siemens, on the other hand, received expert feedback on newly developed hardware and software functionality, and acquired direct access to the latest scientific and medical research in the field of oncology, which will become relevant in future products.

Foresight for the Future

To be even better positioned for future challenges and to fully exploit the high potential of the collaboration, one of the goals is to acquire third party funding for realising new projects within the scope of the strategic alliance. The achievements made by the projects may also help to attract new members to the collaboration, both from the already participating partners DKFZ and Siemens, as well as other institutions.

GOOD GOVERNANCE **IN RADIOLOGY**

How to Optimise Team Performance and Establish a Good Working Culture

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During my career, I was responsible for radiology at the Kantonsspital Münsterlingen, Switzerland. The department includes diagnostic radiology, nuclear medicine and radio-oncology. The hospital provides services for a population of about 100,000 (240,000 for radio-oncology) in internal medicine, general surgery, orthopaedic surgery, hand surgery, urology, gynaecology and obstetrics, paediatrics, oncology, pulmonology, gastroenterology, cardiology and neurology. Working with such a diverse blend of specialties allowed me to develop certain guidelines for optimising team performance, which I share here.

Key Criteria to Optimise Performance

Define the task of your department. Do this together with your team and repeat it constantly so that it is borne in mind by all at all times.

The mission is more then the task. Enlarge the task to the mission, taking into account the preceding and further steps of the process of patient investigation and treatment. Include into the mission the context and external influences, even non-medical matters.

Be a real service provider. Service patients and clinicians. Radiology and the clinical departments don't stand alone, they provide an integrated healthcare product only if they work together. The clinicians themselves are also service providers.

Add value to the examination. At our institution, this is mainly done by more than 40 clinical-radiological interactions per week and by radiologists being available for consultation at any time. Real needs of the patients are fulfilled, supported by the empathic attitude of technicians and physicians in radiology. Respect the patients' needs. Teach this repeatedly in staff conferences.

Take over a part of the responsibility from the clinicians. Radiologists not only read the examinations but also take over some part of the responsibility from the clinician by a meaningful report and a clinically useful conclusion.

Demand professional and social excellence from your team. Mediocrity is not acceptable in your institution. Each team member must be able to work with everybody.

Hand over important decisions to the clinicians. This is mainly the scheduling of patients (as far as possible) and the determination of the urgency of the examination without exception. Our team was afraid of abuse, but this didn't occur

Decide organisational conflicts following clear priorities. Our decisions are taken regarding firstly the interests of patients, secondly the interests of the clinicians and only thirdly the interests of the radiology team.

Don't write e-mails to your team members. Walk around and speak with them. By this you enhance the culture of communication in your department.

"Not concerned" doesn't exist! Our own team members have elaborated on this key paradigm. Since then, conflicts have sharply diminished in our department.

Encourage your team members to take pride in their work. Pride, though it has only slowly developed in our team, is a powerful motivator.

Summary

These guidelines were established over the course of several years with growing experience. Our efforts were not only rewarded by a high degree of approval from the side of patients and clinicians but also by a good culture in the department and a growing job satisfaction of our personnel. So we conclude, that job satisfaction is not a precondition but the result of good teamwork. The latter is always a consequence of good leadership.

Guidelines for Radiology

The radiology department is a service provider for patients and clinicians. The task is to:

- Perform radiological examinations;
- Interpret them;
- Communicate the results to the clinicians;
- Add value for the clinician, and
- Add value for the patient.

LEADING A TEAM **IN TIMES OF CHANGE**

The Impact of Different Personalities on Outcomes

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Each of us has a different risk profile for adoption of change. Some of us are native risk takers, happy to adopt change without clarity of detail or definite outcomes or specific plans. Others are risk averse, require all of the above and do not want to gamble. In this article, I will focus on the impact of individuality within the team, on overall leadership, and outcomes.

In an ideal world, leadership vision would readily convert to management agenda and engagement of the team would not be an issue. Exploring this a little, intransigence is the least likely reason for lack of cohesion in a team. Different experience, beliefs and values influence individual perception and action. We all wish to influence our future positively and that of our work environment.

Yet we all hold the cherished card of the patient dear in terms of their safety and best possible outcomes. An open mind to different approaches is helpful. The leader must be a good listener to hear and understand the disquiet of others and convert that by allaying concerns and channelling energy.

Individual Perceptions Influence Outcomes

Individual perception of situations is varied and unpredictable. One should never assume that all team members are seeing a situation as one sees it. This is the result of different value systems, beliefs and experience but also personality. Some have a very person-focused approach to life and will natively consider impacts on people (i.e. the patient or staff groups). Others have a task focus and, at all costs, may want their outcome and to win the day, regardless of collateral impact.

By acknowledging these natural differences, we can step around the potential conflict that could arise. Prioritisation is another extremely individual influence on outcomes. Individuals lead busy lives and assuming that your agenda is their agenda, can lead to misunderstanding.

The Role of Stakeholders

In undertaking a change in healthcare services or practice, it is essential to pinpoint the individual stakeholders. Patients are an obvious group, but the staff who provide the service and their referrers are legitimate additions. Less obvious stakeholders are those who ultimately pay for the service and alternative service providers or linked services. Those who are likely to be involved in any required training or retraining of staff to provide the new service should also be given a voice.

Once the stakeholders are identified, it is useful to consider what their concerns about the new service might be. Often these will fall into positive and negative aspects, benefits and drawbacks or unintended and unhelpful con-

> "Strength comes from mutual respect and an inclusive approach to team working"

sequences. Leading a team involves a certain effort to predict and document potential pros and cons of any new service. This allows the team leader to arrive at a vision of the future that acknowledges the impact and individual concerns that might arise and allows encouragement of joint working through of these issues to mutual benefit. It is always better to have joint working through of issues and development of plans than for a group or individual to feel that it is 'being done to them'.

Ensuring Team Compliance

When announcing a necessary change in service or practice, there is a certain approach that aims to ensure team engagement and increased likelihood of compliance, as follows:

- Assemble all identified stakeholders, as outlined above;
- Present them with the issue to be addressed or the service to be developed;
- Seek ideas giving an outline of the overall intended vision, and
- Be in listening mode - active listening is a skill that can be employed here.

In active listening, one reflects back the information that a stakeholder has given to confirm understanding but also to encourage clarification in a very supportive, positive way. This may be in the words of the reflector and a useful dialogue may ensue achieving understanding and exploring approach and process.

A shared vision may be developed and even detail of the 'hows' in terms of the planning process. It is worth remembering that nobody understands a service as well as the stakeholders. Fundamentally the users of the service are critical to that understanding. They may even have astute observations in terms of service improvement.

Practical Considerations

At a practical level it is helpful for team-building to put the service development on a poster or board on the wall at one end of the room and for everybody to sit facing the poster. In that way all staff have an opportunity to be seen as part of the solution and it recognises that everybody's contribution is valid. Practical suggestions can be noted on post-its and stuck on the wall by a neutral facilitator of the discussion. Following this session, the clinical leader and facilitator will have a wealth of information upon which to develop a sound plan. This approach sends out the message of the future being a jointly developed one.

It is also important that all parties are kept up to speed with the evolving and developing service change. Adverse impacts on individuals are less likely to arouse obstructive behaviour if there is awareness and preparation for them.

Acceptance of adverse impacts is always easier if the consequence is acknowledged and worked through involving those affected rather than ignoring them. Individual response may be quite emotional if the status quo is under threat. This approach negates any initial 'fight or flight' response.

Strength comes from mutual respect and an inclusive approach to team working. Valuing the diversity of different approaches and perceptions is the strength of a good leader and the basis of a strong and mutually supportive team. Leaders and team members should not feel threatened by different perception but rather actively seek them. The difficulty is sometimes that different perception may feel like a challenge to the 'authority' of the leader.

In summary, team leaders need to be good listeners. They need to hear the problems and concerns of all parties. They should be slow to take offence but value the strength of diverse contributions.

It is too easy to appoint in your own image or select candidates with similar or consonant points of view to your own. The result is "group-think" of a like-minded group. This may feel very comfortable but is exclusion of diversity and a lost opportunity.

Further Reading

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THE IMPACT OF GLOBALISATION **ON HEALTHCARE**

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Globalisation is characterised by the circulation of goods and services between countries using the criteria of efficiency. Such multilateral agreements between countries, unfortunately, often function to the detriment of the countries with less developed economies. Nevertheless, trade can also benefit developing countries. In this article, I explore key drivers for and consequences of a new, global healthcare economy.

Circulation of Patients

Factors like medical tourism, an industry worth an estimated 60 billion dollars and growing, and the changing demographics in many populous countries in Southeast Asia, South and Central America, and the Middle East are changing the face of healthcare on a global scale. High costs and long waiting lists have thousands of patients in the US and Europe looking abroad for accessible, affordable healthcare. Life expectancy in emerging nations is increasing, as are the numbers of health consumers there with the means to pay out-of-pocket for interventions.

The changing global landscape, however, presents a number of questions:

- How will patients choose the right facility and provider?
- How will we measure quality in outcomes? For example, should there be pre-treatment screening for such medical travel?
- Does the patient actually need his or her hip replaced in the first place?
- How will one ensure adequate short and long-term follow-up?
- Who is liable for mistakes?
- How is continuity of care provided across geographic boundaries?

Circulation of Health Professionals

Providers are also on the move. Young professionals increasingly migrate to the West for better training and often remain there to pursue careers Also, some rich countries recruit recently-trained graduates from poorer countries. Another emerging phenomenon is the development, in less developed countries, of medical curricula adapted to North American or Western European standards and are offered in English, allowing a higher level of recognition worldwide and providing a financially competitive education for students from wealthier countries.

Another important development in the emerging economies is the rapid emergence of privately financed specialty hospitals. These hospitals are specialty-focused green-field developments that cater to international patients who are prepared to pay out-of-pocket for healthcare. They coexist with public hospitals and are able to cherry-pick patients to some degree to gain advantage. Operationally, they are being designed from corporate models that prize efficiency and innovation.

Their lower-cost labour force, compared with established market economies in Europe and North America, allows them to price services competitively.

Payers: Insurance Beyond Borders

Emerging economies have traditionally suffered limited insurance options for patients, but this is changing: new legislation in Dubai requires all employers provide health insurance for their employees; Turkey currently has a public healthcare system and is encouraging private systems to develop; and in India, leaders have begun to advocate and develop new insurance systems.

US payers are now exploring an option that could change the landscape in American medicine: offering insurance that includes foreign travel and treatment for lower rates than the cost of comparable treatment in the US. One of the first payers to develop such a plan is Blue Cross of South Carolina, which has made Bumrungrad International Hospital in Bangkok the first provider in its overseas network.

Crucial to the success of these hospitals are their ability to institute a culture of quality, both in the domain of quality of care (Alpha Program and International Joint Commission) and in medical education (IIME, World Federation for Medical Education). These entities are becoming extraordinarily successful regionally, they are competing globally, and their rise is the most important new phenomenon in the globalisation of healthcare.

International Accreditation System

Recognition by Joint Commission International (JCI), the international accrediting body of the Joint Commission on the Accreditation of Healthcare Organisations, has become a significant tool to help these hospitals attract patients and staff. In 2000, JCI certified three such hospitals; today, the number of JCI-accredited institutions is over 100. Even within the established market economies of Europe, JCI accreditation is becoming increasingly important to those seeking treatment or career opportunities at these types of hospitals.

At the same time, the process of qualifying for accreditation has become more rigorous. However, it is important to recognise that accreditation by JCI is the ground floor for quality benchmarks, rather than the ceiling. Although it is not a measure of actual health outcomes, accreditation is a positive indicator that the building blocks are in place, both structurally and from a process perspective, to be able to provide quality care.

If this scenario comes to be, insurance companies will offer cheaper premiums for care provided by countries that are 'accredited' and competitive. As difficult as it might be for us to imagine today, this phenomenon might also affect medical education for two reasons. Firstly, medical education costs are soaring, and the promise of lower cost of education might be very attractive in an open educational 'marketplace'. Secondly, the opportunity for students to train in the same places that patients from their countries are receiving care might be seen as both educationally sound and a bonus for patients who are being treated abroad.

Governments: Changing Roles

Traditionally, governments have assumed the roles of both healthcare provider and payer, but this is shifting in the least-developed and emerging economies where governments are increasingly focusing on paying for care and building intrasectoral reform, encouraging the development of public–private partnerships to fill that role.

They are now looking to serve more as stewards and regulators of healthcare systems than as providers, and one of the governments' most critical aims in this evolving role will be to develop comprehensive provider systems, to encourage the expansion of services for their own residents or others.

Conclusion

It is the turn of healthcare delivery to be globalised. Nevertheless, health cannot be assumed to be the same as other basic goods. Linked to healthcare are many complex ethical, cultural, and human resource issues that we have only begun to name. Further, it is the duty of health professionals to promote health as a global human right. For this reason, we all must be very careful before launching headlong into the globalisation of healthcare and health professional education, taking care to be certain that if we do, it will be for the benefit of all around the world.

THE IMPACT OF **THE ECONOMIC CRISIS ON RADIOLOGY**

Industry Urged to Continue Support

Interviewee
Prof. Guy Frija

Chairman
Department of Radioogy
Georges Pompidou
European Hospital
Paris, France

What is your opinion on the impact of the global economic crisis on radiology?

The answer is complex because three kinds of parameters have to be taken into account: on one hand, large imaging manufacturers are mainly conglomerates, while on the other, expenditure on health is relatively nationalised in many countries. Finally, the economic crisis is affecting all regions of the world but to very different extents. In such a situation, there is reason to expect that economic policy within these large groups could eventually affect imaging, despite the fact that expenditure on health does not suddenly dry up due to stock market fluctuations. The areas most affected by the crisis will be communications expenditure: advertising and support for conferences and for training and research initiatives.

How could the industry plan their investments into medical imaging better, to both respect shrinking budgets, and the continuing need for support of healthcare?

This crisis is an opportunity for industry leaders to better analyse the support they must provide to the world of medical imaging. Rather than scatter their support across a range of events with little scope, they should consider concentrating their efforts on large European and national conferences. Furthermore, they should take into account the desire among the European Society of Radiology and the European Association of Nuclear Medicine to cooperate more extensively: why not combine the technological presentations for these large conferences? It is a unique opportunity: crises sometimes allow us to make important decisions.

Might the numbers of those entering the profession of radiology drop if there is a cut in the market?

I do not believe that there will be a general recession in the radiology market because, as I mentioned earlier, health expenditure cannot suddenly draw to a halt; having said that, radiology will be called upon in future to adapt its work organisation so as to allow broader access to imaging thanks to the industrial development of teleradiology. In Europe, European directives on cross-border healthcare are the precursor to a real revolution in the market for healthcare services' provision. Rather than a recession, I prefer to think of this as a climate prompting the development of new organisational structures. For instance, the practice of teleradiology will become more prevalent as it has now matured as an industry tool. In Europe, job allocations may begin to be extended to the "highest bidders", as is starting to happen in the United States.

How will research be affected?

I do not think that academic institutions will be affected by the crisis to the extent that they will be obliged to cut back on or interrupt their activities in research or innovation assessment. It is likely that in some countries, such as France, this crisis could be an opportunity to concentrate efforts on centres of excellence, which could indirectly see the funds available to these centres increase.

Can industry help to lead radiology and other healthcare services out of the recession?

In order to cope with the recession, existing activities must be consolidated and new ones developed. Health professionals will come under increasing scrutiny to analyse the usefulness of tests carried out. The development of other activities will initially rely on the maintenance of research and innovation activities, without which the system would quickly be stifled. Radiology must serve as a catalyst for the development of information systems; regional and national PACS projects must be developed, creating a real industry of image circulation and storage. This must take place in coordination with national policies aimed at computerising health systems. Luckily, many imaging materials manufacturers have made extensive investments in these fields, and we must try to profit from this.

To conclude, the imaging industry has just experienced some very good years, with significant profits for manufacturers. Today, the situation is undoubtedly very difficult for them: it is unacceptable that after many profitable years it should be radiology that faces budgetary cuts, such as a reduction in support for large conferences and generally to large national and European radiology societies. Such an outcome would make everyone's life more complicated and in particular that of industrial operators as it would only serve in a very indirect way to cut back on the development and adoption of innovations in daily practices. In such a situation, it is most likely that there would be very strong reactions from the national and international communities.

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Product Comparison Chart

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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

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MODEL	ECR[1] Nontilting	Carestream KODAK DIRECTVIEW DR 7500WM System (Multipurpose Wall Stand)
WHERE MARKETED		Worldwide
FDA CLEARANCE	Yes	Yes
CE MARK (MDD)	Yes	Yes
SYSTEM		
Film	Yes	No
Digital	Optional	Yes
Type		CsI (Tl) flat panel
Tomography	Optional barless	No
BUCKY SYSTEM		
Type	Motorised	Motorised, 5 axis of motion, 6th axis optional (floor rail)
Size, cm (in)	43 x 43 (17 x 17)	43 x 43 (17 x 17)
AEC	3-field	Yes, 3 chambers
Grid ratios	10:1 or higher	10:1, 12:1, choice out of 3 different grids
Lines/mm (in)	2.5 (100)	40Lines/cm (102 Lines/inch)
Cassette sizes, cm (in)	All standard	Cassetteless
Longitudinal travel, cm (in)	50 (20)	478 (188)
DIGITAL SYSTEM		
Spatial resolution	>3 lp/mm	3.5 lp/mm
Matrix, pixels	<150 microns	Matrix 3000 x 3000, Pixel 143µm
Gray levels	4096	16,384 capture; 4,096 gray levels output
DICOM 3.0 compliant	Yes	Yes
RADIOGRAPHIC CAPABILITIES		
Bucky	Yes	Yes
Cross table	Yes	Yes
Horizontal	Yes	Yes
Off table	Yes	Yes
Upgradable for digital	Yes	Digital System
X-RAY GENERATORS		
Preferred units	80 kW	80 kW high frequency with digital feedback control circuitry
X-RAY TUBES		
Preferred units		400,000 HU
TUBE SUSPENSION		
Model, suspension		Overhead mounted, fully motorised,
Model, collimator		manual or auto movements Automatic
POWER REQUIREMENTS	Standard	380-480 VAC; 50/60 Hz
PURCHASE INFORMATION		
List price, std configuration		420,000 dollars
Digital upgrade list price		NA
Warranty		1 year
Year first sold		2005
Number installed		
USA/worldwide		NA
Fiscal year		January to December
OTHER SPECIFICATIONS		Designed for multi use. Base system comes fully motorised with bidirectional tube and/or detctor tracking, bidirectional tube/detector centering, optional 16 user configurable auto-positioning linkable to RIS procedure codes for automated workflow. Wallstand base configuration with 5 axis of motion, motorised, 6th axis (floor rail) optional. Kodak DirectView EVP software, DICOM Worklist Management, Capture Link Software for CR/DR integration, IHE Scheduled Workflow Software; HIS/RIS Connectivity, Dose Area Product Metre.
Last Updated		Oct 08
Supplier Footnotes	[1]These recommendations are the opinions of ECRI's technology experts. ECRI assumes no liability for decisions made based on this data.	Due to continous product improvments all data are subject to change without further notice

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KODAK DIRECTVIEW DR 7500DM System (Multipurpose Dual Detector) [2]	**KODAK DIRECTVIEW DR 9500 System (Multipurpose Ceiling Mounted Single Detector)**	**Kodak DirectView DR 3500 System (3 in 1DR Solution) This replaces the DR 3000**	**CARESTREAM DRX-1 System, the worlds first wireless, cassette-sized DR retrofit solution for standard x-ray buckies (Works-in-progress)**
Worldwide	Worldwide	Worldwide	Worldwide
Yes	Yes	Yes	Will be available at product launch
Yes	Yes	Yes	Will be available at product launch
No	No	No	No
Yes	Yes	Yes	Yes
CsI (Tl) flat panel	CsI (Tl) flat panel	CsI (Tl) flat panel	GOS / CSI flat panel technology
No	No	No	
Motorised, 5 axis of motion, 6th axis optional (floor rail)	Motorised, 6 axis of motion	Motorised, 3 axis of motion	Will use existing bucky
43 x 43 (17 x 17)	43 x 43 (17 x 17)	43 x 43 (17 x 17)	35 x 43 (4 x 17), same dimensions like standard ISO x-ray cassette
Yes, 3 chambers	Yes, 5 chambers	3-field	Will use existing AEC
10:1, 12:1, choice out of 3 different grids	8:1, 12:1, choice out of 4 different grids	8:1, 12:1, choice out of 3 different grids	Will use existing grids
40Lines/cm (102 Lines/inch)	80 Lines/cm (203 Lines/inch)	80 Lines/cm (203 Lines/inch)	Will use existing grids
Cassetteless	Cassetteless	Cassetteless	Cassetteless
478 (188)	550 (217)	0 (0)	Will use existing system
3.5 lp/mm	3.5 lp/mm	3.5 lp/mm	3.6 lp/mm
Matrix 3000 x 3000, Pixel 143µm	Matrix 3000 x 3000, Pixel 143µm	Matrix 3000 x 3000, Pixel 143µm	Matrix 2544 x 3056, Pixel 139µm
16,384 capture; 4,096 gray levels output	16,384 capture; 4,096 gray levels output	16,384 capture; 4,096 gray levels output	16,384 capture; 4,096 gray levels output
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Fits in any bucky that can hold a standard cassette
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Digital System	Digital System	Digital System	Its upgrading an analogue room to DR
80 kW high frequency with digital feedback control circuitry	65 or 80 kW high frequency with digital feedback control circuitry	64 or 80 kW high frequency with digital feedback control circuitry	Will use existing generator
400,000 HU	400,000 HU	300,000 or 400,000 HU	Will use existing x-ray tubes
Overhead mounted, fully motorized, manaul or auto movements	Motorized or manual ceiling-mounted 3D-U-arm with auto movements	Motorized floor-mounted C-arm	Will use existing tube suspension
Automatic	Automatic	Automatic	Will use existing collimator
380-480 VAC; 50/60 Hz	380-480 VAC; 50/60 Hz	380-480 VAC; 50/60 Hz	Standard: 90-264V, 50-60 Hz
620,000 dollars	595,000 dollars	331,500 dollars	200,000 dollars
NA	NA	n/a	It is a digital upgrade
1 year	1 year	1 year	1 year
2005	2007	2007	Works-in progress
NA		n/a	n/a
Not specified	NA	n/a	n/a
January to December	January to December	January to December	January to December
Base system comes fully motorized with bidirectional tube and/or detc-tor tracking, bidirectional tube/detec-tor centering, optional 16 user configurable auto-positioning linkable to RIS procedure codes for auto-mated workflow. Wallstand base con-figuration with 5 axis of motion, motorised, 6th axis (floor rail) op-tional. Kodak DirectView EVP soft-ware, DICOM Worklist Management, Capture Link Software for CR/DR in-tegration, IHE Scheduled Workflow Software; HIS/RIS Connectivity, Dose Area Product Metre.	The DR 9500 incorporates a ceiling mounted U-arm (tube and detector) that offers un-precedented flexibility. The DR 9500 easily moves around the patient, making it ideal for all horizontal, upright and angled projections. The bucky and the tube are always aligned, enabling faster positioning, enhanced comfort, and added convenience for patients - particu-larly those with limited mobility. Its three oper-ator interfaces are strategically located to minimise technologist relocation. Patient data from the hospital's HIS/RIS is transferred (via DICOM worklist) to the system's operator console, as well as to the two operator inter-faces on the U-arm. It can quickly and effi-ciently perform exams traditionally performed with a dual detector system.	The floor-mounted DR 3500 System offers a compact footprint and is fully motorized. In this single-detector system, the arm maintains constant alignment between the x-ray tube and the bucky for rapid patient positioning. It is capable of handling upright, table, and angle projections. The arm offers two-speed motor-ized movement and two presets provide Auto-positioning for upright or table projec-tions. Optianl are 20 Auto-Positions and re-mote control available. The systems offers a touch screen Tube interface which is syn-chonised with the operator console, allowing the operator to change i.e. gerator settings or auto-positions either at the system or at the operator console. The DR 3500 uses the same flat-panel digital image capture technol-ogy and image processing software provided with all KODAK DIRECTVIEW DR Systems.	The Carestream DRX-1 System is designed to upgrade an existing x-ray room in less than 2 days to DR. Since the detector's form factor is equal to a standard cassette and the fact its wireless, there is no need for any modification on existing buckies! Since its wireless, the de-tector can be used similar to a x-ray cassette for in bucky, table top, cross table or bedside exams. No wires, no hassles. The systems con-sists from 1 to 3 detectors per room, a in room wifi transmitter, operator console with touch screen user interface, graphical user in-terface, UPS and a battery charger who can load up to 3 batteries at the same time, in other words you could use the system around the clock. The system is independent from the x-ray equipment, so you can exchange or up-grade the existing equipment at any time, the DRX-1 will remain.
Oct 08	Oct 08	Oct 08	Oct 08
Due to continous product improv-ments all data are subject to change without further notice	Due to continous product improvments all data are subject to change without further notice	Due to continous product improvments all data are subject to change without further notice	Due to continous product improvments all data are subject to change without further notice

MODEL	Canon DR System CXDI-60G	Canon DR System CXDI-40EC	Canon DR System CXDI-40EG	Canon DR System CXDI-50G	Canon DR System CXDI-50C
WHERE MARKETED	Worldwide	Worldwide	Worldwide	Worldwide	Worldwide
FDA CLEARANCE	Yes	Yes	Yes	Yes	Yes
CE MARK (MDD)	Yes	Yes	Yes	Yes	Yes
SYSTEM					
Film	No	No	No	No	No
Digital	Yes	Yes	Yes	Yes	Yes
Type	GOS and Gadolidium	CsI and a-Si	GOS and a-Si	GOS and a-Si	CsI and a-Si
Tomography	Not specified	Possible and limited to 3 seconds acquisition time	Possible and limited to 3 seconds acquisition time	Possible and limited to 3 seconds acquisition time	Possible and limited to 3 seconds acquisition time
BUCKY SYSTEM					
Type	Filmless	Filmless	Filmless	Filmless	Filmless
Size, cm (in)	NA	NA	NA	NA	NA
AEC	NA	Optional	Optional	NA	NA
Grid ratios	4:1, 8:1, 10:1	8:1, 10:1, 12:1	8:1, 10:1, 12:1	4:1, 6:1, 8:1, 10:1	4:1, 6:1, 8:1, 10:1
Lines/mm (in)	40/cm	40/cm	40/cm	40/cm	40/cm
Cassette sizes, cm (in)	Filmless	Filmless	Filmless	Filmless	Filmless
Longitudinal travel, cm (in)	NA	NA	NA	NA	NA
DIGITAL SYSTEM					
Spatial resolution	3.1lp/mm	3.1 lp/mm	3.1 lp/mm	3.1 lp/mm	3.1 lp/mm
Matrix, pixels		2688 x 2688	2688 x 2688	2208 x 2688	2208 x 2688
Gray levels	4,096	4,096	4,096	4,096	4,096
DICOM 3.0 compliant	Yes	Yes	Yes	Yes	Yes
RADIOGRAPHIC CAPABILITIES					
Bucky	Filmless	Yes	Yes	Filmless	Filmless
Cross table	Yes	Optional	Optional	Yes	Yes
Horizontal	Not specified	Not specified	Not specified	Not specified	Not specified
Off table	Yes	Not specified	Not specified	Yes	Yes
Upgradable for digital	NA	NA	NA	NA	NA
X-RAY GENERATORS					
Preferred units	Any	Any	Any	Any	Any
X-RAY TUBES					
Preferred units	Any	Any	Any	Any	Any
TUBE SUSPENSION					
Model, suspension	Any	Any	Any	Any	Any
Model, collimator	Any	Any	Any	Any	Any
POWER REQUIREMENTS	100, 120, 230, 240 VAC; 50/60 Hz	100, 120, 230, 240 VAC; 50/60 Hz	100, 120, 230, 240 VAC; 50/60 Hz	100, 120, 230, 240 VAC; 50/60 Hz	100, 120, 230, 240 VAC; 50/60 Hz
PURCHASE INFORMATION					
List price, std configuration		180,000 dollars	160,000 dollars	112,000 dollars	130,000 dollars
Digital upgrade list price	NA	NA	NA	NA	NA
Warranty	1 year	1 year	1 year	1 year	1 year
Year first sold	2008	2003	2002	2003	2006
Number installed USA/worldwide	…. includes units sold to the veterinarian market	70	2400 (includes previous models CXDI-11, CXDI-12, CXDI-22 and CXDI-40G)	1000, includes units sold to the veterinarian market	50
Fiscal year	January to December	January to December	January to December	January to December	January to December
OTHER SPECIFICATIONS	None specified.	None specified.	None specified.	None specified.	None specified.
Last Updated	Oct-08	Oct-08	Oct-08	Oct-08	Oct-08
Supplier Footnotes					

Definium 8000	**Definium 6000**	**RADspeed safire**	**AXIOM Aristos Family**	**Ysio**
Worldwide	EMEA	Whole world	Worldwide	Worldwide (except China)
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
			Wall stand/ table detector/ multi-functional, ceiling mounted detector with cantilevered table	Full automated or full synchronized system version with two different detectors: - wireless (wi-D) and - integrated for use with the patient table and the wall stand .
Also possible	Also possible	Optional	Yes	Yes, CR cassettes
Yes	Yes	Yes	Yes	Yes
CsI	CsI	Shimadzu Safire FPD	For radiography	For radiography
Yes (VomlumeRAD multi-slice tomography)	No	Optional barless	Yes, selected systems	Future delivery (for fully automated system version only)
DIGITAL DETECTOR	DIGITAL DETECTOR (removable)			Wall stand with integrated detector. Alternatively wall stand and table with wireless detector (wi-D)
Filmless	Filmless	Motorized	Flat Detector	Yes
41x41 (16x16)	41x41 (16x16)	43 x 43 (17 x 17)	43 x 43 (17 x 17)	Integrated detector: 43 x 43 cm (17 x 17 inch) or Wireless detector: 35 x 43 cm (14 x 17 inch)
Yes	Yes	3-field	3-field Iontomat	3-field Iontomat
12:1	13:1	10:1 or higher	15:01	15:01
Not specified	Not specified	4	8 (206)	80 lines/cm (31.5 inch)
Filmless	Filmless	(FPD system)	NA	35 x 43 cm (for bucky wall stand with wi-D or in table Bucky)
±63 (±25)	NA	40 (15)	61 (24) to 346 cm (136) depending on system	26 to 173 cm (79 inch)
				35 x 43 cm wireless detector
2.5 lp/mm, DQE 77%	2.5 lp/mm, DQE 65%	3.3 lp/mm	3.5 lp/mm	3.5 lp/mm
2022 x 2022, 200 µm	2022 x 2022, 200 µm	150 microns	3000 x 3000, 143 µm	2372 x 3000, 144 µm
14-bit	14-bit	65534(16bit) on FPD, 16384 (14 bit) on DICOM	14-bit	14-bit
Yes	Yes	Yes	Yes	Yes
DIGITAL DETECTOR	DIGITAL DETECTOR (removable)	Yes	Yes, wall position/table	Yes
Yes (depending on configuration)	Yes	Yes (in CR/Film)	Yes and optional trolley required for wall stand system	Yes
Yes	Yes	Yes	Yes	Yes
Yes with CR or film cassette	Yes with CR or film cassette	Yes (in CR/Film)	Yes	Yes
NA	NA	Yes	NA	Digital system
Jedi (65, 80 kW)	65, 80 kW	80 kW, Type: UD150B-40	High frequency, 50 or 80 kW (polydoros LX)	High frequency R generator with 65 or 80 kW
Maxiray 100	Maxiray 100	or 50 kW, Type: UD150L-40 0,6/1,2mm Type: 0.6/1.2P364DK	Siemens Optilix; 0.6, 1 mm focal spot, 600 kHU; Siemens Optitop; 0.6, 1 mm focal spot, 783 HU	Siemens Optitop: 0.6, 1.0 mm focal spot, 783,000 HU
Overhead Tube Suspension	Overhead Tube Suspension	CH-200, ceiling suspension	Ceiling-mounted and floor mounted available	Ceiling-mounted tube with MaxTouch - multi functional display with color touchscreen on the tube housing for enhanced workflow by control of exam.parameters in the exam room. Automatic positioning of x-ray tube controlled via organ programs with more than 500 different system positioning options. (fully automated system version)
Automatic multileaf with filter selection	Automatic multileaf with filter selection	R-30H, auto size-sensing collimator	Automatic multileaf with filter selection	Automatic multileaf with copper filter selection
380-480 VAC ±10%; 50/60 Hz ±6%; 3-phase	380-480 VAC ±10%; 50/60 Hz ±6%; 3-phase	Standard	400-480 VAC ±10%; 50/60 Hz ±6%; 3-phase	380/ 400/ /440/480V ± 10% at 50 or 60Hz
			475,000 to 765,000 dollars depending on system and options	(depending on system configuration and options)
NA	NA		NA	Digital system
1 year	1 year		1 year	1 year
2005	2006		1999 and 2002	2008
				> 30 systems worldwide
Not specified	Not specified			USA/ Worldwide
January to December	January to December		October to September	October to September
Autopositioning, auto-image paste, VolumeRAD, dual energy options.	Autoprotocol assist, Dual Energy options.	Next-generation Direct-conversion FPD for higher image quality and lower dose	Scoliosis imaging; decentered collimation; 17 x 17" detector; footswitch for locking tabletop movement; table shuttle; patient support for chest exams; additional patient display.	Ortho long leg /spine (future delivery), Dual Energy (future delivery), DiamondView Plus (image processing method), handheld and wireless remote control for system movements , auto tracking function, automatic centering of the x-ray tube to the wall stand and patient table
Nov-08	Nov-08		Apr-07	October 08

	Swissray	Swissray	Swissray	Swissray	AGFA HealthCare
MODEL	**ddRCompact Series**	**ddRFormula Series**	**ddRCombi Series**	**ddRPortable Detector**	**AGFA DX-Si**
WHERE MARKETED	Worldwide	Worldwide	Worldwide	Worldwide	Europe
FDA CLEARANCE	Yes	Yes	Yes	Pending	Yes
CE MARK (MDD)	Yes	Yes	Yes	Yes	Yes
SYSTEM	C-Arm single detector multi functional, off detector imaging capable, mobile table	C-Arm single detector multi functional, off detector imaging capable, mobile table	Over head tube suspension, single detector multi functional, off detector imaging capable, mobile table or fixed elevating table with 4 way float top	Light weight portable DR detector	
Film	No	No	No	No	Yes
Digital	Yes	Yes	Yes	Yes	Yes
Type	Direct Digital Radiography	Direct Digital Radiography	Direct Digital Radiography	Direct Digital Radiography	CR
Tomography	No	No	No	No	Optional
BUCKY SYSTEM					
Type	HD Silicon Solid State	Si TFT Flat Panel	Si TFT Flat Panel	Si TFT Flat Panel	Manual
Size, cm (in)	43 x 43 (17 x 17)	43 x 43 (17 x 17)	43 x 43 (17 x 17)	35 x 43 (14 x 17)	43 x 43 (17 x 17)
AEC	3-field chamber	5-field chamber	5-field chamber	NA	3-field
Grid ratios	15:1	15:1	15:1	15:1	8:1 or higher
Lines/mm (in)	80 L/cm	80 L/cm	80 L/cm	80 L/cm	NA
Cassette sizes, cm (in)	Cassette-free	Cassette-free	Cassette-free	Cassette-free	All standard
Longitudinal travel, cm (in)	Fixed (multiaxis)	Fixed (multiaxis)	Fixed (multiaxis)	NA	35 to 190 (Center to Center)
DIGITAL SYSTEM					
Spatial resolution	Up to 3.3 lp/mm	3.5 lp/mm	3.5 lp/mm	3.5 lp/mm	NA
Matrix, pixels	4096 x 4096 pixels	3000 x 3000 pixels	3000 x 3000 pixels	2372 x 3000 pixels	NA
Gray levels	16,384 (14 bit)	16,384 (14 bit)	16,384 (14 bit)	65,536 (16 bit)	4 096
DICOM 3.0 compliant	Yes	Yes	Yes	Yes	Yes
RADIOGRAPHIC CAPABILITIES					
Bucky	Yes	Yes	Yes	Yes	Yes
Cross table	Yes	Yes	Yes	Yes	Yes
Horizontal	Yes	Yes	Yes	Yes	Yes
Off table	Yes	Yes	Yes	Yes	Yes
Upgradable for digital	NA (digital system)	NA (digital system)	NA (digital system)	NA (digital system)	Yes
X-RAY GENERATORS					
Preferred units	80 kW at 100 kHz	80 kW at 100 kHz	80 kW at 100 kHz	Any	65 / 80 kW
X-RAY TUBES					
Preferred units	Optitop 150/40/80 HC-100L	Optitop 150/40/80 HC-100L	Optitop 150/40/80 HC-100L	Any	SV 150 / 40 / 80 C -100
TUBE SUSPENSION					
Model, suspension	Integrated in C-Arm	Integrated in C-Arm	3D Ceiling Suspension	NA	3D TOP Overhead Support
Model, collimator	Automatic	Automatic	Automatic	NA	Automatic (AL01) or Manual (ML01)
POWER REQUIREMENTS	208 / 230 VAC 50 Hz - 60 Hz	208 / 230 VAC 50 Hz - 60 Hz	208 / 230 VAC 50 Hz - 60 Hz		Standard
PURCHASE INFORMATION					
List price, std configuration	250,000 dollars	475,000 dollars	525,000 dollars	190,000 dollars	225,000 Euro
Digital upgrade list price					NA
Warranty	1 year	1 year	1 year	1 year	1 year
Year first sold	2007	2006	2005	New product	2006
Number installed					20 plus
USA/worldwide					Europe
Fiscal year					
OTHER SPECIFICATIONS	1. Complete APS - Automated Positioning System, Fully automated, remote controlled – 1296 pre-programmed, customised positions 2. The AutoStitching function automatically combines up to four images. It comes with a field mapping function to preset the whole examination. The single focus technology eliminates distortion thus providing accurate imaging data.	1. Complete APS - Automated Positioning System, Fully automated, remote controlled – 1296 pre-programmed, customised positions 2. The Si Flat Planel FP-5000 detector is protected by a patent pending 3P – Panel Protection Program including infrared sensors and shock absorbers to achieve industry leading reliability.	1. Complete APS - Automated Positioning System, Fully automated, remote controlled – 1296 pre-programmed, customised positions 2. The Si Flat Planel FP-5000 detector is protected by a patent pending 3P – Panel Protection Program including infrared sensors and shock absorbers to achieve industry leading reliability.	Available with cable and Wi-Fi data transfer	
Last Updated	October 2008	October 2008	October 2008	October 2008	
Supplier Footnotes					<1>These recommendations are the opinions of ECRI's technology experts. ECRI assumes no liability for decisions made based on this data.

USING GADOLINIUM-BASED **CONTRAST AGENTS**

Six Key Steps for Success in Patient Management

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In comparison to iodinated contrast media, and with the smaller volumes needed for diagnostic imaging, Gd-based contrast agents (GBCA) have a more favourable renal profile and reduced nephrotoxicity. However, a relatively new condition has raised questions about the unrestricted administration of GBCA in patients with severe or end stage renal disease. New guidelines are needed to safely administer Gd-based contrast agents, in order to take advantage of the full benefits of using them, while avoiding further cases of nephrogenic systemic fibrosis (NSF). It is important to note that the number of new cases of this condition appears to have decreased significantly over the last year.

Whilst it is unclear whether the Gd detected in biopsies in patients with NSF was in its "free" ionic form or bound to its chelator molecule, these findings have contributed to the hypothesis that NSF might be a late adverse reaction to Gd contrast agents. The majority of cases of NSF have occurred after relatively high doses of Gd agents (i.e., > 0.3 mmol/kg bodyweight) for indications such as magnetic resonance angiography (MRA) or in patients who had repetitively undergone several contrast-enhanced MR examinations in a short period of time.

Exact Mechanism Not Fully Understood

The exact mechanism of NSF development is not clearly understood and the role of Gd has yet to be elucidated. However, it is undisputable that there is a clear association between Gd and NSF, whether in the administered chelate form, or, as is postulated by some authors, having been released from the chelate. There is no definite consensus in the MR community regarding the most important parameter that should be used to compare relative risk between agents, and it would be wrong to consider some Gd chelates as safer than others until more is know about the etiology of NSF. To this point, it is not yet understood why some patients developed symptoms of NSF within a few days after exposure to a Gd-based contrast agent, whereas in others the symptoms were reported months or even years after Gd administration. Another unclear finding relates to the incidence of NSF in patients with end stage renal disease. In this patient group, some institutions have estimated that approximately 3 - 5% seem to be at a risk of developing NSF after administration of high-dose Gd. However, the circumstances preventing the development of the condition in the remaining 95 - 97% of patients have not yet been determined.

In addition, other important factors have been described as potentially involved in the pathogenesis of NSF, e.g. acidosis, application of erythropoietin, and the existence of a proinflammatory state (such as caused by major surgery). However, it is uncertain which factor, or combination of factors, is most important.

Six Steps for Safe Routine Administration

Despite the fact that the exact mechanisms of the pathogenesis of NSF remain unclear, radiologists still need MR protocols that minimise the risk of the condition, such as minimising the volume of contrast for the specific clinical indication in daily clinical practice for patients with acute or severe renal failure. The following six recommendations are suggested as proposals for routine imaging of patients with impaired renal function in view of NSF:

1. Consider the risks and benefits of any Gd-injection
In renally compromised patients, up-to-date serum creatinine levels must be available and point of care testing should be considered if lab values are older than a week. Based on these values, together with size, age, gender, and weight of a patient, eGFR parameters should be calculated in order to identify patients with values below 30 ml/min/1.73m2.

2. Reduce contrast dose
Generally, dosing of 0.1 mmol/kg bodyweight should not be exceeded, and repeated dosing within a week must not be performed. When data acquisition is carried out at 3.0T, even lower doses might be applicable due to inherent higher signal at higher magnetic field strength.

3. Consider non-contrast-enhanced MRI/MRA
Some indications in clinical imaging do not necessarily require contrast media injection, especially in musculoskeletal and neuro-imaging. For angiographic studies, new and promising techniques have become available that no longer

> "Radiologists must involve themselves in the process of patient screening"

require contrast injection: steady state free precession (SSFP) MRA is void of contrast material and provides an excellent display of vascular morphology. Arterial spin labeling (ASL) or carbon-13 injections also hold promise for arterial imaging without administration of Gd-based contrast agents.

4. Optimise the MR examination technically
Improved spatial and temporal resolution can nowadays be acquired with parallel acquisition imaging techniques. Additional modifications of standard procedures (e.g. venous compression or hybrid-MRA for peripheral vascular imaging) will further improve the image quality. The application of these new methods might permit a reduced dose, or even omission, of GBCA.

5. Consider alternative imaging techniques
For in-patients at risk of developing NSF, alternative cross-sectional imaging techniques might be applicable to provide an appropriate diagnosis. Ultrasound with colour-coded haemodynamic information might be a good tool for assessing vascular disease in some patients. And those patients who are on long-term haemodialysis might be subjected to contrast-enhanced CT imaging.

6. Involve the referring colleague and nephrologist
With a proactive communication regarding NSF towards the referring physician and involvement of a nephrologist the shadow of the disease might be lightened in the long run. Such an inter-professional alliance will increase awareness of the need for a dedicated risk assessment and alert stance with regards to NSF.

Conclusion

Although this condition is now a factor in our decision-making process, the beauty of contrast-enhanced MRI or MRA exams has not become the beast. Radiologists must involve themselves in the process of patient screening in order to identify those at risk of NSF. As clinicians, it is essential that we consider the needs of patients who are not at risk of this condition. As NSF has, to date, only been associated with severe or acute renal impairment, we should continue to have confidence in using the most appropriate GBCA in contrast enhanced MR techniques in that majority of patients not at risk, so they continue to receive the benefits of these techniques.

CAD AND BREAST CANCER SCREENING

An Alternative to Double Reading?

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Breast screening is recognised as an effective method of reducing breast cancer mortality and morbidity and routine screening programmes have now been introduced in many countries worldwide. Reading large numbers of films in which there is a low incidence of cancer cases (< seven per 1000 screened) is a highly demanding, repetitive and error prone task.

We know that double reading improves cancer detection by up to 10% and is standard practice in at least 12 European countries but single reading is still standard in the US. Double reading increases the workload of film readers and in the UK, where over 1.3m women per annum are screened, the screening programme is struggling to meet government targets to extend the age range for screening.

To meet these demands, alternative working practices such as training radiographers to work as film readers have been introduced and the potential of computer aided detection (CAD) is being evaluated. If the performance of a single reader using CAD could match that of double reading this could provide an alternative to double reading or improve performance in screening programmes currently undertaking single reading.

CAD and Mammography

CAD systems use a sophisticated pattern recognition software system to alert the reader to potentially suspicious features on a mammogram that may have been overlooked or dismissed as normal. High-resolution digital images acquired directly from a digital mammography system or by digitising analogue films, are analysed by computer algorithms developed to specifically detect mammographic abnormalities such as soft tissue masses or microcalcification clusters (Figure 1a.).

In practice, the reader makes an initial (unprompted) review of the mammogram and then consults the CAD marked ('prompted') image. Any 'regions of interest' marked by CAD are reassessed by the reader and a final decision is made on whether a case merits recall for further investigation.

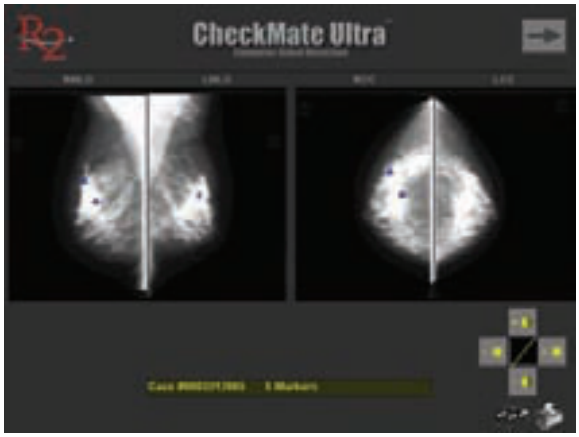

Figure 1a Image analysis of a mammogram by the Hologic R2 ImageCheckerTM CAD system showing CAD marks for masses (asterisks) and microcalcifications (triangles)

Reader Performance Using CAD

CAD systems operate with high sensitivity (up to 88% for soft tissue masses and 97% for microcalcifications) but have relatively low specificity generating CAD marks that falsely identify normal areas on a mammogram as being suspicious. Some of these marks may be readily dismissed. However, in a high volume screening environment, where <1.0% of cases are cancer cases, a high ratio of false positive to true positive CAD marks will reduce confidence in CAD marking and could be detrimental to reader performance by distracting the reader's attention away from a genuine abnormality.

Using CAD in the decision-making process involves complex interactions with human cognitive processes, psychology and behaviour. Readers need a training period to understand how CAD systems perform and gain confidence in integrating the information provided by CAD with their own knowledge and experience. It is important that readers avoid becoming reliant on CAD and less diligent in visual searching or conversely, be falsely reassured by the absence of any CAD marks.

CAD Studies

CAD systems in screening mammography have several potential benefits: enhancing reader performance, increasing the proportion of early stage cancers detected and a solution to the increasing workload of film readers. In a screening programme environment, the impact of CAD has been shown to be a complex interaction dependent on the performance of the CAD system, the experience of the film reader and population differences in the prevalent and incident rates of breast cancer.

No definitive conclusions on the clinical use of CAD can be drawn from published studies due to intrinsic methodological differences. Early studies focussed on the proportion of early missed cancers marked by CAD. Most were retrospective, and case mixes usually contained a much higher proportion of cancer cases than would be encountered in screening, thus overestimating CAD prompted performance. Furthermore, studies included readers with variable mammography experience and training with CAD.

A meta-analysis of more recent prospective studies that compared reader performance before and after looking at CAD marked images, or over a time period before and after the introduction of CAD, concluded there was no statistically significant improvement in cancer detection rates by single reading with CAD compared to double reading with arbitration. More importantly, the significantly higher recall rate of single reading with CAD would result in more assessment clinics and additional anxiety and stress for women from potentially unnecessary recalls and biopsies. The key issue is whether the latter constitutes an acceptable trade-off for any saving in reader time.

CADET I and II

It has become clear that the most informative evidence to assess single reading with CAD against double reading would be obtained from large scale, prospective, randomised trials of CAD in the screening programme. In the UK, the CADET I trial (Computer Aided Detection Evaluation Trial) was a retrospective matched comparison study conducted in two UK breast screening centres.

The aim of the study was to evaluate whether CAD could improve the performance of a single radiologist to the level of double reading by direct comparison of the performance of single readers using CAD against the previous double reading. The study used a random sample of over 10,000 mammograms containing 2.3% cancer cases that had been previously double read in 1996. Although single reading

with CAD resulted in a small increase in cancer detection, there was also an increase in recall rate. Taking into account various limitations of the study design it was concluded that single reading with CAD was no worse than the current standard practice of double reading.
The CADET II study extended the evaluation of CAD into a prospective randomised comparison of the cancer detection rate and recall rate of single reading using CAD with standard double reading of mammograms. The trial recruited over 30,000 participants from women attending breast screening for routine two-view mammography at three NHSBSP centres.

A total of 28,204 mammograms were read by both double reading and by another single reader using CAD. To minimise reader bias an additional 1,152 mammograms were read by double reading only and 1,182 mammograms read by a single reader using CAD only.

Analyses Reveal Need for Further Study

The results of this study are currently being analysed. If CADET II demonstrates that single reading with CAD provides a viable alternative to double reading then a cost effectiveness study will be required to evaluate any savings in reader time against the cost of CAD systems and any additional costs that may result from its usage.

In this respect, the utility of CAD systems should become more cost-effective when screening programmes implement full field digital mammography since the CAD software can be readily integrated into the digital workstation. Separate digitisation of the mammographic film images is not required and readers can view the CAD marks directly, in the same physical location on the soft copy display rather than comparing a separate image.

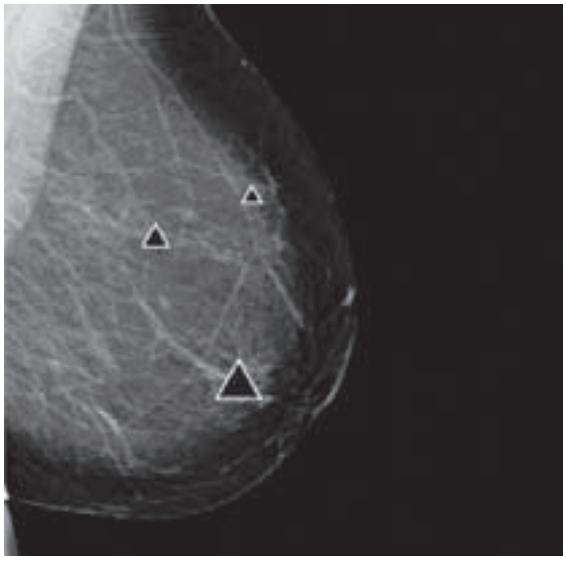

Figure 1b The EmphaSizeTM CAD mark of the Hologic R2 ImageChecker CAD system increases in size as the algorithm determines that a region contains more features indicative of malignancy.

Both images provided courtesy of Hologic R2

MRI **OF THE BREAST**

A Valuable Tool for Accurate Patient Management Decisions

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Currently, conventional mammography and ultrasound are standard imaging techniques for detection and evaluation of breast disease and are the primary imaging modalities used in screening women at high risk for breast cancer. However, these techniques are associated with limited sensitivity and specificity for the detection and diagnosis of breast lesions, particularly in women with dense breast parenchyma. Clearly, there is increased likelihood of inappropriate patient management if therapeutic decisions are made solely on the basis of mammography and ultrasound findings.

Numerous studies have confirmed the superior diagnostic performance of breast MRI compared to conventional mammography and ultrasound and the potential of the method for more effective cancer screening in women with high familial risk of breast cancer. The most recent guidelines of the American Cancer Society (ACS) now recommend contrast-enhanced breast MRI for breast screening in women with an approximate 20 - 25% or greater lifetime risk of breast cancer.

Comparatively few studies have compared different MR contrast agents for potential differences in diagnostic yield in patients with suspected breast cancer. In part this is because the R1 relaxivity values of most commercially-available MR contrast agents are similar (approximately 4.3 – 5.0 L•mmol–1•sec–1 at 1.5 Tesla) and thus similar lesion signal intensity enhancement and dynamic contrast behaviour is seen when these agents are administered at equivalent dose. Here, we look at the most recent studies in this field.

Gadobenate dimeglumine (MultiHance®; Bracco Imaging SpA, Milan, Italy) is a contrast agent with increased R1 relaxivity relative to conventional gadolinium agents due to weak, transient

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Nationally Recognised Breast Centre Increases Offering for Patients

Following the release of the results of the Digital Mammographic Imaging Screening Trial (DMIST) 2005, the number of breast centres using digital mammography increased rapidly. Over forty percent of the U.S. mammography sites now have digital equipment, compared to 10 percent just two years ago. Overall, DMIST found the accuracy of digital mammography to be roughly equivalent to that of analogue for the general population. However, for a significant share of the patient population, such as women with dense breasts or those under the age of 50, the study found digital to be more accurate than its screen-film counterpart.

Combined with benefits like increased reimbursement and greater efficiency, the cost and effort of offering digital mammography became a worthy investment to many breast centres, including our own. It was decided that a gradual transition would help us get introduced to the concept and give us a chance to work out the kinks before going towards a complete digital conversion.

In March 2006, we installed the first digital system at an outlying breast centre. We decided to integrate digital at the main breast centre in December 2006; the complete conversion was finished the following March. The hospital now operates eight digital mammography systems at the five locations.

Improved Detection with Digital

In 2007, we performed a mid-year audit of recall and detection rates to evaluate the performance of the new equipment. The audit showed the detection rate increased to seven cancers for every 1,000 patients screened, from approximately five-and-a-half. Recalculating the results in early 2008 showed that from January 1 to December 31, 2007, the breast centre's overall cancer detection rate increased by 60 percent, to 8.5 cancers per 1,000 patients.

While the images take longer to read, it's only because digital provides a lot more useful information than analogue. The images are bigger, the contrast resolution is better and there are a lot of details you simply couldn't see with analogue. We've accepted the increase in information afforded by digital mammography rather than trying to get our recall data to fit back into the 'norm' that has been accepted for years with film-screen technology.

In addition to increased detection, we experienced optimised workflow and larger patient volumes. At the centre's main location, the length of screening exams has been reduced from 20 to 10 minutes. In turn, this expanded capacity enabled the facility to accommodate more patients, resulting in an average monthly volume increase of 27 percent over the prior year.

In addition, computer-aided detection (CAD) becomes a more useful tool with digital mammography. CAD markings on a digital platform are more specific, especially compared to the relative uncertainty of film-screen images that have been digitised specifically for use with CAD. With analogue, there was always the question if you're missing something or what exactly CAD is trying to show. With digital, it's very clear what CAD is high-

lighting, which enables you to deal with that information much faster.

A Centre of Excellence

In May 2008, the American College of Radiology (ACR) designated the facility as a Breast Imaging Centre of Excellence. In order to receive this recognition, a breast centre must earn accreditation in all of the ACR's voluntary breast-imaging accreditation programmes, in addition to the mandatory Mammography Accreditation Programme. The Ross Breast Centre is fully accredited in mammography, stereotactic breast biopsy, breast ultrasound and ultrasound-guided breast biopsy.

Entering the Digital Age with Hologic

For the Ross Breast Centre, the decision to go digital with the Hologic Selenia system was a straightforward choice. In previous years, we had examined digital equipment from other vendors, but felt there were many deficiencies that would further complicate a digital transition. In addition, the larger sizes of other equipment would have required us to remodel the mammography suite to accommodate the new machines.

The Selenia system, on the other hand, fit in the existing space, and our staff found the workstation layout to be intuitive and user-friendly. Many of the facility's analogue units were Hologic Lorad machines, and previous experiences with Hologic were positive.

In fact, the Ross Breast Centre's use of Selenia digital mammography is just part of a long line of partnering with Hologic for our women's health needs. We utilise the Hologic Discovery bone densitometry system at the Lindale site and the Hologic R2 Image Checker system for CAD on our SecurView workstations and also the Suros ATEC breast biopsy system from Hologic for MRI-guided biopsies. In addition, we are a certified Softer Mammogram Provider. We provide the Hologic MammoPad breast cushion, a radiolucent foam cushion that covers the surfaces of the mammography equipment. We are the only local facility where women can get a "softer" mammogram.

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interaction of the contrast-effective chelate of this agent (Gd-BOPTA) with serum albumin. Compared with gadopentetate dimeglumine (Magnevist®; Bayer Schering, Berlin, Germany), the R1 relaxivity of gadobenate dimeglumine in blood is roughly two-fold higher at all commercially-available magnetic field strengths, ranging from 10.9 vs. 4.7 L•mmol–1•sec–1 at 0.2 Tesla to 6.3 vs. 3.3 L•mmol–1•sec–1 at 3 Tesla. Numerous studies show that the increased R1 relaxivity of gadobenate dimeglumine translates into greater signal intensity enhancement and thus improved image quality and diagnostic performance compared to comparator contrast agent at equivalent or higher dose.

The possibility to achieve greater contrast enhancement with a standard dose of 0.1 mmol/kg bodyweight relative to that achievable with an equivalent dose of a conventional gadolinium agent may have particular value for imaging applications in the breast in which lesions are often small, poorly-enhancing or otherwise inconspicuous against the surrounding normal breast parenchyma.

Previously, we compared 0.1 mmol/kg bodyweight gadobenate dimeglumine with an equivalent dose of gadopentetate dimeglumine in 25 consecutive women using an intra-individual crossover study, in which all patients received both agents, and demonstrated significant superiority for gadobenate dimeglumine for both the detection and characterisation of breast lesions (Pediconi F. et al, Radiology. 2005 Oct;237(1):45-56. Epub 2005 Aug 26).

Which Contrast Agent Performs Better?

We have since confirmed the findings of this earlier study in a larger population of 47 women, which confirmed that a dose of 0.1 mmol/kg bodyweight gadobenate dimeglumine improves the detection of breast lesions and the performance of the MRI exam regarding the differentiation of benign from malignant breast lesions. In terms of overall diagnostic performance, significant superiority was noted for gadobenate dimeglumine compared to gadopentetate dimeglumine for sensitivity (98.0% vs. 76.0%; p=0.0064), accuracy (88.5% vs. 69.2%; p=0.0004), PPV (86.0% vs. 76.0%; p=0.0321) and NPV (95.2% vs. 57.1%; p=0.0003). Specificity was also higher for gadobenate dimeglumine (71.4% vs. 57.1%) although the difference was not significant (p=0.1277).

Improved detection and characterisation of breast lesions with gadobenate dimeglumine resulting in a better evaluation of overall tumour extent might also benefit treatment planning for patients with breast cancer. Inappropriate surgical intervention remains a risk of inaccurate pre-operative evaluation of patients with breast cancer.

Further Specific Applications for Breast MRI

A further specific application of breast MRI is for the evaluation of the contralateral breast in women with malignancy in one breast diagnosed by means of conventional screening mammography or ultrasound.

Several studies have been performed to evaluate the preoperative use of breast MRI as a supplemental examination to clinical examination, mammography and/or ultrasound to assess the extent of disease within the breast. We have shown that MRI of the breast permits the detection of additional malignant foci not seen on mammography and/or ultrasound and that detection of these additional foci results in a change in patient management in 11 – 20% of patients (Pediconi F. et al, Breast Cancer Res Treat. 2007 Nov;106(1):65-74. Epub 2007 Jan 3).

Findings Lead to Change of Diagnosis

Concerning the detection and identification of malignant lesions, breast MRI was markedly superior to mammography/ultrasound (sensitivity for detection: 100% vs. 77.3%, accuracy for malignant lesion identification: 93.4% vs. 72.1%). In large part this can be ascribed to the breast density of the patients concerned: conventional mammography and ultrasound are known to be limited in patients with dense breast parenchyma. In terms of the impact on patient management, our breast MRI findings resulted in a change of diagnosis for 38/164 (23.2%) patients overall and an altered approach to patient management for 32/164 (19.5%) patients.

The altered approach to management involved more extensive surgery in 28/164 (17.1%) patients because of additional lesions or a larger lesion size, and cancellation of a proposed lumpectomy in 4/164 (2.4%) patients (Pediconi F. et al, Breast Cancer Res Treat. 2007 Nov;106(1):65-74. Epub 2007 Jan 3.).

In another study (Pediconi F. et al, Radiology. 2007 Jun; 243(3): 670-80. Epub 2007 Apr 19) we showed that that 28 (24%) out of 118 patients with malignant breast lesions on conventional x-ray mammography/ultrasound also had solitary contralateral breast lesions that were detected only on breast MRI. Of these 28 lesions, 22 (18.6% overall) were subsequently confirmed to be malignant after histological evaluation. Previous studies have reported contralateral lesion detection rates for breast MRI ranging from 8.2% (15/182 patients) to 32% (72/223 patients).

Breast MRI Superior to Mammography and Ultrasound

The sensitivity, specificity, and accuracy of breast MRI for contralateral breasts harbouring malignant or high risk lesions among 118 patients with negative contralateral breasts at mammography/ultrasound were 100%, 93.8% and 94.9%, respectively. Similarly, the PPV that detected lesions were malignant was 78.6% while the corresponding NPV that the absence of detected lesions was truly indicative of a negative contralateral breast was 100%. This study confirmed that breast MRI is superior to mammography and ultrasound for the depiction of contralateral breast cancer or high risk lesions in patients with a newly diagnosed unilateral breast cancer or high risk lesions depicted with conventional techniques (Pediconi F. et al, Radiology. 2007 Jun;243(3):670-80. Epub 2007 Apr 19).

Conclusion

Although our results clearly support the view that breast MRI is a valuable imaging modality for accurate patient management decisions, a possible limitation of these studies is that only patients considered suspicious or highly suspicious (BI-RADS IV and V) for breast cancer have been evaluated. Further prospective work in a more diverse group of patients are necessary to ascertain the full additional value of breast MRI.

OVERVIEW OF **HEALTHCARE IN THE US**

Disparity in Access to Medical Coverage Continues to Provoke

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The United States is the only wealthy industrialised nation without a universal healthcare system, according to the Institute of Medicine of the National Academy of Sciences. It has a mixed system of public and private insurance. Most working-age Americans have private health insurance through their employers. Private health insurance covers about 57% of the population, while only 27% is insured through government-funded means. Over 15.5% of Americans do not have health insurance and about half of bankruptcies in the US involve a medical reason or large medical debt. Private and government programmes for healthcare exist and are explained below.

Private Programmes

1. Health Maintenance Organisations (HMOs): An HMO is a prepaid "managed" health plan delivering comprehensive care to members through designated providers, having a fixed periodic payment for health services.
2. Preferred Provider Organisations (PPO): A PPO has arrangements with doctors, hospitals and other providers who have agreed to accept the plan's allowable charges for covered medical services that are similar to a fee-for-service plan. This gives patients a choice of using doctors and hospitals in a network with a co-payment and outside network with an annual deductible and a percent of the bill.
**Approximately 50% of the US population is enrolled in one of these two programmes, with about 29.3% enrolled in an HMO and 19.8% in a PPO (MCOL, 2008).

Government Programmes

1. Medicare: A federal programme provides health insurance to all Americans over 65 years of age, persons with disabilities and end-stage renal disease.

2. Medicaid: This insurance programme provides for certain low-income families with children; aged, blind, or disabled people on supplemental security income, certain low-income pregnant women and children, and people with very high medical bills. Medicaid is funded and administered through a state-federal partnership. Although there are broad federal requirements for Medicaid, states have a wide degree of flexibility to design their programme. However all states must cover basic services: inpatient and outpatient hospital services, skilled nursing and home health services, family planning, and periodic health check ups. Medicaid reaches about 40% of Americans at the 100% poverty level of Health and Human Services 2005.

3. State Children's Health Insurance Programme (SCHIP): This provides health benefits coverage to children living in families whose income exceeds the eligibility limits for Medicaid with incomes at or below 200% of the federal poverty level (annual income of 32,180 dollars for a family size of 3).

4. There is also a military plan for active and retired servicemen and women.

Healthcare Statistics and Costs

In 2008 the life expectancy in the US is 78 years of age, according to the CIA Factbook. Deaths from heart disease, cancer and stroke continue to drop. Heart diseases are the number one cause of death followed by malignant neoplasm and cerebrovascular diseases. Infant mortality has dropped to 6.9 deaths per 1,000 live births.

Healthcare spending reached 16% of GDP in 2007, making the total estimated national health expenditure 2.3 trillion dollars. National healthcare expenditures are projected to reach 3.6 trillion dollars (18.7% of GDP) in 2014, growing at an average annual rate of 7.1% per year from 2003 to 2014 (Centres for Medicare and Medicaid Services 2004 & 2005). Intensive care units spend 10 - 30% of a hospital budget which accounts for to 0.5 - 1% of the GDP.

Rising Costs Hit Employers

While rising costs may not create major problems for the economy as a whole, they negatively affect employers, employees, government and patients. The aging population is not an adequate explanation for the increased cost since it is too gradual a process to rank as a major cost driver in healthcare. The lack of well-developed competitive markets in healthcare may be partially responsible for the higher expenditure. The US has the highest cost per unit of care, physician

fees, payment per hospital day and pharmaceutical prices. Even though physician visits and hospital days per capita have been lower in the US than many other developed nations, use of expensive technologies, market power of hospitals and physicians, who are able to garner high prices for services, more rapid diffusion of innovative technologies, and a higher cost for administering the healthcare system has driven the overall healthcare costs to be high.

One proposed driver of healthcare spending growth is the medical malpractice system, which encourages physicians to practice "defensive medicine" by ordering unnecessary diagnostic tests or treatments to avoid malpractice litigation (Anderson 1999). Defensive medicine may account for 5 - 9% of health expenditure (Hessler and McClellan 1996).

Approximately 63% of growth in healthcare spending is the result of an increased prevalence of obesity, stress, ozone, changing treatment threshold for hypertension, diabetes, hyperlipidaemia and osteoporosis and new innovations like statins, antidepressants, and other medications (Thorpe et al. 2005). Treatment of low-birth weight babies and heart attacks has also accounted for 37% of growth in healthcare spending (ibid).

RADIOLOGY PRACTICE IN THE UNITED STATES

Overview from the American College of Radiology

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The US has approximately 30,000 post-training, professionally active radiologists, or about 100 radiologists per million Americans. Approximately 15 - 20% of radiologists are in academic practices. Almost all the rest are in private practice. However, 16 - 18% of all radiologists are in non-academic, multi-specialty private practices. Only 2 - 3% are in government practices. Around 20% of US radiologists are women.

Education and Training

Mandatory training for radiology consists of one clinical year after medical school and four years of radiology residency. Then, about 90% of residents voluntarily go on to a fellowship year of subspecialty training. Certification is by the American Board of Radiology (ABR). Certification is voluntary, but required by most employers. At least 97% of residency graduates now become board-certified. A few years ago, the ABR moved from lifetime certificates to 10-year certificates. Eventually, the final certifying exam will change to one that concentrates on three subspecialty fields chosen by the trainee. A preliminary exam will continue to cover the whole of radiology.

Obtaining a radiology residency position is highly valued. Radiology is relatively attractive because it has exciting technology, fairly regular work hours, and favourable incomes. There are approximately 1,000 radiology residency positions each year and, thus, approximately 1,000 trainees graduate into the workforce each year.

Three-quarters of radiologists report they currently subspecialise to some extent. On average, radiologists who subspecialise spend 40 - 60% of their work time in their subspecialty, 10 - 20% of work time doing general radiology, and the rest in other fields. The largest subspecialties among post-training radiologists are body/cross-sectional/abdominal imaging, interventional/vascular radiology, breast imaging/women's imaging, and neuroradiology.

Work Patterns

Full-time radiologists work approximately 50 hours a week. Around 15 - 20% of radiologists work part-time, working about half as much. Full-time radiologists report an average of almost 40 vacation days a year. In addition, they have about 10 days a year for continuing education and professional society meetings. In addition, approximately 10 holidays annually is standard in the US.

Workload per average radiologist is growing rapidly, by 25% from 1991 - 92 to 2002 - 03, reaching 13,900 studies annually. Measured in relative value units (RVUs), which take account of the amount of work involved in each study, the increase over the same period was more than 50%. CT and MRI grew the most.

Concerns about How to Manage Growing Workload

New technologies, such as 2- and 3-D viewing and PACS, are probably the main methods by which radiologists are doing so

much more work without much longer hours. The use of external off-hours teleradiology companies has drawn much attention recently. They are now used by about half of US radiology practices to obtain preliminary interpretations of night and weekend imaging. Many radiologists are concerned this development will lead to radiology becoming a commodity and radiologists losing their status as professionals. Most recently, the percentage of practices using these companies apparently has ceased growing, and many practices are starting an internal equivalent arrangement. They do this either by hiring radiologists to routinely work nights and weekends, or by having each member of the practice work nights for a week or a month, rather than one night at a time.

Quality Improvement

Quality is a major issue, especially because, outside of hospitals, non-radiologists are free to purchase or lease imaging equipment and to perform imaging and interpretation with no oversight. In 1987, the American College of Radiology (ACR) developed a voluntary accreditation programme in mammography because of revelations of poor quality. Now, similar mammography accreditation is mandated by national law, and ACR is the main accrediting body.

More recently, the ACR developed voluntary accreditation programmes in essentially all other imaging modalities. Recent national legislation requires non-hospital facilities that perform CT, MRI, PET, or nuclear medicine to become accredited in those modalities by 2012. The ACR was a major force in getting this quality-increasing legislation passed, and is expected to become a major accrediting organisation.

Cost and Appropriateness Issues

The US spends far more per capita on healthcare than any other country, and imaging costs are growing particularly rapidly. Thus, there is constant pressure to cut the costs of imaging. The ACR is the radiology organisation principally involved in resisting these such cuts. Predominantly, payment for physicians in the US is a fee per individual service performed. Usually, income of a private radiology practice, after deducting expenses, is split evenly among partners. A radiologist usually becomes a partner in a private practice after about two years.

Appropriateness is another major issue, partly because extensive evidence shows that non-radiologists with a financial self-interest in imaging order far more imaging for equivalent patients than physicians who do not self-refer. The ACR has developed an extensive set of appropriateness criteria. It is seeking to get clinicians to use these criteria, and it seeks regulatory and legislative changes that would curb self-referral.

References used in this article are available on request by contacting the Managing Editor at editorial@imagingmanagement.org.

†

A friend has left us. **Marc Kandelman** is no longer by our sides. Despite the strength of character for which he was known, Marc was vanquished by ill health.

His departure will leave a deep void in our small universe. His perception of our speciality, his contribution to important projects, his dynamism and his friendliness will be profoundly missed. His *'joie de vivre'* and his smile have helped us all. He was for those who knew him a source of comfort and of pleasure.
Marc, we miss you already – your absence in the halls of the recent JFR congress reinforced our sense of loss. Again, thank you for everything, Marc.

The office of the FNMR sympathises greatly with the suffering of his wife, Nathalie, and that of their children and all his family members.

Doctor Jacques NINEY
President FNMR

*On behalf of the Editor-in-Chief and all the team at IMAGING Management, we wish to express our sympathy and condolences for the loss of Dr. Kandelman.

MobileDaRt Evolution

Premium Quality and Connectivity in Mobile X-ray

Shimadzu's next generation mobile X-ray system MobileDaRt Evolution supplies advanced features and benefits based on the best-selling MobileArt series, awarded by Frost & Sullivan, one of the world leaders in market consulting on emerging high-technology and industrial markets.

The digital general-purpose MobileDaRt Evolution system integrates all state-of-the-art features available on the market. It is the premium DR solution to mobile X-ray imaging for digitalisation of patient wards, emergency rooms (ER), traumatology, intensive care units (ICU) and paediatrics. Recent market research studies show that operators using mobile systems claim that maneuverability, image quality and X-ray penetration are the most valued features of these instruments. 36 % of interviewees ranked manoeuverability as the most crucial function, while image quality and X-ray penetration ranked # 2 (20% each).

Studies Provide Guidelines for High Performance

The outcome of these studies was used as a guideline for Shimadzu when developing the next generation of digital mobile X-ray systems, the MobileDaRt Evolution. It is an evolutionary change in mobile diagnostic imaging equipment in terms of mobility, operability and image quality. The merger of long-term experience, a high-level of engineering and continuous review of clinical feedback is the platform MobileDaRt Evolution is built on. Thomas Nordhoff, Senior Manager Medical Systems, Shimadzu Europe says: "Besides technically advanced specifications, we offer a unique feature regarding operability: the steering bar can be raised to four different heights between 910 mm and 1,000 mm above ground level. This is a great benefit for taller personnel to ergonomically operate and move the system."

Other evolutionary steps cover the rapid display of high-quality clinical images, immediate image processing, an efficient clinical workflow, and fast integration into the hospital network.

"Shimadzu's research and development follows the central mission to offer the best possible diagnostics with the highest patient- and user-friendliness," adds Nordhoff.

Blur-Free Images on the Spot

In cases of emergency or other difficult conditions, it is often difficult for patients to maintain a stable position. For these situations, state-of-the-art rapid radiography with a maximum capacity of 32 kW can be applied, ensuring blur-free images. MobileDaRt Evolution produces high-output X-rays allowing radiography to be performed faster than before.

Figure 1: MobileDaRt Evolution is the next generation unit of the awarded MobileArt series and combines all most modern features available on the market.

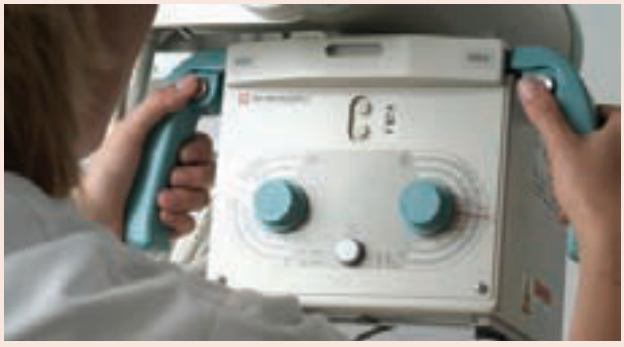

Figure 5: The MobileDaRt Evolution can be moved forward or backward by the collimator-mounted bedside drive controls.

Figure 2: After exposure, various types of post-processing functions support the optimisation of the images on the LCD touch-screen.

- **Dose area product metre and beam filtration**
  Attaching an optional dose area product (DAP) meter to the collimator allows for dose measurement and display of the actual dose values on the main unit. The dose information is recorded in the DICOM header of the images. Alternatively, just a display can be installed showing dose values calculated by the system. As children are much more sensitive to radiation than adults, Shimadzu provides an X-ray beam filtration for dose reduction.

- **Freely rotatable cross-arm with counterbalance system**
  The MobileDaRt Evolution supports a wide range of radiographic examinations at bedside. There is no need to reposition the unit in narrow spaces. Even the most difficult imaging situations are accessible through the system's flexibility of its ultra long arm (up to 1,200 mm). The cross-arm is freely rotatable 270° in either clockwise or counterclockwise directions. A counterbalance system allows for easy positioning and accurate exposure.

- **Flat panel detector for filmless operation**
  The thin 14 x 17 inch flat panel detector (FPD) of the MobileDaRt Evolution provides filmless operation. The high-performance FPD covers large examination regions and ensures high resolution and sharp images. Furthermore, images can be validated within 3 seconds after exposure. Particularly useful for paediatric examinations is a newly developed small-sized 9 - 11 inch lightweight FPD that easily fits also into standard incubators. As there is no need to replace cassettes, radiography can be performed on several people without having to consider the number of film- or CR-cassettes. All these features add up to cost and workflow efficiency.

- **"Inch-Mover" and "All Free" buttons**
  The MobileDaRt Evolution can be moved forward or backward by the collimator-mounted bedside drive controls. Due to safety considerations any sudden force applied to the steering bar during inch-mover operation stops the system automatically. In addition, X-ray irradiation is also automatically disabled during any movement of the system.

  Just by pressing any of the "All Free" buttons releases the electro-magnetic locks for arm rotation, arm extension, and vertical movement of the X-ray tube, thus allowing positioning in one simple move. The counterbalance system makes the accurate positioning easy. The keyless password lock permits only defined operators access to the system.

- **DICOM-supported workflow and image processing**
  By simply touching the screen, the image is uploaded to the PACS station within a few seconds. The MobileDaRt Evolution supports DICOM modalities (Print, Store and Modality Worklist Management). Data can be transferred to a laser printer, image server or viewer via LAN cable output. The system can communicate with network equipment through wireless LAN, providing even greater freedom.

  After exposure, various types of post-processing functions support the optimization of the images on the LCD touch-screen. Image processing enables individual selection of the required image information. About 3,500 high-resolution digital images can be stored in the onboard computer of the MobileDaRt Evolution. Intuitive PC-guided operation allows the images to be easily and quickly uploaded to the hospital network.

Pioneers of Vision
Technology of the 21st Century

Shimadzu develops, manufactures and distributes a broad range of diagnostic systems in all areas of clinical application – digital subtraction angiography (DSA), cardiovascular systems, digital radiography & fluoroscopy systems, ultrasound and general radiography equipment.

One of Shimadzu's latest milestones in X-ray technology is a flat-panel detector named "Safire", the world's first large format FPD converting X-rays directly into electronic signals using amorphous Selenium.

In 2004, Shimadzu Europe was awarded the Growth Strategy Leadership Award by Frost & Sullivan for its outstanding achievement of growth in the mobile X-ray field. In this segment, Shimadzu markets the MobileArt series, a family of systems offering efficiency, user-and patient friendliness together with high quality images. The MobileDaRt Evolution merging the most advanced features marketwide is the next generation development in digital mobile X-ray radiography.

Figure 4: The handle height option is absolutely unique making it easy for taller personnel to operate and move the system

Figure 3: MobileDaRt Evolution is the premium DR solution to mobile X-ray imaging for digitalisation of patient wards, emergency rooms (ER), traumatology, intensive care units (ICU) and paediatrics.

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THE AMERICAN SOCIETY OF **RADIOLOGIC TECHNOLOGISTS**

Serving the Radiologic Science Profession in the United States

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As the world's largest and oldest membership association for medical imaging technologists and radiation therapists, the American Society of Radiologic Technologists (ASRT) has had a profound impact on the radiologic science profession. Its contributions include evidence-based research, governmental advocacy support and educational opportunities for practicing radiologic technologists in the United States. Its efforts have resulted in the ASRT becoming known as the premier association advocating for the advancement of radiologic technologists and providing the support RTs need to excel in their chosen profession.

Established in 1920, the ASRT has experienced tremendous growth since its inception. In 1932, the association had 400 members and was known as the American Society of x-ray Technicians. As the profession grew and new specialties emerged, membership numbers steadily rose. In 2008, the ASRT reached the 129,000-member mark and serves technologists who practice in all medical imaging specialties, including computed tomography, mammography, magnetic resonance imaging and nuclear medicine.

Mission

The ASRT is governed by a seven-person Board of Directors. The ASRT's mission is to foster professional growth of radiologic technologists by expanding knowledge through education, research and analysis; to promote exceptional leadership and service; and develop the radiologic technology community through shared ethics and values. The ASRT achieves its mission through a series of dynamic tactics designed to support RTs' educational goals, enhance patient care and bolster the profession's standing within the healthcare community.

Providing career resources and educational opportunities for RTs are key components of the ASRT's services. The ASRT provides its members with a myriad of unique career resources, including regular salary surveys to gauge income levels and trends, a state-of-the-art Customer Information Department to respond to member questions and the ASRT JobBank®, which allows RTs to conduct nationwide job searches.

Education a Priority

Even more impressive are the educational opportunities offered by the association. The ASRT's educational materials cover every practice area, from pediatric imaging and cancer pain management to proper mammography techniques and basics of radiation protection.

In the United States, RTs are certified by the American Registry of Radiologic Technologists, which requires them to earn 24 continuing education credits every two years. The ASRT is only one of a handful of organisations approved by the ARRT to perform all four CE responsibilities: developing, sponsoring and evaluating CE activities and recording technologists' accumulated CE credits.

The ASRT provides its members with educational opportunities through its educational materials and scientific journals. The ASRT's in-house continuing education department oversees the review and approval process for educational courses submitted by external CE sponsors to ensure that they meet ARRT standards. Moreover, the ASRT's official scholarly journals, Radiologic Technology and Radiation Therapist, include "directed reading" articles that provide CE credits for RTs. The ASRT also offers CE opportunities through virtual media outlets such as podcasts and web casts.

Peer-reviewed articles serve as an additional educational opportunity for ASRT members. The ASRT journals feature original research articles covering all disciplines and specialties within the medical imaging profession. These articles are evaluated by editorial review boards composed of RTs who are experienced researchers and writers.

Supporting Enhanced Patient Care

In addition, the ASRT supports enhanced patient care through other avenues, including educating RTs, lawmakers and the public about safe medical imaging practices and the importance of educational standards for practicing technologists. The ASRT achieves this through educational campaigns and political advocacy efforts at the state and national levels.

In 2008, the ASRT joined four other radiology organisations to found the Alliance for Radiation Safety in Paediatric Imaging. Through its "Image Gently" campaign, the Alliance is raising awareness in the medical imaging field about the opportunities to lower radiation dose in the imaging of children.

The Alliance has grown to more than 20 radiology and paediatric organisations, including international organisations. The campaign has been very successful and has already garnered pledge support from more than 1,500 medical imaging professionals. More information can be found at www.imagegently.org.

The CARE Bill: Promoting Standards

At the legislative level, the ASRT supports enhanced patient care through the establishment of minimum education and credentialing standards for personnel who perform medical imaging and radiation therapy procedures. The ASRT has partnered with other radiologic science organisations to propose minimum federal standards to ensure that patients receive the best care possible. Known as the "Consistency, Accuracy, Responsibility and Excellence in Medical Imaging and Radiation Therapy" bill, the CARE bill will ensure that all healthcare workers in the US who perform radiologic procedures meet basic educational and certification standards.

To promote the CARE bill and raise awareness about the profession at a national level, the ASRT sponsors National Radiologic Technology Week® each year and holds the annual "RT in D.C." lobbying event in Washington, D.C. Technologists from around the country converge on Capitol Hill to meet with elected officials to advocate for the CARE bill and promote the importance of the profession.

NRTW is a week-long celebration that honours the efforts and accomplishments of RTs. Healthcare facilities throughout the country recognise RTs and promote the profession internally and externally through a series of events including open houses, parties and educational seminars.

Introducing the Radiologist Assistant

Additionally, the ASRT partnered with the American Registry of Radiologic Technologists, the American College of Radiology amongst others, to introduce the radiologist assistant in the US, which is now recognised nationally. RAs are advanced-level radiologic technologists who enhance patient care by extending the capacity of the radiologist in the diagnostic imaging environment.

Practicing RAs complete an advanced academic programme and, under the supervision of a radiologist supervisor, are qualified to perform fluoroscopy and selected radiology procedures, patient assessment, patient management and initial evaluation of diagnostic images.

> "The CARE bill will ensure healthcare workers in radiology meet basic standards"

ASRT Education and Research Foundation

To ensure that the profession continues to move forward, the ASRT helps recruit students to careers in radiologic technology by providing scholarship and grant opportunities. The ASRT Education and Research Foundation awards scholarships and grants that advance the medical imaging and radiation therapy profession.

As the philanthropic arm of the ASRT, the foundation works with individual donors and corporate sponsors to award tens of thousands of dollars annually in scholarships and grants to students and practicing RTs. Since 2000, the Foundation has awarded one million dollars in scholarship and helped more than 300 entry-level students and professionals reach their educational goals.

Future goals for the association include expanding educational opportunities for RTs, becoming actively involved with national health care policy initiatives and focusing on the needs of the patients. The ASRT also plans on building online programmes and services to help medical imaging professionals with self-assessment and career building opportunities.

Industry News

Carestream Infrastructure For R-Bay Project

The R-Bay project aims to address the uneven spread of radiologists across member states with the creation of an internal eMarketplace for eHealth services in Europe. Carestream are facilitating the remote reporting of images in Denmark, Finland and the Czech Republic by clinical providers in Estonia, Lithuania and the Netherlands and are working closely with Finnish IT provider Mawell who provide the central eConsultation workflow portal.

Barco Sells Advanced Visualisation Business

Barco has entered into an agreement to sell its Advanced Visualisation activities to Toshiba Medical Systems Corporation, via its newly formed, wholly-owned subsidiary, Toshiba Medical Visualization Systems Europe. 'Advanced Visualisation' was part of Barco's Medical Imaging Division through the acquisition of the Voxar company. The divestment operation, which is subject to approvals from relevant antitrust authorities, is expected to close within a few months.

eHealth Global Releases Image Exchange Service

eHealth Global announced the release of the Image Exchange Service for RHIOs and Community Health Networks at the annual meeting of the American Health Information Management Association in Seattle. The service allows healthcare services to share medical images accessed through the company's eHealthViewer. The service facilitates 3D viewing and multi-planar (MPR) reformatting from any Windows PC or Windows Mobile smart phone.

Europe's First Multi-Slice PET/CT Scanning Device

GE Healthcare delivered their multi-slice PET/CT Scanning Device to the Turku PET Centre in Finland. The scanning device combines the latest PET and computed tomography technologies to enable non-invasive imaging of heart functions. The specialised software fuses PET and CT images into a 3D view of moving organs or structures.

MRI Oncology Package Released

GE Healthcare launched the new Signa Magnetic Resonance Imaging (MRI) Oncology package at ASTRO. This package is said to enhance MRI for radiation therapy planning with a detachable flat-surface patient table with indexed edges, flexible surface coils for high resolution imaging and treatment positioning aids. Its objective is to facilitate the co-registering of MRI and CT images by acquiring MRI images in the same positioning as CT images.

CAD Could Improve Cancer Detection

A study published in the New England Journal of Medicine has shown that Hologic's Computer-Aided Detection (CAD) system could improve the rate of cancer detection in sreening mammography.

Researchers compared the cancer detection rate for single reading of screening mammograms with CAD input versus double reading without CAD support. It was found that CAD could be an alternative to double reading and could improve detection rates from screening mammograms read by a single reader. This is especially relevant in the US where single readings are most common.

Amerinet Awards FUJIFILM Single-Source FFDM Contract

FUJIUFILM Medical Systems and Amerinet have agreed a Full Field Digital Mammography (FFDM) contract for their CR-based digital mammography systems. The FFDM systems have been added to the existing digital x-ray contract that will remain in place until December 2009.

Siemens MVision™ and Intensity-Modulated Radiation Therapy

Siemens claim that MVision™'s megavoltage cone beam imaging solution helps physicians to determine the location of the target tissue and to automatically correct the treatment field. MVision™ features a 3D cone-beam, precise positioning, extensive coverage of the target volume and requires no additional hardware.

Clearance for R2 Quantra™ Volumetric Breast Density Assessment

Hologic have announced FDA clearance for the R2 Quantra™ volumetric breast density assessment tool. It is a software application created to provide radiologists with an automated method for assessing breast density. R2 Quantra™ creates an internal 3D model of the breast from which it derives estimates of the fibroglandular tissue volume and total breast volume.

Research published in the Journal of the National Cancer Institute suggests that breast density is as significant a predictor of breast cancer risk as age.

Trauma Centre Installs S-Fast Point-Of-Care Ultrasound Tools

Los Angeles County-USC Medical Centre, a level one trauma centre, has installed 12 of SonoSite's S-Fast ultrasound tools in an attempt to integrate ultrasound into patient resuscitation and trauma care. The tools are mounted on resuscitation towers alongside monitors, defibrillators and pulse oximeters.

Carestream Health Unveil New Software

New software for Carestream's DR 7500 digital radiography system has been unveiled. It contains KODAK DIRECTVIEWEVP Plus, which is claims to provide more consistent image presentation and orthogonal control of image processing. The software also boasts a new tool allowing images to be calibrated to radiologist preference, optimising image presentation and reducing the need for reprocessing.

Philips and Celsion Research Agreement

An agreement to develop a new cancer treatment that combines ultrasound and drug delivery technology has been made between Philips and Celsion. The potential for using Celsion's Thermodox® in combination with Philips' MRI guided high intensity focused ultrasound (HIFU) to treat solid and diffuse tumours will be explored. If successful they claim it would be possible to treat tumours that would be otherwise inaccessible and also reduce side effects.

Ulrich Medical® Announces CO2 Insufflator for Virtual Coloscopy

Ulrich claim that in comparison to manual room air insufflation, the new product significantly improves diagnostic results. "Our novelty offers an automatic insufflation of carbon dioxide with an easy setting and monitoring of gas volume and pressure. In addition patient's comfort is increased due to the guarantee of a faster resorption."

First Artis Zee System Installed in Scotland

Hairmyres Hospital in Lanarkshire has installed the first cardiac Artis Zee interventional imaging system in Scotland. The system from Siemens Healthcare can be used for diagnostic procedures, coronary intervention and pacemaker insertion. The benefits are said to be a more efficient workflow, better patient throughput and comprehensive and quality images without increasing the dose.

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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

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AGENDA

Key Seminars & Conferences

December 2008

15 – 20 **27th Annual Head-to-Toe Imaging Conference**
New York, US
www.med.nyu.edu/courses/cme/headtotoe08

January 2009

5 – 9 **17th Annual Winter Diagnostic Imaging Update**
Beaver Creek, US
http://radiologycme.Stanford.edu/2009vail

5 – 9 **Essentials of Radiology Imaging**
Costa Rica, Costa Rica
www.med.nyu.edu/courses/cme/costarica09

7 – 11 **Indian Imaging Association Congress**
Patna, India
www.iria2009.com

8 – 10 **3rd Leuven Course on Head and Neck Imaging**
Leuven, Belgium
www.headandneckimaging.be

27 – 31 **NYU Radiology Imaging Congress**
Hawaii, US
www.med.nyu.edu/courses/cme/hualalai09

February 2009

2 – 4 **10th ESGAR CT Colonography Hands-on Workshop**
Harrogate, UK
www.esgar.org

16 – 20 **ERASMUS Course on Head and Neck MRI**
Vienna, Austria
www.emricourse.org

March 2009

4 – 7 **10th Annual Advances in Breast Imaging and Intervention**
Las Vegas, US
www.radiologycme.stanford.edu/2009breast

6 – 10 **21st European Congress of Radiology**
Vienna, Austria
www.myesr.org

23 – 27 **17th Annual Diagnostic Imaging Update on Maui**
Maui, US
radiologycme.stanford.edu/dest

25 – 26 **3rd ESGAR Image-Guided Ablation Workshop**
London, UK
www.esgar.org

April 2009

4 – 7 **Charing Cross International Symposium**
London, UK
www.cxsymposium.com

15 – 18 **GEST 2009 Meeting Europe**
Paris, France
www.gest2009.eu

16 – 19 **68th Annual Meeting of the Japan Radiological Society**
Yokohama, Japan
www.radiology.jp

21 – 24 **2nd Pan-Arab Radiology Congress**
Alexandria, Egypt
www.parcalex.com

22 – 24 **6th Vienna Interdisciplinary Symposium on Aortic Radiology**
Vienna, Austria
www.visar.at

28 – 1 **25th Iranian Congress of Radiology**
Tehran, Iran
www.icr2009.ir

May 2009

19 – 22 **11th Annual International Symposium on Multidetector-Row CT**
San Francisco, US
www.radiologycme.stanford.edu/dest

20 – 23 **Deutscher Roentgenkongress (DRK)**
Berlin, Germany
www.roentgenkongress.de

27 – 29 **II Congreso Cubano de Imagenologia**
Havana, Cuba
www.sld.cu/sitios/imagenologia

28 – 29 **Interventional Fellows Conference**
San Francisco, US
radiologycme.stanford.edu/dest

June 2009

23 – 26 **ESGAR 20th Annual Meeting and Postgraduate Course**
Valencia, Spain
www.esgar.org

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