IMAGING Management

Promoting Management and Leadership in Medical Imaging

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

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VISIT US @ ECR 2012 #704

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European Congress of Radiology

ECR 2012

Vienna

March 1–5

Online Registration now open
myESR.org/registration2012

European Diploma in Radiology
Next Dates and Application
myESR.org/diploma

Poster Abstract Submission for EPOS™ open until December 31, 2011
myESR.org/epos_submission

The annual meeting of ESR myESR.org

Structured Reporting

Prof. Iain McCall

Editor-in-Chief
editorial
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Dear readers,

IMAGING Management has long stood for the professional development of competency and excellence, not just in medical imaging management, but all the ancillary roles of a healthcare leader. We are therefore delighted to support the first dedicated Management in Radiology (MIR) led workshop taking place on Saturday, March 3, at 13.00 (Room Q), during this year's European Congress of Radiology (ECR) and aimed at leaders and Chairmen in medical imaging management as well as for young radiologists looking to accrue and augment critical leadership skills that will advance both their own careers and the professional standing of medical imaging itself.

Including some of the top figures that work with and inspire IMAGING Management and have done for more than a decade, this workshop will showcase the latest management strategies amongst an international audience.

Let me also draw your attention to our cover story in this issue, which features the top presentations made during the recently-held Annual Scientific Meeting of Management in Radiology (MIR). Each of the speakers during the congress gave excellent talks on the need and requirements for setting up a standard system for imaging reporting. The first, Jan ML Bosmans reporting from Ghent, covered an indepth study he made into whether radiologists actually prefer or require a reporting template. An extensive look at the IT support required to enact such a system is then examined by the Chair of the Royal College of Radiologists (RCR) Imaging Informatics Committee in the UK, Dr. Neelam Dugar. A small presentation is then made of the RadLex PlayBook system in the U.S., which was recently presented at the RSNA, and which provides a standard, comprehensive lexicon of radiology orderables and procedure step names.

Of note in this edition's feature articles are papers by Editorial Board Member Prof. Hans Blickman, who writes about the changeover and impact of moving from a modality to an organ-based workflow, and this is complemented by a paper from Dr. Daniel Boxer, who writes about an IT system for radiology session scheduling. Another notable management-based paper takes a look at the Royal College of Radiologists' recently updated iRefer guidelines, with the aim of addressing the need for greater justification of imaging exams.

Our 'In Focus' section this edition looks at the unique approach to radiology business management in Algeria, plus an interview with the President of the national society of medical imaging there, Dr. Bendib, which discusses the structure and professional challenges for the profession there.

I would like to wish you all a fruitful and productive visit to this year's European Congress of Radiology. I welcome your feedback on any of the papers included in this issue, and urge you to contact myself at the journal on editorial@imagingmanagement.org to share your management expertise.

Sincerely,

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Report from MIR: Structured Reporting

IMAGING Management brings you coverage from the recently held Management in Radiology (MIR) Annual Scientific Meeting, where top leaders and trendsetters in healthcare management, primarily medical imaging, convene to discuss hot topics in workflow and IT implementation. As is traditional, we selected the session that produced the most intense debate and favourable response from attendees, and asked the presenters to write a report on their session, and why leaders in medical imaging should pay attention to it: in this case, the evolution and need for structured reporting in radiology.

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ECR Special Preview

SURVEY SHOWS GENERATIONAL DIVIDE POSES CHALLENGE TO ADOPTION

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An Accenture survey of more than 3,700 doctors across eight countries has found that healthcare IT is improving health practices and there is common agreement on the top benefits of technology across countries. But some physicians do not yet see all the benefits, especially those over 50 or those who are not actively using healthcare IT, such as electronic medical records (EMR) and health information exchanges (HIE).

The physician quantitative research -which is part of an Accenture Connected Health Study that will be published soon - surveyed 500 doctors per country in Australia, Canada, England, France, Germany, Spain and the United States and 200 doctors in Singapore between August and September 2011. The research measured physician attitudes toward "Connected Health," an approach to healthcare delivery that leverages the systematic application of healthcare IT to facilitate the accessing and sharing of information and the analysis of data across the healthcare system.

Global Findings

The majority of doctors in all of the countries surveyed believe that healthcare IT does provide some common top benefits, including better access to quality data for clinical research (70.9 percent reported positive benefits), improved coordination of care (69.1 percent) and a reduction in medical errors (66 percent). But some doctors do not yet see all the benefits of healthcare IT with high percentages reporting either a negative impact, no impact or didn't know for reducing unneeded procedures (43.6 percent), improving access to services (43 percent), or improving patient outcomes (39.2 percent). Those physicians who are routine users of healthcare IT, however, rated the overall benefits more positively than their counterparts who are less actively involved with these technologies.

Findings From England

In England, the Accenture survey found:

- With an average score of 61 percent, physicians are just above the global average of 59 percent in their perception of the benefits of healthcare IT across the 10 areas surveyed.
- The majority of English doctors (71.4 percent) believe that connected care will result in better access to quality data for clinical research. The next top two benefits were improved coordination of care across settings/service boundaries (67.1 percent) and reduction in medical errors (64.9 percent).
- Just over half of physicians believe that healthcare IT will result in increased speed of access to health services to patients (55.3 percent) and will reduce the number of unnecessary interventions and procedures (52 percent).
- Less than half of the English physicians surveyed believe that healthcare IT will result in reduced risk of litigation (44 percent).

Jim Burke, Managing Director, Accenture UK Health Industry said, "It is encouraging to see that the physicians surveyed are recognising the benefits associated with integration of currently siloed patient data across care settings and that this is enabling better clinical research and integrated care pathways. As this trend grows and these connected health solutions are established and expanded, patients will benefit and the recently announced government initiative to make increased use of healthcare data for clinical research will become a reality."

Country Comparisons

The survey also revealed that doctors across the eight countries have somewhat similar perceptions about the top benefits of healthcare IT. However, doctors in Singapore and Spain perceive a more positive impact compared to their counterparts in the United States, Canada and Australia.

Age Divide

There was a statistically significant contrast in attitudes among doctors over and under 50 years of age. The Accenture study found that doctors under 50 are more likely to believe that healthcare IT has a positive impact across a wide range of perceived benefits, including improved health outcomes for patients, increased speed of access to health services and reductions in medical errors. More than 72 percent of doctors under 50 think EMR and HIE will improve care coordination across settings and service boundaries. And, 73 percent believe these technologies will offer better access to quality data for clinical research. These numbers vary, however, for doctors over 50 - only 65 percent and 68 percent respectively perceive the same benefits.

Routine Users of Healthcare IT

The Accenture study also asked physicians about the extent to which they used 12 different "functions" of EMR and HIE - such as electronic entry of patient notes, electronic referrals to or from other physicians, electronic ordering, electronic prescribing and communicating with other physicians or patients via secure email. The results showed that physicians who are routine users of a wider range of healthcare IT functions have a more positive attitude toward the benefits these technologies bring. The survey shows that, on average across all the countries, as physicians start to use more "functions" - the more positive they are about the benefits. Comparison of use and perceived benefits of healthcare IT As the number of routinely used healthcare IT functions increases, doctors' overall perception of the benefits grows more positive. Jim Burke added: "The survey confirms what we are increasingly seeing across the country. As physicians' familiarity with sophisticated IT grows, both within and outside their workplace, the greater their expectation that modern technology is needed to bring our healthcare systems and processes into the 21st century."■

Management in Radiology

ESR MIR

European Society of Radiology

MANAGEMENT IN RADIOLOGY

Annual Scientific Meeting

combined with JUNIOR COURSE October 10, 2012

October 11–12, 2012, Milan/IT

mir-online.org

MIR is a subcommittee of the ESR Professional Organisation Committee

ASSOCIATION NEWS

DETAILS ANNOUNCED FOR 2012 MIR CONGRESS

The 2012 edition of the Annual Scientific Meeting of Management in Radiology (MIR), chaired by Prof. Peter Mildenberger, has been announced for October 11 – 12, in Milan, Italy. This yearly gathering of leaders in healthcare, primarily coming from the medical imaging sector, but extended to all those with an interest in healthcare economics, management and senior level administrative topics, will address the following areas:

- *Workflow Issues;*
- *Benchmarking and Costs;*
- *Building and Managing Imaging Services;*
- *Strategies in Radiology;*
- *Quality Issues;*
- *Appropriateness and Radiation Aspects;*
- *Ultrasound, and*
- *Management Around the World.*

Call for Abstracts

MIR is happy to receive your abstract for inclusion at its Annual Scientific Meeting from October 11 - 12, 2012 in Milan, Italy. All submitted (poster) abstracts will be rated by the MIR Subcommittee. Abstract submitters will be notified about acceptance/rejection. The best accepted abstracts will be then invited for oral presentation during the annual scientific meeting. More details and requirements will soon be announced.

Imaging Management Junior Course

Also taking place one day prior to the meeting, the Imaging Management Junior Course aims to help young radiologists who aim to grow their career in medical imaging after qualification. Benefits will include:

- *Learn about radiology management topics*
- *Network with leaders in radiology from throughout Europe and North America*

This year's MIR Imaging Management Junior Course will take place directly before the main MIR Annual Scientific Meeting on October 10, 2012. The organisation are looking forward to welcoming radiologists towards the end of their training and urge them to take the opportunity to combine the Junior Course with the MIR main conference.

Winter Course Review

Taking place this year in the winter ski resort of Schladming, Austria, from January 14 – 16 2012, the annual MIR winter course programme welcomed an exclusive selection of leaders in healthcare with the aim that each delegate left with new insights and practical solutions they can implement immediately. Two trainers from "Inspire Change" explored the following five key topics:

- *Chairing National & International Meetings;*
- *Advanced Presentation Skills;*
- *Negotiating;*
- *Dealing with Difficult People, and*
- *Influencing.*

The trainers from "Inspire Change" taught participants how to spot the professionally trained negotiator, the tricks they sometimes play and how to handle them and keep the negotiation fairly working for all parties as well as skills such as:

- *Being clear about your message;*
- *Getting buy in for your ideas, and*
- *Respecting others points of view.*

This well-received leadership course proved extremely beneficial to attendees and will be held again in 2013, with further details to be announced in this journal and on the association website.

Further information can be found on www.mir-online.org

CIRSE & RADIATION SAFETY

In the question of radiation protection education for all medical professionals in Europe, CIRSE has assumed a pioneering role. Under the guidance of the ESR, CIRSE is involved in the EC-funded MEDRAPET project which has two main goals:

1. Assess the current standard of radiation protection training for medical professionals in Europe, and
2. Update the European radiation protection guidelines.

To give the project scope and relevance in Europe CIRSE, which is represented in the steering committee, has teamed up with several other medical societies that represent professions that deal with ionising radiation in medicine. These include:

- *EANM (European Association of Nuclear Medicine)*
- *EFRS (European Federation of Radiographer Societies)*
- *EFOMP (European Federation of Organisations for Medical Physics)*
- *ESTRO (European Society for Radiotherapy and Oncology)*
- *ESR (European Society of Radiology)*

MEDRAPET Workshop

On April 21 – 23, 2012 the European Workshop on Education and Training in Medical Radiation Protection will be held in Athens, Greece. The workshop aims to facilitate the discussion on issues related to radiation protection education and training of medical professionals in the EU member states.
In the course of the workshop the results of a survey on European training in medical radiation protection will be presented and discussed.

The workshop will certainly yield an inspired discussion on the current situation in Europe and is free to attend. If you have any questions about the workshop or the project as a whole please don't hesitate to contact Robert Bauer (bauer@cirse.org).

Further information can be found on www.cirse.org

IHE CONNECTATHON MOVES TO BERN, SWITZERLAND

The 12th Annual European interoperability testing event for IT in healthcare, known as the IHE Connectathon, will be held in Bern, Switzerland from May 21 to May 25, 2012 at the Bern Expo.

More than 300 information technology engineers from 70 companies are expected for this year's event, an intensive, live five-day 'connectivity marathon' for testing the interoperability and connectivity of health information systems. At the IHE Connectathon all companies implementing IHE Technical Framework Profile specifications in their products have an exclusive opportunity to test their applications with systems and products from other vendors.

In parallel with these testing activities, Connectathon 2012 will offer a full programme of workshops and meetings bringing together key stakeholders from European health IT projects including a major eHealth day conference on May 24. The results of the Connectathon are published on the IHE-Europe website and participating vendors may refer to the IHE Integration Statements to show compliance of their products with IHE Integration Profiles. This is a clear benefit to vendors when responding to Requests for Proposals from users.

Further information can be found on www.ihe-europe.net

CARS 2012 INVITES YOU TO PISA

Taking place in Pisa, Italy, from June 27 – 30, the annual CARS congress is the yearly occasion where medicine and technology meet to present and discuss the key innovations that shape modern medicine on a worldwide basis. As is traditional, the ISCAS, EuroPACS, CAR, CAD and CMI societies will join CARS holding their own meetings are part of this large event.

The congress will also be part of the Bioengineering Week, which starts in Rome on June 24 and moves to Pisa to join with CARS. At CARS you will have the opportunity to meet scholars and experts in the fields of radiology, surgery, engineering, informatics and/or healthcare management who have an interest in topics, such as:

- Image- and model-guided interventions;
- Advanced medical imaging;
- Image processing and visualisation;
- Computer aided diagnosis;
- Medical simulation and e-learning;
- Surgical navigation and robotics;
- Model-guided medicine, and
- Personalised medicine.

Further information can be found on www.cars-int.org

Focusing more on the patient, less on technology

syngo.plaza at University Hospital in Würzburg, Germany

The University Hospital of Würzburg just migrated from Siemens SIENET Magic to *syngo*.plaza, marking a further step toward optimizing workflow economy and medical quality. It is now one of the system's biggest users in Germany, with plans for 100 users to operate approximately 170 modalities in radiology, urology, gastroenterology, neuroradiology, and pediatric radiology.

The switch marked a major leap forward. Professor Dietbert Hahn, MD, director of the hospital's Institute of Radiology, points out unequivocally: "we took another step toward optimizing workflow economy and medical quality with the hospital-wide introduction of *syngo*.plaza". Both time savings and quality enhancement were major factors driving the move. Tools such as the Findings Navigator, for instance: "With *syngo*.plaza, we can visualize measurements of tumors or other lesions in an action log. When we reopen the series later, we automatically see the images with the measurements from that time. That saves time and helps during the diagnostic process."

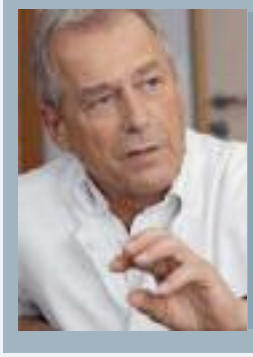
Moreover the Wuerzburg University Clinic is also evaluating *syngo*.via[1], the advanced imaging software which offers innovative applications for almost all modalities.

Switching to the Next View in Seconds[2]

Another example is the Cross Reference mode, which is used for reporting CT or MRI studies. The radiologist marks a certain spatial point within a series and can then automatically locate that point in a different view. Detlef Klein, MD, senior physician in the hospital's radiology department cites a real-world example to explain the benefits of this process: "Using the Cross Reference tool, I can switch perspectives in seconds2 to find out whether an air pocket is located within the intestine or is extraluminal." In principle, the site's former PACS also offered the ability to call up multiple orthogonal views, of course. "But it is significantly faster now, with just one click from the mouse menu," Klein says.

Indeed, time savings and speed are what the switch is all about. Downloading a polytrauma case with 1,600 images now takes just a few seconds1 at most, where the radiology team in Würzburg used to wait several minutes for the same process to finish in the past. Speed also affects communication within the team, as Hahn points out: "It used to take a minute and a half to load an MRI or CT series. That was unbearably long for clinical demonstrations or tumor conferences. With syngo.plaza, the images now appear onscreen right away." Since these kinds of conferences often involve discussing images from twenty or more patients, including preliminary scans, it is easy to see how much time the new PACS saves.

Individual series now load in three to four seconds[2] since they are no longer trans-



Prof. Dietbert Hahn, MD, Director of the Institute of Radiology at the University Hospital of Würzburg, Germany

"Combining *syngo*.plaza and *syngo*.via creates a homogeneous solution that helps radiologists avoid cumbersome, timeconsuming switches to special workplaces for cardiac or vascular scans, for instance. One system, one philosophy, one kind of user logic – this approach has a bright future."

ferred to the interpretation console locally, and are available on the hospital's network. In this context, Hahn lays out a simple calculation: "If it took a minute and a half to call up a study using the old PACS, and we open 400 studies per day, we can see, in purely arithmetic terms, that *syngo*.plaza will now help save us several hours of loading time – time that we can better use elsewhere. The image memory is large enough that we can even access the images for multiple patients at the same time."

On the topic of work speed and waiting times, Professor Matthias Beissert, MD, managing physician at the Institute of Radiology, can't resist a slight dig at Siemens: "We had to wait a bit longer than we had originally expected for *syngo*.plaza," he notes. Developing an advanced PACS simply takes time. "And a new PACS from Siemens is no exception," he says. But jokes and critical comments aside, Beissert does ultimately have praise for Siemens as a longstanding, valued partner: "The wait was worthwhile – well worthwhile, even."

One factor in his positive overall assessment of *syngo*.plaza is the Smart Select function, a personalized tool that each radiologist can arrange according to his or her routines. The radiologist selects the eight most frequently used functions and places them in the "star", where they can then be clicked directly, instead of having to use the navigation bars for access. This helps ensure that users move forward quickly, with just a few clicks, saving "mouse mileage" and allowing the radiologist to concentrate completely on the image.

Data Sets from 1.2 Million Scans Migrated to New PACS

The facility in Würzburg decided on "everything in a single archive" as a solution. All of the existing data from ten years of digital radiology – 1.2 million scans, totaling 50 terabytes in all – was transferred to the new system. The department's former PACS, SIENET Magic, has definitely been put out of commission now that the data migration is complete, and the radiologists are working exclusively with *syngo*.plaza.

The fact that the data transfer took only about eight months is due to a number of factors, including the optimized management of the migration process. Those responsible for the project pinpointed a transfer speed that allowed radiologists to do their work without issues during the migration, while still keeping the preliminary studies generated earlier available for comparison purposes without long wait times.

During the migration process, Siemens maintained its own office within the radiology institute to monitor the data transfer and remain available to PACS users at all times. "We always have an expert contact person nearby to help us right away with all our technical questions and issues relating to using the system," says Klein, praising the support provided for the project.

For Physicians, Not Engineers

So what's the final verdict on *syngo*.plaza? Beissert pauses, then answers: "We are focusing less on the technology and more on the benefits that the technology brings us for our reporting. That means *syngo*.plaza has taken our radiology department into the future." The new PACS is a tool that allows radiologists once again to concentrate more on the original purpose of the profession in their day-to-day practice: That is actually the best compliment *syngo*.plaza could hope to earn. After all, it was developed for physicians – not for engineers.

Prof. Matthias Beissert, MD, Managing Physician at the Institute of Radiology

"The idle times we experienced during tumor conferences while we waited for the images is now – finally – a thing of the past for us."

Detlef Klein, MD, Senior Physician at the Institute of Radiology at the University Hospital of Würzburg

"The support we received from Siemens during the migration was everything we could have hoped for."

Info/Contact
www.siemens.com/syngo.plaza

[1] *syngo*.via can be used as a stand-alone device or together with a variety of *syngo*.via-based
[2] Results may vary. Data on file.

Another Successful IT@Networking Awards

The European Association of Healthcare IT Managers is proud to present the Winners, Finalists and Nominees for the *IT@Networking Awards 2012 (IT@2012)***. These fifteen medical technology and healthcare IT projects came to Brussels on the 18-19 January to battle it out to win the coveted IT@2012 trophy and prize money.**

Yet again the sheer number and quality of submitted projects surpassed our expectations. This year projects ranged from EMRs and telemonitoring to whole genome sequencing and predictive software. Competition was fierce but in the end Ian de Vega took the top prize with the South African primary healthcare information system.

How it Works

The *IT @ Networking Awards 2012* is an open competition for fully implemented, operable healthcare IT and medical technology solutions. *IT @ 2012* identifies some of the finest and most innovative departmental, institutional, local, regional and national healthcare solutions.

Intelligent medical technology and IT increase cost-effectiveness, productivity and safety and *IT @ 2012* is designed to help healthcare facilities identify proven medical technology investments. It is an event to promote healthcare IT innovation and collaboration on a European and even global level.

The competition spanned over two days. The first day saw each nominee introduce their project to their peers and the expert panel of judges in a short MindByte presentation in the hope of winning votes and progressing to the second round of more detailed WorkBench presentations. Interactive in nature, each presenter was cross-examined by the audience, expert judges and their fellow competitors in question and answer sessions after each presentation. As always attendees did not hold back in their questioning!

To ensure cross-departmental understanding and facilitate comparison between projects, each presentation must adhere to our strict presentation criteria. After each presentation and Q&A session the audience and expert judges (CEOs, CIOs, CMIOs, hospital and IT managers, radiologists, policy makers and physicians) also cast their vote according to this structure.

Presentation Criteria

1. THE IMPORTANCE OF TECHNOLOGY
What technology was used and how was it integrated into the workplace?

2. BENEFITS
Has the project helped those it was designed to help?
Has the project changed how tasks are performed?
What new advantages or opportunities does the project provide?

3. ORIGINALITY
What makes the solution special?
Are there any original features?
Is it the first, the only, the best or the most effective application of its kind?
Is it an improvement on existing implementations?

4. DIFFICULTY
What important obstacles had to be overcome?
Were there any technical or organisational problems?

5. SUCCESS
Has the project achieved or exceeded its goals?
How do you see the project's success affecting other applications, your facility or other organisations?
How quickly would the users accept the implications of this innovation?

6. IMPACT
What is your overall impression of the project?

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

IT@2012 Winners.

1st Place: Successful Development and Implementation of a Primary Healthcare Information System (Presented by Ian de Vega)

2nd Place: Individualised Patient Disease Diagnosis and Treatment through Whole Genome Sequencing and Comparison (presented by Peter van der Spek)

3rd Place: eyeSmart EMR - Intelligent IT Solution for Eyecare (presented by Anthony Vipin Das)

IT@2012 Finalists.

3D PACS Through Virtual Reality- Sisopacs (Presented by Nejat Unsal)

Bedside Detection of Awareness in the Vegetative State (Presented by Camille Chatelle)

Polytechnic University Hospital "La Fe" in Valencia, Spain- Mobility System to Guarantee Clinical Safety and Optimize Bedside Processes, Saving Costs (Presented by Serafin Arroyo)

MyHCL Project, Lyon public hospitals, France (Presented by Cecile Dolla)

A New System for Continual Defensive Monitoring and Rapid Response: Saving Lives and Reducing Costs by Extending Best-Practices in Surgery and Critical Care Across the Enterprise (Presented by Jeffrey Charles Bauer)

IT@2012 Nominees.

Ágora - Lightweight EHR Viewer (Presented by Juan Abenza)

GNU Health: Benefits of Free Software in Public Health (Presented by Luis Falcon)

Veneto-ESCAPE Project (Presented by Federica Sandri)

The European Project Renewing Health (Presented by Silvia Mancin)

Schizophrenia Prediction: ITAREPS System (Presented by Jan Hrdlička)

The Winner of the IT@Networking Awards 2012

Successful Development and Implementation of a Primary Healthcare Information System.

Rosemary Foster, Ian de Vega

It is globally recognised that the only way to effectively support continuity of care is to implement an electronic health record (EHR) system on a large scale. The implementation of a national EHR is a high priority in the ehealth strategies of most countries, regardless of whether they are first world or low- and middle-income countries. In South Africa, this has been successfully achieved in the Western Cape province.

Although South Africa has had some active health information systems implementations, only about a third of all public sector hospitals have some form of electronic medical record system. There is little or no integration between these systems and network and Internet access is not commonly found in public health facilities, especially primary healthcare facilities (community health centres and clinics).

Prior to 2004 in the Western Cape, none of these primary healthcare facilities were computerised. In 2004, there was an initiative to connect the fifteen largest community health centres to the provincial WAN. Computers were also installed but only provided email capability. For registry staff who were struggling to process more than 1,000 patients a day, for doctors who had to see up to 100 patients a day and for patients, who had queued outside from 4am, ill and often collapsing, this was of little help. Registry staff battled under chaotic circumstances, often using up to four different filing systems in the same facility.

PHCIS

A small team within the provincial government had designed and implemented a successful centralised system called CRADLE for use in the midwife obstetrics units (MOUs), public sector facilities where women receive ante-natal care and deliver their babies. It was proposed that CRADLE be adapted for use in all primary healthcare facilities, particularly making use of the patient registration functionality. The resulting system would be known as PHCIS (Primary Healthcare Information System).

In 2003, the South African cabinet announced that anti-retroviral treatment (ART) for HIV/AIDS would be introduced in the public sector. It would be essential to monitor the roll-out of ART and to provide regular reports to the national Department of Health. The decision was taken to use the same CRADLE patient registration capability and to develop this ART module in-house, with guidance from the University of Cape Town Health Sciences Faculty. The ART module, called eKapa, was therefore to be part of the PHCIS suite and the development was done in parallel.

The decision to enhance the CRADLE system was taken because it had the necessary foundations to suit the unique requirements and the cultural context. The CRADLE system had already been proven in the MOUs. Several commercially available systems were investigated but it was felt that, besides being very expensive, they were generally not suitable. There was considerable pressure at the time to use an open-source database and development tools. However, it was felt that the existing CRADLE team was skilled in the development language and it would easier to find reliable skills in this language. The CRADLE system already used a commercial database management system and there were economies of scale in expanding this.

From the outset the vision was to take a step-wise approach, i.e. not to proceed to the next level until the foundations were in place. This is illustrated in Figure 1.

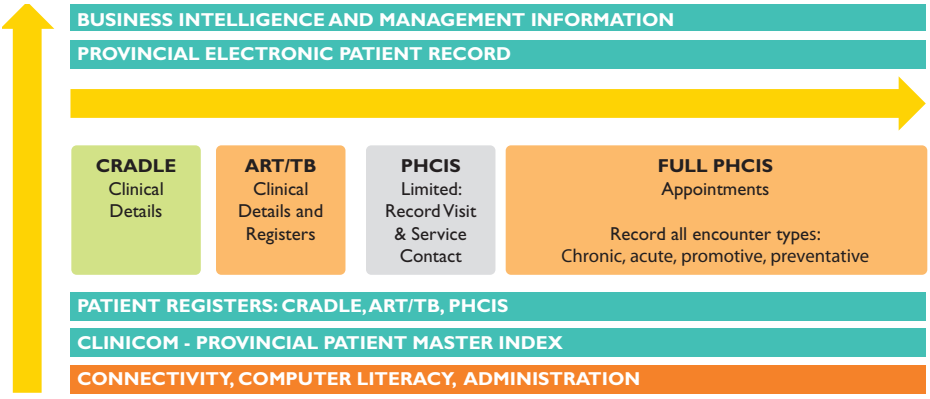


Figure 1. PHCIS development and implementation – a step-wise approach.

Step 1. Connecting facilities to the WAN, giving staff basic computer literacy training and enabling them to use the computers to support administration of the facilities, e.g. email, access to the transversal financial system, BAS.

Step 2. Providing the capability of registering the patients on a centralised database, recording and updating demographic details, both on the PHCIS database and the provincial Patient Master Index (PMI) which is maintained in the Clinicom system (a centralised system used in provincial hospitals). At this stage staff could print labels that could be used by the pharmacy and to label specimen containers.

Step 3. Allowing more details to be recorded so that specialised registers could be maintained, e.g. for ART or TB treatment.

Step 4. Begin to add clinical details onto the patient record and proceed gradually until a comprehensive, longitudinal health record is maintained.

Step 5. Use the PHCIS database as a source for management reporting and business intelligence applications.

An Agile Tailor-Made Solution

The philosophy and methodology used for the design and development of PHCIS can be described as "agile". The development team worked very closely with the project manager and the business analyst, who in turn, dealt with the users on a daily basis. The roll-out began in 2006, using the approach described above. Two weeks after each "go-live" an on-site review was held where the users communicated openly about the system with the entire team, giving useful feedback to the developers.

Besides regular project meetings, the project manager and business analyst met regularly with facility staff and managers in a forum where they discussed the project, the system and its impact on clinic workflows. The team also spent a considerable amount of time visiting the facilities and speaking to staff and patients. This close relationship with the users and the patients continues and the result is that the "design reality gap" for PHCIS is very small, i.e. it is tailored to the needs of the users, the patients and the managers, closely fits the socio-cultural context, and has an improved chance of being adopted and retained.

The System

The hardware used for this system is very basic. All hardware procured must conform to the standards laid down for the provincial government, must be affordable as the budget is constrained and must be easy to support. Equipment used consists of standard network cabling for the LAN and WAN, compact workstations with flat screens, specialised high-speed label printers and laser printers for reports. In addition, bar-code scanners are used in the registry to scan the patient's card on arrival in order to open the electronic record. Bar-code scanners are also used to record details about a patient visit, with minimum effort on the part of the clinician or clerk.

One of the impressive features of the sys-

tem is that it accesses a central PMI via web services. This PMI is used for all patient-based systems in the province - at hospitals, MOUs, ART clinics and 100 clinics serviced by the City of Cape Town. The City of Cape Town system has also been developed in-house by the city's ICT services.

PHCIS has an SMS capability which allows reminders to be sent e.g. to patients who have missed appointments, or to parents to bring their children in for their next immunisation dose. On-going work with facility managers and users has ensured that PHCIS is an integral part of clinic workflows. Most facilities are not modern and were not built with computerisation in mind. It has been challenging to adapt workspaces, already cramped and ergonomically unsuitable, for the use of computer technology while at the same time taking into account high volume workflows.

Challenges

When roll-out of PHCIS began in 2006 the project team had to overcome several challenges:

- There was very little funding for this project;
- There was considerable resistance and lack of buy-in, especially at the outset. The behavioural patterns of staff and patients had to be changed. Staff were accustomed to chaotic workflows and facing long queues of frustrated patients. Patients were used to spending a full day in the facility each month in order to collect repeats of chronic medication;
- There was a shortage of skills for support of the system;
- The network infrastructure was not adequate and/or accessible;
- There was a lack of reliable and affordable connectivity;
- Processes for procurement of network infrastructure and hardware were complex and slow;
- Buildings were not designed for computerisation;
- Electrical supply to the facilities could be unstable;
- There were security and access issues. In some areas gang warfare raged outside the facilities at the time of "go-live", several sites had all computers stolen, electricity supplies were disrupted when underground cables were stolen for their copper content, and on more than one occasion workers were involved in national strikes;
- The organisational structure did not include the roles necessary for the success of this project, i.e. information officers and data capturers.

Over the past five years these challenges have been overcome through innovation, teamwork and buy-in from the provincial department of health's top management. The original goal of the project, to implement a patient management system in 33 community health centres, has far been exceeded. Today PHCIS has been implemented at 113 facilities and the roll-out continues. The aim is to include 126 more sites within the next year. The system tracks more than 5.6 million folders and the PHCIS database alone (apart from the provincial PMI) holds information for over four million patients.

Benefits: Patients and Staff

This success has resulted in tremendous benefits for the patients, the users and the managers. Patients are benefiting from improved quality of care resulting from informational continuity, i.e. their records may be accessed at any PHCIS facility. Improved organisation and quicker throughput means that they do not have to queue for so long. They do not have to arrive early to secure a place in the line as those who must make repeat visits are given appointments. Patients who "walk in" for acute visits are also processed faster. Overall this gives the patients respect and dignity – the system knows them and recognises them, their files are retrieved rapidly. Patients can plan their time better and do not have to lose a day's work in order to pick up medicine.

The users can be divided into two groups – the clinicians and the administrative staff. The clinicians benefit because the environment is now generally less stressed. Their workload is better paced and, knowing their schedules ahead of time, they can plan their own time better. They are able to deliver a better quality of care because they have better information about the patient. The administrative staff has become empowered through computer literacy. The staff at the registry windows experience less stress as the patients are happier and the waiting room is less crowded. They have more job satisfaction as the job is more skilled and more is required of them.

Both user groups benefit from the simple but innovative use of barcode scanners to record visit details. By scanning three times – the patient's barcode, the clinician's barcode and the reason for the visit, the user triggers the rapid creation of an encounter within the patient's electronic health record. The patient encounter holds the following essential information – which patient was seen, when the patient was seen, where the patient was seen, who attended to the patient and what was the reason for the visit (e.g. BCG first dose).

Managers are benefiting from the easy availability of high quality and accurate information. They are able to base strategic planning and decision-making on information reported or extracted from the system. Regular reports with the indicators they are required to provide are also easily obtained. They are able to monitor staff activities and workload as well as perform patient profiling for improved chronic disease management.

Conclusion

There is no doubt that PHCIS is a major success. In 2008 the PHCIS project won the African ICT Achiever's Award for the best ICT project in Africa. In the same year the project won the silver award in the Premier's Service Excellence Awards. In South Africa, the ART module of PHCIS has been mandated as the national electronic medical record system for the monitoring of treatment of HIV/AIDS in public healthcare facilities.

Work on PHCIS is ongoing and the team is always looking for ways to improve the system. In the words of Claudette Ruiters, the dynamic PHCIS project manager: "The question you have to ask yourself is 'would you like to be a patient in this facility'? And if the answer is 'NO' – then you have to do something about it!

DO DOCTORS PREFER STRUCTURED RADIOLOGY REPORTS?

From Illusion to Illumination

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Radiology was born in December 1895. Not much later, doctors were reading and reporting x-ray images across the world. More than a century later, imaging technology has made quantum leaps forward, but reporting has changed very little. It has been proven time and again that radiologists as well as referring clinicians favour a shift from free text to structured reporting (SR), and yet little of all this appears to seep through in daily practice. Are we really serious about SR, and what is the likelihood that we will use it regularly in our lifetime?

Early Surveys

What referring clinicians expect from us, radiologists, surpassed speculation and personal convictions almost a quarter of a century ago. In 1988, a survey by Lafortune and collaborators in Montreal showed that the principal characteristics considered useful by clinicians were clarity, brevity, clinical correlation and, especially among general practioners, advice on planning of future investigations [1]. That same year, in a survey by Clinger's team in Tucson, Arizona, the overall quality of the reports issued by their department was rated 8/10. Fifty-nine percent of the responders thought the reports were usually clear, 40 percent that they were occasionally confusing, and 49 percent stated that they sometimes did not sufficiently address the clinical questions [2].

Three years later, Sandeep Naik and collaborators at the University of Toronto also included radiologists in their study, and compared their preferences with those of the referring physicians. In the same paper, they rekindled the radiological community's interest in 'itemised' (i.e. structured) reporting. And indeed, SR was favoured by an overwhelming majority of the clinicians (86 percent) and a convincing majority (64 percent) of the radiologists in their study [3].

Quality, Structure and Length

The primary focus of our own research at the University of Antwerp was not to determine physicians' preferences but to determine the quality and structure of radiology reports. In 2002 - 2003, we performed a small scale audit of reports at Antwerp University Hospital. Reports were rated by an experienced radiologist, who is also an editor of medical magazines according to five criteria: clarity, brevity, directness, language and clinical utility. The overall quality of the reports was found to be sufficient but there was room for improvement. Staff radiologists did not make better reports than residents-in-training [4].

In a larger, bi-national study we concentrated on the functional parts of abdominal CT reports, their respective length, and the total length of the reports [5]. At each of eight collaborating centres in the Netherlands and Flanders, the Dutch speaking part of Belgium, 100 consecutive abdominal CT reports were collected. After exclusion of non-standard reports, 525 were maintained for further study. The length of the reports and of their functional parts was determined using Microsoft Word's character and word counting features. Numerical results were ordered according to the country, the reporting radiologist (staff or resident) and the nature of the medical centre (university or community), and subjected to statistical analysis.

The reports showed a wide variety in general layout, style, length and content. Reports made by residents were longer than those made by staff radiologists. In Flanders, reports were longer than in the Netherlands. There was also a trend towards longer reports in academic centres than in community hospitals.

None of the reports examined were made according to a pre-structured model. As for the 'natural' or 'spontaneous' structure of these free text reports, 71 (13.5 percent) did not have an impression or conclusion but that number was very variable depending on the institution. Like many other characteristics of the report, whether or not there was a conclusion seemed to depend largely on local tradition. As Hall points out, impressions (i.e. conclusions) are an excellent gauge of the common sense and clinical judgment of the radiologist. Separating the important from the incidental often takes time and thought [6]. National and international guidelines encourage consistent ordering of a report, including adding a conclusion [7 - 10].

In a comparable study in Finland, Heikkinen et al obtained very similar results [11]. Sobel et al (1996) systematically characterised the information provided by chest radiography reports of 822 elderly people in 297 acute-care hospitals. They found wide variation in the content of chest radiography reports, extensive variation in terms used to identify the presence or absence of abnormal findings, and a large degree of uncertainty in what was found [12]. In 2010, Pool et al reviewed 25 published papers and four guidelines and found little consistency

in the language used to describe imaging findings, and much variation in diagnostic certainty [13].

In short, if there is an optimal way of reporting imaging studies, no-one seems to have found it yet.

Opinions and Expectations Measured

To examine the perceived preference of radiologists and clinicians for structured, itemised reports we set up two large-scale, bi-national internet surveys at the University of Antwerp: COVER (Clinicians' Opinions, Views and Expectations concerning the radiology Report) and ROVER (Radiologists' Opinions, Views and Expectations concerning the radiology Report) [14]. Participants were asked to rate 46 statements on a Likert scale (entirely agree, rather agree, neutral, rather disagree, entirely disagree). Most of the statements in both surveys were paired, which would allow close comparison between the ideas expressed by radiologists and by referring clinicians. With 873 respondents, COVER and ROVER are to our knowledge the largest surveys on the report that have been reported to date.

> "Personal convictions on how best to report appeared to have high emotional value. However, it was felt that if radiologists would not actively participate in the development of SR, other healthcare stakeholders would impose it anyhow"

Most clinicians (71.8 percent) declared themselves satisfied with the radiology report and a large majority of them (87.0 percent) considered it an indispensable tool. Most accepted that the radiologist is the best person to interpret the images. Nearly all referring clinicians and radiologists (97.4 percent and 98.5 percent respectively) were convinced of the need to provide adequate clinical information and a clear clinical question when requesting imaging studies.

As for the structure of the report, brief reports of complex examinations such as abdominal ultrasound were rejected by 70.9 percent of the clinicians. Itemised reporting of complex examinations was preferred by both the clinicians (84.5 percent) and the radiologists (67.7 percent), almost exactly the same figures as Naik's. Conversely, the suggestion that a radiology report should consist of prose was rejected by 56.0 percent of the referring clinicians and 72.9 percent of the radiologists.

Almost four out of ten radiologists in ROVER were convinced that their own reports were better than their colleagues'. This emphasises how deeply a radiologist's reporting style is rooted in personal experience and convictions. It may also partly explain why it is so difficult to streamline and standardise the reporting process.

How do the results of other recent studies compare to ours? In a survey by Grieve et al, GPs favoured detailed reports in a tabulated (structured) format for ultrasound examinations [15]. In a survey among specialists, the same team with Plumb as first author found a preference for more detailed reports with a radiologists' comment rather than for briefer reports, even for normal examinations. Tabular reports were preferred to prose (free text reports), the combination of a detailed report presented in a tabular format accompanied by a radiologist's comment being the most preferred style [16].

In research that has not yet been published, our team has tried to determine which other factors are involved in the slow implementation of structured reporting. Being compelled to report within a rigid frame without any room for nuance was judged unacceptable by an international focus group of radiology professionals. Personal convictions on how to report best appeared to have high emotional value. However, it was felt that if radiologists would not actively participate in the development of SR, other healthcare stakeholders would impose it anyhow [17].

There and Back Again?

The theoretical pros and cons of SR have been discussed extensively [18]. As for practice, a comparative study has shown that the output to the clinician is okay: structured reports are as efficient as free text reports in conveying the message [19]. The input, however, is problematic: another comparative study has shown that structured reports risk being less complete and accurate, both to a degree that could impair patient care. In the same study, participating radiologists thought SR was quite cumbersome, but they still considered it a good idea! [20]

In all surveys, referring clinicians and (to a lesser degree) radiologists prefer SR to free text reporting; but in spite of this, in most centres SR is limited to a few very specific examinations, if any. Worse: in centres such as Toronto General Hospital and Midway Medical Center, Los Angeles, where SR was introduced by enthusiastic supporters and used for a number of years to most doctors' satisfaction, its use was discontinued more or less when these supporters left the institution [21, 22].

That is not a coincidence. There is little doubt that referring clinicians are dreaming of more accessible reports of specific complex examinations. One even wonders why they still accept follow-up reports of oncology patients, or any report containing measurements, that is not made according to stan-

dard protocols. The situation of the radiologists who are supposed to produce them, however, is completely different.

SR Received Positively Despite Limited Adoption

Despite the support of societies such as the RSNA, SR is very much the domain of a handful of very enthusiastic radiologists, as can easily be deduced from the names of speakers on the subject at international events. But even some of these seem to take a different stance today. According to one of these experts, Chris Sistrom, Professor of Radiology at University of Florida College of Medicine, better speech-to-text adoption is the main reason. Early speech recognition systems were not very good, so radiologists tried to gain back efficiency by switching to structured reporting. Nowadays, recognition is much better and radiologists have learned to dictate in ways that enhance recognition, so we are moving back to simple dictation [23]. In my own contacts with colleagues in several institutions in Europe, I experienced a lot of positive interest in SR, but at the same time clear skepticism as to its implementation. And indeed, if reporting a CT scan of the lumbar spine or an MR scan of the liver turns five line reports into a multimedia experience of mouse clicks and pop-up menus, few will welcome the transition.

Reality therefore compels us to critically review the surveys that have convinced us of the need to switch to SR, including our own. To my knowledge, only in Naik's pivotal and well-designed survey both groups had some experience with SR, and only in ultrasonography [24]. Since their experience with SR was limited or non-existent, responders in other surveys will have based their answers on theoretical considerations only. And convictions are fine, but they may turn into illusions if not met by anything useful within a reasonable timeframe.

Conclusions

No-one can deny that gigantic steps have been taken to make SR a feasible and even attractive alternative to free text reporting. The value of Integrating the Healthcare Enterprise (IHE), in which radiologists closely cooperate with the industry [25] cannot be overestimated. The further completion of Radlex [26], the development of more than 140 RSNA templates for structured reporting [27], of DICOM Supplement 155, the RadLex Playbook [28], etc. each represent major leaps forward on the long and hazardous road to SR. All those engaged in these projects deserve our gratitude and high esteem, for theirs is a highly frustrating but grandiose mission.

Hopes are also that one day technology will provide a solution. 'Talking templates' have been proposed to overcome the distraction caused by mouse-and-keyboard operation [29]. A few providers are trying to develop systems that automatically transform free text into a structured report. I too hope that one day someone will come up with iStructuring, the ultimate device we were all waiting for. And maybe turn illusion into illumination. ■

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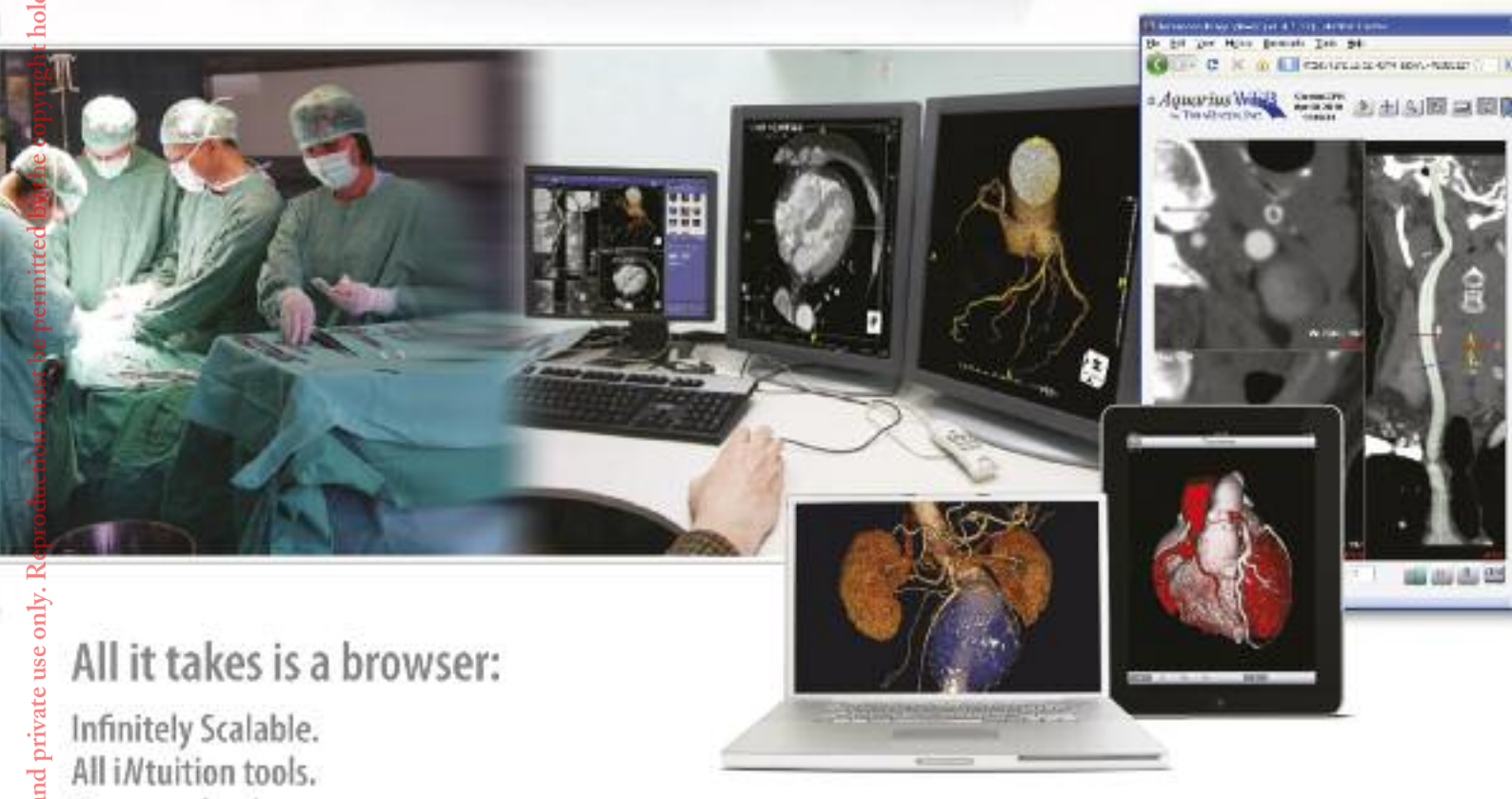

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Hologic Introduces Synthesized 2D Image Algorithm

Eliminates Need for Additional Exposures

Designed to eliminate the need for a 2D Mammogram in a 2D plus 3D tomosynthesis exam, C-View™, Hologic's 2D image reconstruction algorithm, is CE Marked and meets the legal requirements for selling the product throughout the European Economic Area and in other countries recognizing the CE Mark.

At the European Congress of Radiology (ECR) meeting in March, Hologic, a leading developer, manufacturer and supplier of premium diagnostic products, medical imaging systems and surgical products dedicated to serving the healthcare needs of women, announced the commercial release of its C-View synthesized 2D image reconstruction algorithm. This algorithm benefits both patients and medical professionals in that it eliminates the need for a conventional 2D mammogram as a component of a 2D plus tomosynthesis (3D mammography) breast cancer screening exam. C-View software is approved for sale throughout the European Economic Area and in other countries recognizing the CE Mark.

Benefits for Users

For users of Hologic's 2D plus tomosynthesis breast cancer screening system, C-View software creates a 2D image from a single tomosynthesis scan and eliminates the need for the acquisition of additional 2D exposures. In the Hologic press release announcing the development of the new algorithm, Dr. Stephen Rose, a board certified radiologist with Houston Breast Imaging, one of the first U.S. radiologists to adopt breast tomosynthesis, stated "Hologic's synthesized 2D image reconstruction algorithm is very impressive. C-View provides the information contained in a conventional 2D mammogram without the need for additional exposures while maintaining the superior clinical performance of Hologic's combo-mode (2D plus tomosynthesis) imaging."

Dr. Per Skaane presented the first large scale look at the use of tomosynthesis in screening at the world's largest gathering of medical imaging professionals, the RSNA in November 2011. Dr. Skaane studied tomosynthesis read with 2D, and with the synthesized 2D in place of the 2D image. During his presentation, he pointed out that when taken together, the following results have been seen in the performance of tomosynthesis:

- The sensitivity of 2D mammography plus tomosynthesis is higher than 2D alone and
- The screening recall rate of 2D mammography (or synthesized 2D) plus tomosynthesis is lower than that of 2D alone.

These results are extremely promising for the performance of this new technology and are yet another result showing that tomosynthesis is likely to revolutionize mammography. Hologic is the global market leader in breast tomosynthesis with its Selenia® Dimensions® platform. In Hologic's clinical studies, radiologists reading in combo-mode (2D plus tomosynthesis) compared to 2D mammography alone demonstrated superior clinical performance in a number of areas, including recall rate and Receiver Operating Characteristic (ROC) performance.

How the Technology Works

Mammography is clearly an enabling technology, and tomosynthesis and now synthesized 2D imaging, are just the latest evolutions in this new approach to breast imaging.

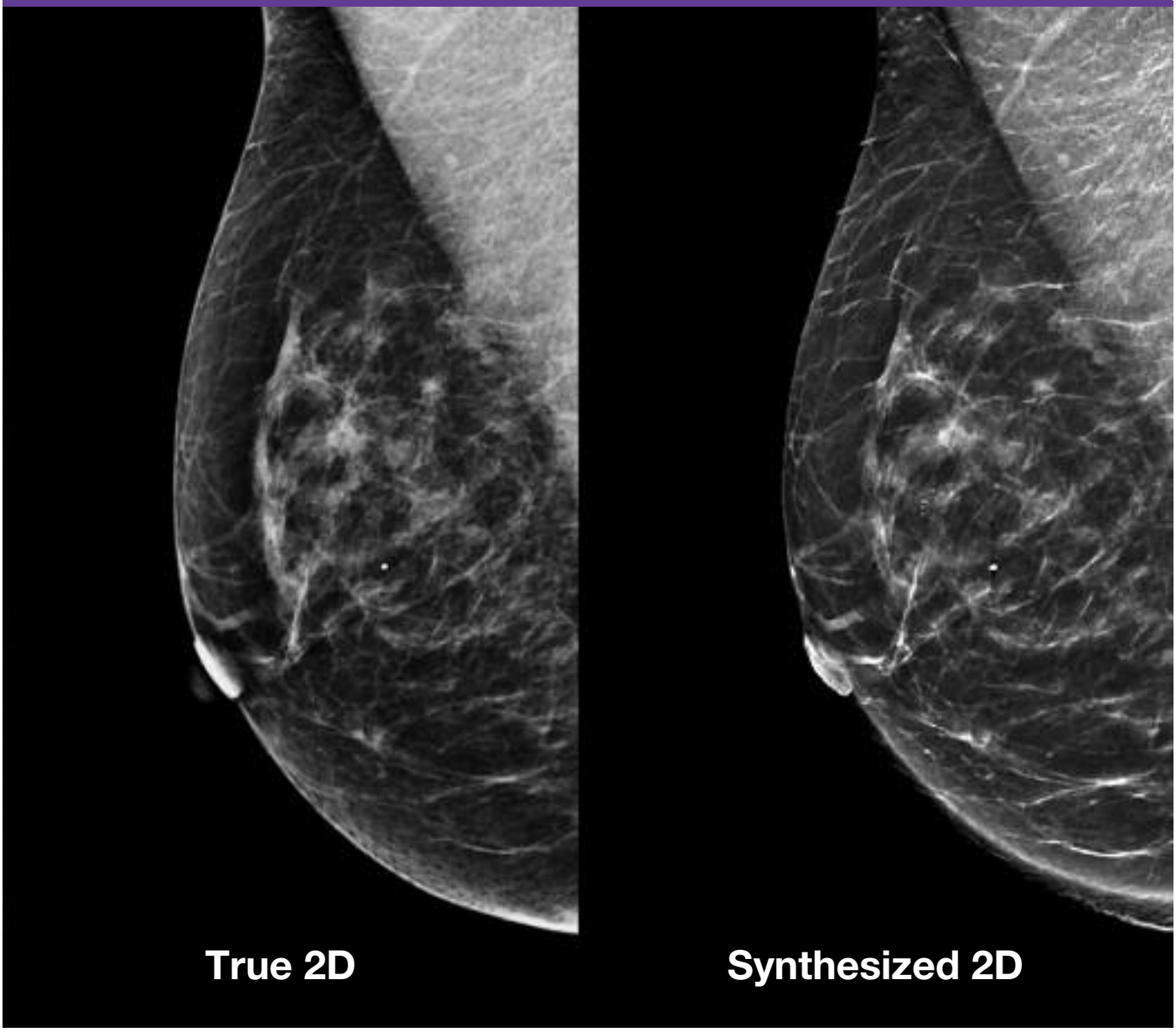
One area in which extensive research and development efforts have been focused is the creation of a 2D image synthesized from a tomosynthesis data set. Hologic's C-View synthesized 2D image reconstruction algorithm reduces the number of exposures leading to slightly shorter exam times and reduced patient dose. The s synthesized 2D plus tomosynthesis exam is approximately half the dose of a 2D plus tomosynthesis exam, and approximately the same as a 2D exam alone. This is an important evolution of this technology, especially in dose-sensitive regions.

The algorithm functions by involving smart summing of the individual slices that make up the tomosynthesis image set. In clinical use, the synthesized 2D image will be reviewed together with the tomosynthesis image set.

There are technical challenges to creating a synthesized 2D image that is close in quality to that of a true 2D image, however much progress has been made in this area. One study of the performance of an early version of synthesized 2D in a pilot study, presented by Dr. David Gur at RSNA 2011, concluded that a minor improvement in the quality of a synthesized 2D image could lead to an acceptable diagnostic quality and eliminate the need for acquiring both a 2D and a tomosynthesis dataset during tomosynthesis based breast cancer screening.

All these studies taken together lead to some very strong conclusions - tomosynthesis with either 2D or with synthesized 2D offers the potential to both increase cancer detection and reduce recall rate relative to 2D mammography.

The quality of the Hologic synthesized 2D is very good and offers the potential for eliminating the need for an additional exposure to acquire a 2D image



Since the U.S. Food and Drug Administration's (FDA) approval of the first commercial systems in 2000, digital mammography has become an accepted standard of care in breast cancer screening and diagnosis and has paved the way for the newest groundbreaking technology in this arena - breast tomosynthesis. Breast tomosynthesis is a screening and diagnostic modality that acquires images of a breast at multiple angles during a short scan. The individual images are then reconstructed into a series of thin, high-resolution slices typically 1 mm thick, which can be displayed individually or in a dynamic ciné mode. A tomosynthesis data set virtually eliminates detection challenges associated with overlapping structures in the breast, which is the primary drawback of conventional 2D analog and digital mammography.

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REPORT **TEMPLATES**

Clinical Aspects & IT Requirements

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Radiology reports are the form of communication between radiologists and the referring clinical doctor. The referring clinical doctor sends a "radiology request card or letter", which may be on paper or in electronic format. The IT system used for generating a radiology request is referred to as Ordercomms. Let us look at the clinical structure of a radiology request card/letter. The referring doctor provides some background clinical information (clinical symptoms/findings and any relevant blood tests). He/she would also provide a differential diagnosis or provisional diagnosis (if there is one at that stage). However, often it may not be possible to come to a differential diagnosis at that early stage, so the request card may simply describe the symptoms, e.g. "shortness of breath. Cause?" Finally the requesting doctor usually asks a clinical question.

Radiology Request Structure

If we were to implement a template for a radiology request card for Ordercomms, this is how it would be structured:

1. **Patient related information**
   a. Name, DOB
   b. Sex
   c. Address
   d. Unique ID
   e. Patient location at request (i.e. inpatient or outpatient - and ward name/institution if inpatient)
2. **Author of request information**
   a. Name
   b. Grade/Role
   c. Department/Specialty
   d. Institution
3. **Recipient Information**
   a. Name of Radiologist/Group
   b. Department/Specialty
   e. Institution
4. **Investigation Requested**
5. **Clinical Information**
   a. Clinical symptoms/signs/results of investigations
   b. Differential Diagnoses (if possible at the stage)
   c. Clinical Question

When we look at this basic structure, we realise that whilst the first four groups are machine/computer readable, the final group (clinical information) is narrative and needs to be human readable. If we were to look for an IT document structure that would allow standard clinical practices to continue, we find HL7 CDA (Clinical Document Architecture) fulfils the architectural needs for Clinical Request cards. It has two parts: machine readable & human readable.

Clinical Context is Critical

Radiology reports are communication from radiologists back to the referring clinicians in response to the radiology request (the radiologist would have performed some imaging exams, & the report is the form of communication between radiologists and referring clinicians). Equally, if we were to look at the structure of a radiology report, we find a lot of similarities. Radiology reports would often describe the findings on the images. They would come to a summary/conclusion, which would include responding to the clinical question in the request card. They would provide a differential diagnosis (if it is possible at that stage). They would also provide a recommendation if appropriate.
My own clinical structure for a radiology report is:

- **Clinical Indication:** This is my brief interpretation of the clinical requesting information.
- **Findings:** Description of the findings on the images.
- **Conclusion & Differential Diagnosis:** If it is possible to arrive at a conclusion & differential diagnoses at this stage.
- **Recommendations:** For example, referral to another department, further tests, etc.

It is however, important to remember that the clinical/narrative content within a report will vary very vastly depending on the clinical context and type of investigation. Sometimes a report that says a single word "normal" is perfectly adequate, and any additional words may not add any further clinical value.

Radiology Report Structure

Hence, if we were to create a template for a radiology report, it would be as follows:

1. **Patient Related Information:**
   a. Name, DOB,
   b. Sex,
   c. Address,
   d. Unique ID

e. Patient location at Request (i.e. inpatient or outpatient- and ward name/institution if inpatient)

2. **Author of Radiology Report:**
   a. Name of reporter
   b. Grade/Role
   c. Department/Specialty
   d. Institution

3. **Recipient Information**
   a. Name of Referrer
   b. Department/Specialty
   c. Institution

4. **Investigation Performed**

Table 1

XDS/XDR Metadata Concepts

XDR/XDR Metadata	Radiology Report (by RIS)	Radiology Request (By Ordercomms)
Source Patient Info-Name	Patient Name	Patient Name
Source Patient Info-DOB	DOB	DOB
Source Patient Info-Sex	Sex	Sex
SourcePatientInfo - Address	Address	Address
SourcePatientID & SourcePatientInfo-ID	PAS No.	PAS/NHS (depending on source - hospital or GP)
Patient ID	NHS No.	NHS No.
HealthcareFacilityTypeCode (NHS directory for Facility types - NHS Hospital, GP Surgery, ISTC, Private Hospital)	NHS Hospital, ISTC, Private Hospital, etc.	NHS Hospital, ISTC, Private Hospital, GP Surgery, etc
Author-Name	Reporter Name	Requester-Name
Legal Authenticator	2nd Reporter (Consultant) if appropriate otherwise primary opertator	Responsible Consultant
Author-Role (NHS directory of codes for roles/grade)	Reporter Grade: Consultant, Junior doctors, Radiographer	Requester Grade: Consultant, Junior doctor, Nurse, Radiographer, etc.
Author - Specialty (NHS directory for Department/Speciality - NHS Directory of Services in Choose & Book)	Diagnostic Imaging	Requesting Dept - (General Medicine/Surgery, etc.)
Author - Institution (Where the author is employed-NHS Directory)	NHS Trust Name	NHS Trust Name/GP surgery etc
PracticeSettingCode (Performing Department - NHS directory for Department/Specialty - NHS Directory of Services in Choose & Book)	Diagnostic Imaging	General Medicine/Surgery/GP
DocumentClassCode (High level Category) (Needs National agreements)	e.g. Radiology Report	e.g. Radiology Request
DocumentTypeCode (fine level category) (Needs national agreement)	e.g. National Exam Code Description	e.g. National Exam Code Description
Title of Document (Use common clinical terms to describe these documents)	Radiology Report	Radiology Request
Document Unique ID in source system	?Report no ?	Order no
Creation Time	Date & Time of Report Authorised	Date & Time when Request Completed
Service Start Time	Date & Time of Report start/dictation	Date & Time of Request
Service Stop Time	Date & Time of Report Authorised	Date & Time of Request
Event Code (Use National Exam code for Radiology procedures)	e.g. CT Head	e.g. CT Head
LanguageCode	e.g. en-GB	e.g. en-GB
MimeCode	e.g. Text/xml(CDA)	e.g. Text/xml(CDA)
ConfidentialityCode	Normal/Sensitive	Normal/Sensitive
FormatCode	e.g. code: urn:ihe:rad:TEXT displayName: CDA Wrapped Text	e.g. code: urn:ihe:rad:TEXT displayName: CDA Wrapped Text
EntryUUID	Assigned internally - never seen by users	Assigned internally - never seen by users
Author (telecommunications) Sender—XDR only) (NHS Directory for department/speciality) + Institution	Department + NHS Trust	Department with NHS Trust/GP Surgery
intendedRecipent (XDR only) - (NHS Consultant /GP code+ Department +Institution)	NHS Consultant /GP+ Department +Institution	NHS Consultant /GP+ Department +Institution
Source ID (XDR only) (NHS Directory of Institution Codes - RP5, RP6 etc)	NHS Institution code for the sending organisation	NHS Institution code for the sending organisation
uniqueID - (XDR only) (systems generated for transaction)	internally assigned	internally assigned
SubmissionTime—(XDR only)	Date time when sent	Date time when sent

5. **Clinical Content** (variable):
   a. Clinical Indication
   b. Findings on the images described,
   c. Conclusion & Differential diagnoses
   d. Recommendations

We suddenly find many similarities in the document structures between the two clinical documents - Radiology Request and Radiology Report - apart from the Clinical Content element. This kind of structure would fit with much of the clinical correspondence between specialties or even within specialties. Medicine is not maths and radiology reports are opinions based on certain information provided. Hence, radiology reports must provide a narrative content, within a structured machine-readable framework.

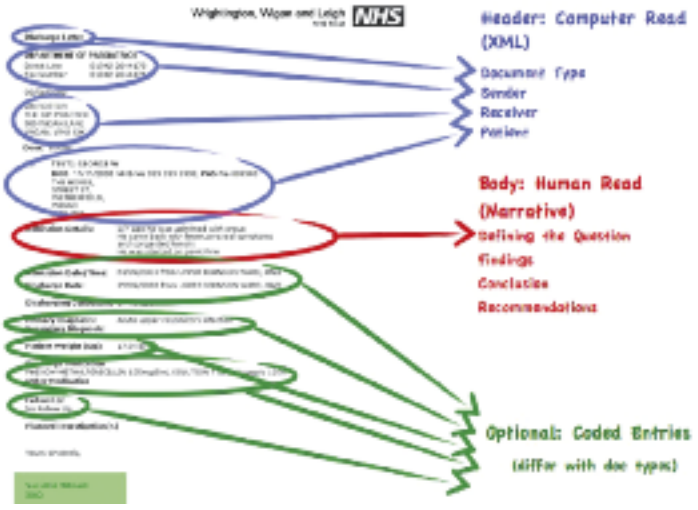

Figure 2

CDA Format

IT Documentation Structure

This must be kept in mind when speaking with vendors, who are looking into IT templates for radiology reports. RIS (Radiology Information System) is the IT system that generates radiology reports. CDA is the IT document structure being gradually adopted across the world by RIS vendors. CDA structure has three elements:

1. Machine Readable - patient, author, recipient, etc.
2. Human Readable - narrative
3. Coded Entries - optional and dependent on the document type. Coded entries are specific to a document type and are an important feature of CDA. Coded entries would be useful for populating certain fields for national registries. For example, radiation dose or radiology exams, TNM staging for cancer registries, certain fields for research purposes, fields for audit/finance etc. Coded entries could be intelligently incorporated into the CDA based radiology report by the RIS vendors.

Why do we Need CDA?

The question we ask ourselves is why do we need to adopt a standard document template like CDA? The simple answer is communication. We need to share the radiology reports generated in RIS with other IT systems used by the requester. Referrers may wish to read their reports in a variety of IT systems - Ordercomms (so that clinicians can track reports in the context of the requests they have made), PACS (so that clinicians can see reports in context of images), EPR (clinicians want to see radiology reports, radiology request and images in the context of other clinical documentations), GP Systems (for radiology requests coming GPs), etc.

Standard methodology for transfer of CDA documents (radiology reports) with other IT systems will very much depend on whether the transport is required within Information Governance (IG) boundaries or outside the IG boundaries. Where transport of documents is required to be within IG boundaries, XDS of IHE is the methodology. Any XDS consumer within an XDS domain - IG boundaries – Order Comms, PACS, EPR will be able to display these reports within an XDS framework. Outside the IG boundaries transfer of documents requires point-to-point transfer of individual documents - XDR of IHE is the global transport standard for this. Metadata required for both XDS and XDR should already be part of the CDA machine-readable data headers.

XDS/XDR Metadata Concepts

XDS/XDR metadata concepts are described in table 1, page 21 as an example which some are recommending for use in England, although this is still to be agreed nationally. Similar metadata structure will need to be agreed in different countries. The Netherlands has been more advanced than England with moving to a standardised XDS metadata set and you can find more information on that at this website: http://www.nictiz.nl/page/Nieuws?mod%5BNictiz_News_Module%5D%5Bn%5D=2400.

Conclusions

Understanding CDA and XDS/XDR concepts are key to understanding why IT templates for radiology reports are required and also ensuring that the IT templates chosen are suitable for clinical practice. The key reason for requiring IT templates is to facilitate electronic report sharing between multi-vendor IT systems – the RIS and varied IT systems used by the referrers. Hence adoption of global standards for documents (HL7, CDA) and global standards for transport/access (XDR/XDS) is key in a multi-vendor IT systems environment. ■

RADLEX **PLAYBOOK**

The Next Stage in Innovating Standard Radiology Procedure Names

The Radiological Society of North America (RSNA) released the first version of the RadLex Playbook (http://playbook.rsna.org) on November 1 during the recently past RSNA congress, and already this resource has found eager users in the radiologic community. The Playbook provides a standard, uniformly structured set of names for radiology procedures. The RadLex Playbook was demonstrated in the Image Sharing Demonstration booth at the RSNA 97th Scientific Assembly and Annual Meeting at McCormick Place in Chicago.

The initial release of the Playbook provided names for more than 350 common CT procedures. It was developed by extracting names from "chargemasters" - lists of orderable procedures - from several large radiology sites and adapting them to the standardised structure defined for Playbook terms.

The Playbook fills a significant gap in the web of information used in radiology: the absence of a consistent way of referring to specific radiology procedures. Currently each institution develops its own list of procedure names. Considerable effort is expended in creating and maintaining these lists. Moreover, the fact that each site develops and maintains its own list thwarts the ability of each institution to use its information for secondary purposes like clinical trials, outcomes analysis, national registries, and other quality improvement efforts. This coming year the RadLex Playbook project will release a set of terms for standardised naming of MRI and x-ray procedures.

"The release of the RadLex Playbook is an important milestone for radiology, as it brings us into the era of large-scale efforts to understand and improve our imaging practices, and to enhance our access to and use of imaging information in clinical practice, teaching and research," said Daniel L. Rubin, M.D., M.S., assistant professor of radiology and medicine at Stanford University and Chair of the RadLex Steering Committee of the RSNA.

The Playbook provides the crucial technology to enable all institutions and practices to improve the quality of data shared with image and dose registries.

American College of Radiology an Early Adopter

The American College of Radiology (ACR) has become an early adopter of the Playbook for use in its CT Dose Index Registry (DIR; https://nrdr.acr.org/Portal/DIR/Main/page.aspx). The DIR allows facilities to compare their CT dose indices to regional and national values. Using Playbook procedure names makes it possible to effectively analyse and compare the information submitted to establish national benchmarks. The ACR has begun applying Playbook procedure names to the data it collects and using them in the reports generated through the DIR.

BACKGROUND: WHAT IS RADLEX?

As images, imaging reports, and medical records move online, radiologists need a unified language to organise and retrieve them. Radiologists currently use a variety of terminologies and standards, but no single lexicon serves all of their needs. RSNA RadLex is a single unified source of radiology terms that is designed to fill this need.

Beginning in 2005, RSNA convened experts in imaging informatics and radiological subspecialties to create this resource, which is now made freely available to the healthcare community. RadLex has developed into a rich, structured radiology-specific ontology, which currently includes more than 30,000 terms.

HOW IS IT USED?

RadLex enables numerous improvements in the clinical practice of radiology, starting with the ordering of imaging exams, through the use of information in the resulting radiology report. It also makes possible more effective reuse of information for research and educational purposes. Some specific uses of RadLex terminology include:

- Automatic order entry decision support
- Vendor independent "protocoling" of complex imaging exams
- Reliable PACS display layouts
- No need to re-dictate lengthy imaging technique sequences
- Improved speech recognition accuracy
- Speech-enabled structured reporting to satisfy regulatory requirements
- Real-time decision support for the radiologist
- Rapid teaching file creation
- Accurate report search and data mining

"We have found that procedure names vary between and even within imaging facilities," said Richard Morin, Ph.D., FACR, and Chair of the Dose Index Registry Committee. "Use of the RadLex Playbook allows the Dose Index Registry to standardise exam names across hundreds of facilities which, in turn,

» CONTINUES ON PAGE 37

ECR PRESIDENT PROF. LORENZO BONOMO ON THE GROWTH OF THE ECR AND THE ROLE OF MANAGEMENT

Healthcare Economics, Cost-Effectiveness and Leadership Growing in Significance

This year's elected President of the European Congress of Radiology (ECR), Prof. Lorenzo Bonomo, is Chairman of the Department of Radiology and Director of the Radiology Training Programme at the Catholic University Sacro Cuore in Rome. Here he talks to IMAGING Management about what's in store for attendees at this year's ECR, the increasing importance of management topics and the role of e-learning in encouraging young radiologists.

Please tell us about the path of your involvement with the European Society of Radiology (ESR). When did you first come to be a member, and how did you get more and more involved?

I attended the ECR for the first time in 1991, and I've been a member of the ESR since its foundation in 2005. In 2008, I was nominated member of the congress committee, and started working on the organisational aspects of the annual meetings, which have become increasingly successful. There has been a continuous improvement in the quality of the ECR, both in terms of presentations and of the high standards of its educational and scientific activities. I am extremely honoured to be the President of the congress this year. Today, the ECR is the annual meeting of one of the most relevant medical societies in the world, with more than 52,000 members.

Please tell us also about your involvement with the Italian Society for Radiology, and the links between it and the ESR. Why are these international connections so important for the growth of radiology as a specialty?

I think my appointment as ECR President is also a big recognition of Italian radiology for its huge contribution since the foundation of the ECR, to that society. I became a member of the Italian Society of Medical Radiology (SIRM) in 1976. I also had the honour of being the President of SIRM from 2002 to 2004. During my Presidency, I tried to stimulate the collaboration between SIRM and EAR, the European Association of Radiology, supporting the building up of a common house of European radiology, the ESR. The Italian society has always worked together with the ESR to encourage attendance at the ECR. European countries are very different in terms of population, education and radiological training. A continuous correspondence between the European and national societies is therefore pivotal, if we want to improve the development of radiology at a European level. I think that the ESR will continue to work in this direction.

What are the sessions that one should not miss, at this year's ECR congress?

I wish I could attend every session in the programme, because every session has been organised with great care, by experts in the different topics. Personally, I look forward to the "ESR Meets" sessions and to the interdisciplinary sessions. Besides my home country, Italy, this year's guest countries include Romania and Egypt, the latter being the first ever African guest country at the ECR. The invited partner discipline is actually one of our sister disciplines: radiation oncology. If I were a young radiologist, I wouldn't miss the activities dedicated to the younger generation. Moreover, I would like to attend the EPOS discussion sessions, including the new "trial update" discussion of posters submitted on the days prior to the congress and presenting new studies that will have a certain impact on radiology in the near future. I am confident that these sessions will be very successful, but I look forward to the social events as well, a great occasion to strengthen friendships with as many as possible of the participants.

Participants will need to plan their agenda according to their personal needs and interests. There are such a variety of topics and learning objectives that everybody will find sessions that appeal to them. Young radiologists, in particular, will have a wide range of possibilities among presentations and hands-on workshops. All participants, howev-

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er, should be encouraged to attend the plenary sessions, the honorary lectures, and the interactive sessions.

"An efficient and effective management and administrative organisation is absolutely indispensable for the correct and successful functioning of any medical department, and especially radiological departments"

Do you believe that management and administrative topics such as healthcare economics, cost-effectiveness and leadership will play a growing role in radiology education, and why should radiologists put greater focus on these areas?

An efficient and effective management and administrative organisation is absolutely indispensable for the correct and successful functioning of any medical department, and especially radiological departments. Radiology is a complex discipline, with important budgets, it is constantly evolving and requires flexible and careful management, which pays attention to the patients' needs. Therefore it is necessary that, along with the traditional clinical topics, the training of young radiologists includes topics such as healthcare economics, cost-effectiveness and leadership. Since its foundation, the European Society of Radiology has been very sensitive to such issues. The annual Management in Radiology (MIR) meetings (www.mir-online.org) testify to ESR's interest in these topics.

At the recent RSNA congress, there was intense interest and discussion of shrinking healthcare budgets and their potential impact on the radiology workforce. Do you think the deepening economic crisis will make cuts into European radiology as well, for the foreseeable future, and how will this be felt in your opinion?

It is doubtless that the economic crisis being experienced across the entire world, and especially in Europe, will significantly affect radiology. Along with the reduction of investments in new technologies, a reduction in medical and technical personnel is to be feared. Therefore, it is necessary to find and experiment with new organisational models, which allow us to keep up the productivity and quality standards of our institutions. Let's hope that it won't be long before the crisis ends!

How have you managed to balance these extra duties as congress President with your regular scientific and clinical commitments? Why is it important that radiologists get more involved in extra-clinical activities such as these?

It is very important, when you work as a radiologist in your hospital, that you know what is going on in the rest of Europe, and the world. It is also fundamental for a radiologist today to acquire other competencies, such as management know-how and human skills. Being in touch with so many colleagues and with the ESR staff has certainly enhanced my activity as Chair of the department, my work as a radiologist and my personal relationships, since many of the colleagues I have been working with for the ECR 2012 are actually friends. Time is always too short to keep up with all the correspondence, but fortunately technology helps to speed up communication.

Supporting professional development in the younger generation is an essential and important role of more seasoned, experienced radiologists. What does this year's ECR offer to the younger generation?

We will give particular attention and space to young radiologists, who are the promising future of the discipline, and to students, in order to make them acquainted with the beauty and interest of our world and to attract them to radiology. Several initiatives, such as ESR Rising Stars, Junior Interpretation Sessions, the Radiology Trainees Forum and the ESOR session will be dedicated to them. The programme "Invest in the Youth" will continue its highly successful activity. The aim of the programme is to give young radiologists and radiographers in training the chance to participate in the meeting.

ECR is well known for its innovative tools supporting e-learning during the congress. Can you tell our readers a bit more about these?

We have increased the number of interactive sessions this year, because it is a great way for the attendees to participate directly with the speakers. The EPOS section has been slightly modified. EPOS discussion topics will include: "Oncologic Imaging: Response Evaluation", "Ischaemic Heart Disease: CT or MRI?", "Diffusion-Weighted MRI of the Abdomen", "Iterative imaging", "Breast MRI". As I mentioned, there will also be a discussion about what we call "trial update" posters. Selected sessions – such as the opening ceremony, honorary lectures and "ESR meets" sessions – will be broadcast online on the ESR website, thanks to an initiative introduced this year and called "ECR goes to". It will help the congress to reach out

to radiologists who would otherwise be unable to benefit from its high quality programme. And all congress presentations will also be available after the congress on the ESR website.

Vienna is well known as one of Europe's foremost cultural city destinations. What does the ECR offer attendees in terms of social and cultural activities this year?

Our poster image for ECR 2012 is a painting by Arcimboldo, an Italian artist who became especially well known throughout Europe after the Austrian Emperor Rudolf II exhibited his paintings in the many residences of the Habsburg imperial family. This choice intends to acknowledge historical and cultural links between Italy and Vienna. The opening lecture will be given by Sylvia Ferino-Padgen, an expert on Arcimboldo with Italian origins, and art gallery Director of the Kunsthistorisches Museum of Vienna. Thus, the opening ceremony – as usual at ECR – will give attendees a taste of the President's country, yet not only through music. Other events will have an Italian flavour, but I don't want to give away too much, because I don't want to ruin the surprise! In any case, Vienna is such a beautiful city that everybody will enjoy walking in its streets, as well as visiting its museums, during the breaks in the congress.■

Launches Dedicated Management Course During ECR

IMAGING Management is delighted to continue its long-standing collaboration with Management in Radiology (MIR), by announcing this year's first ever MIR-led session which is devoted to key management and healthcare administration topics at this years European Congress of Radiology. We encourage all those in a position of leadership in the department of medical imaging, as well as young radiologists looking to develop their career in the long-term, to take advantage of this great round-up of management-focused presentations from leading and well-respected experts with long-standing links to the MIR organisation.

Taking place on Saturday, March 3 at 13.00 (Room Q), MIR have announced that the programme will include the following expert speakers and topics:

Radiology in an Age of Austerity - Trends in Communication, Management and Economy Speaker Affiliation

13:00 E-health

- Teleradiology and e-health - the ESR perspective (J. Schillebeeckx)
- International teleradiology - is multilingual reporting essential? (P. Ross)
- National e-health strategy - the Canadian experiences (D. Koff)
- Empowerment of patients with personalised image sharing-extending IHE (D. Mendelson)
- E-health - the European perspective (P. Zilgalvis)
- Discussion

15:30 Communication with our Partners

- Computerised Physician Order Entry (CPOE) and decision support - Clinical value (Ch. Kahn)
- Communication of urgent and unexpected findings (M. Centonze)
- Implications of reporting infrastructure - general reading room vs. individual offices (N. Strickland)

16:45 Managing Radiology

- Imaging and benchmarking: Implications for radiology (E. Schouman-Claeys)
- The added value of in-house radiological IT (J. Jakobsen)
- Risk management in radiology (U. Senol)
- Discussion and closing remarks (Y. Menu / P. Mildenberger)

IMAGING Management's Guide to Top ECR Highlights

18th Congress of Radiology (ECR) 2012

The European Congress of Radiology (ECR) is the annual meeting of the European Society of Radiology (ESR), which has grown now to almost 56,000 members. It is a trend-setting, dynamic and service-oriented congress, well-known as one of the most innovative meetings within the scientific community, embedded in a unique and inspiring ambience. Its purposes are many: medical imaging continues to evolve into a highly technology-oriented specialty, and with the rapid level of innovation, the ECR congress meets this need to educate, inform and disseminate information to its participants. For example, the most recent development has been the establishment by the society, of two new committees: one for oncologic imaging, the other for emergency radiology, two growing and demanding areas where radiologists will need a central hub to organise and promote excellence in these fields.

Inside:

ESR Meets…

Friday, March 2, 10:30 - 12:00 / Room A

ESR Meets Italy

Prof. Antonio Rotondo, President of the Italian Society of Radiology (SIRM) invites this year's ECR attendees to discover what is happening for medical imaging in Italy. The Italian Society of Medical Radiology (SIRM) represents many thousands of radiologists and is currently the largest medical society in Italy, with around 9,000 members. As well as sessions outlining the performance of medical imaging in Italy, attendees can attend sessions such as:

- MR contrast agents for liver imaging: A. Giovagnoni; Ancona/IT
- Outlook and clinical perspectives of MDCT coronary angiography: M. Galia; Palermo/IT
- Experimental study with 7T-micro MRI: in vivo rat model of intestinal infarction: R. Grassi; Naples/IT

Saturday, March 3, 10:30 - 12:00 / Room B

ESR Meets Egypt

Prof. Dr. Fathy Tantawym, Head of the Egyptian Society of Radiology & Nuclear Medicine (ESRNM) welcomes participants to attend a special session covering the latest advances in medical imaging in Egypt. The ESRNM has 3,423 active radiologists registered as members of the society and holds two scientific meetings per year covering all subspecialties of radiology. The peer-reviewed Egyptian Journal of Radiology and Nuclear Medicine (EJRNM), established in

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1986, is published four times a year. Sessions include:

- MDCT of Royal Egyptian Mummies: secrets unveiled: A. Selim; Cairo/EG
- Egyptian women's health outreach programme: yesterday, today and tomorrow: D. Salem; Cairo/EG
- Interventional management of HCC: Egyptian experience: A. El-Dorry; Cairo/EG

Sunday, March 4, 10:30 - 12:00 / Room B
ESR Meets Romania
Prof. Dr. Dragos Negru, President of the Romanian Society of Radiology and Medical Imaging (SRIM) proudly welcomes participants at this year's ECR congress to not only learn more about developments in medical imaging in Romania, but to attend key scientific presentations during the session. The Romanian Society of Radiology and Medical Imaging (SRIM) holds its own congress every two years and publishes its official journal, Imaging, four times a year. Sessions will include:

- Hepatic nodules in cirrhosis: I.G. Lupescu; Bucharest/RO
- Interventional treatment in liver malignancies: B. Popa; Bucharest/RO
- Imaging and guided biopsy in breast malignancies: M. Lesaru; Bucharest/RO

State of the Art Symposia

This year's ECR congress marks another first: Emergency radiology has until now lacked its own society, prompting the initiation of the European Society of Emergency Radiology (ESER) on October 1, 2011 as the first European professional and scientific group in this particular field. This is marked during the congress by a State of the Art Symposium dedicated to professionals working in this area, and is an unmissable session for all those involved in the provision of medical imaging in the emergency radiology field.

Saturday, March 3, 16:00–17:30, Room A
Polytrauma in the golden hour: the key role of emergency radiologists in the ED when time makes the difference

Other Symposia will include:

Friday, March 2, 08:30–10:00, Room D2
Imaging during pregnancy

Sunday, March 4, 16:00–17:30, Room E2
Imaging hip joint replacement

Special Focus Sessions

One of the key Special Focus Sessions at this year's congress aimed at Managers and Leaders of medical imaging department deals with the practice of remote radiology for those who use new technology to keep abreast of workload when away from the medical imaging department. Chaired by Prof. Luis Donoso, it looks at the importance of teleradiology and PDAs as well as the legal issues in teleradiology in this situation.

Sunday, March 4, 08:30–10:00, Room F1
Radiology on the road: working when you are away from home

Other Special Focus Sessions Include:

Friday, March 2, 08:30–10:00, Room F2
Controversies in Breast Imaging

Friday, March 2, 08:30–10:00, Room Q
Diagnosis and management of acute vascular abdominal problems

Thursday, March 1, 16:00–17:30, Room E1
Neuroimaging in neonates, infants and children: when to do what

Professional Challenges

Another unmissable highlight of this year's congress centres around the Professional Challenges section, one that is of key importance to readers of IMAGING Management journal, and those with an interest in best practice in managing a department of medical imaging and related healthcare economics fields. This year's congress addresses the need for nuclear medicine specialists to work together with radiologists for diagnosis of their patients, and is cemented by a growing cooperation between the ESR and European Association of Nuclear Medicine (EANM). Hybrid methods employing technologies from both sides are leading to more overlap and the society states that it is inevitable that there should be greater cooperation between both sides.

Thursday, March 1, 16:00 - 17:30, Room L/M
Diagnosis of inflammatory conditions Joint session of the ESR and the EANM (European Association of Nuclear Medicine)

Other Professional Challenges Sessions include:

Saturday, March 3, 16:00–17:30, Room F2
An epidemic spreading from West to East: medico-legal challenges for radiologists

Monday, March 5, 08:30–10:00, Room L/M
Joint Session of ESR and ICRP (International Commission on Radiological Protection) Upcoming challenges in radiation protection

Honorary Lectures

Thursday, March 1, 17:45–19:15, Room A
Opening Ceremony
Presentation of Honorary Members
Opening Lecture
Arcimboldo in the service of natural science
Sylvia Ferino-Pagden; Vienna/AT

Friday, March 2, 12:15–13:10, Room A
Gold Medal Awards
Josef Lissner Honorary Lecture
The pulmonary nodule: old and new challenges
Cornelia Schaefer-Prokop; Amersfoort/NL

Saturday, March 3, 12:15–12:45, Room A
Antonio Chiesa Honorary Lecture
Small is beautiful! The voyage of head and neck imaging into the future
Roberto Maroldi; Brescia/IT

Sunday, March 4, 12:15–12:45, Room A
Wilhelm Conrad Röntgen Honorary Lecture
In search of venous thromboembolism: the first 2,912 years
Lawrence R. Goodman; Milwaukee, WI/US.■

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PROCESS **IMPROVEMENT**

Moving to an Organ-Based Workflow

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Today's era of patient-centric medical/imaging care evolved from the modality specialists of the 1980s and '90s. It became obvious in subsequent years that radiology had to become more workflow-oriented, and be a more integral part of a multidisciplinary patient care team.

At the same time, the arrival of PACS/RIS, the digitalisation of imaging in particular but also of the laboratory and other medical specialties, necessitated a critical look at how imaging delivered its product to its two customers: the patient and the referring physician. That we could not just do this at our own pace was the result of the publication in 1999 'To err is human', a critical treatise on medical care, errors and poor outcome.

Couple this with certainty that the demand for imaging continues to expand due to growing and aging populations and imaging technology's continuing advances, it is not difficult to conclude that we imagers must either adapt or lose our place (also referred to as 'commoditisation'…) in the diagnostic and therapeutic pathway. As a result, amongst other factors, radiologists are faced with the question of how to balance providing a product - in this case, an exceptional patient experience along with superior images and a (correct, helpful) final report - with speed and efficiency that is error-free and doesn't compromise patient safety.

To meet this need, we need to examine all processes in the imaging department and ensure they perform reliably and under all circumstances. These include, but are not limited to, scheduling the appropriate study quickly, performing them in an efficiently run imaging suite, making the resulting images available for interpretation within a short time and ensuring timely delivery of the resulting report to the requesting physician.

Volume Drives the Bottom Line

At the URMC department of radiology, we perform over 600,000 procedures annually, in a hub–and-spoke set of facilities, with 70 radiologists, 39 residents and a dozen fellows. It is a busy trauma centre with two helicopters, serving an area of over one million inhabitants. It is at the forefront of imaging technology in the region and blessed with top-notch leadership, seemingly state-of-the-art. But, like everywhere, despite stringent efforts to keep up, technology is evolving faster than even the largest medical centre can react, and our task is to do as well as we can with the means we have.

Ten years ago, in the backyard of Kodak, but not getting all that much support, integrating best of breed, namely getting the best products and tying them together, was the way that many imaging departments set up PACS, RIS and enterprise-wide viewers, which came with its own challenges.

Today, we continue to face obstacles of interconnectivity saddled with basically two PACS/RIS systems working in parallel. The challenge was to upgrade the PACS/RIS, update viewing stations, and make sure our systems will seamlessly integrate into Epic/eRecord, the new enterprise-wide Electronic Medical Record (EMR) currently being rolled out. So, technological problems and their solutions in medical imaging are being thrown up quickly, if not, unfortunately, in synchronicity. It is quite a task to manage these processes pro-actively.

Underlying these elements, volume drives the bottom line, particularly in the U.S. market, even for healthcare providers. Hence our shift to organ-system based workflow and re-organisation this past year. More efficient use of the modalities and the ancillary personnel allows us to communicate the final report, our product, more quickly and more specifically to the referring clinician. In this article, I will share some aspects as to how that process has evolved at the URMC, hopefully helpful to those who must travel the same path.

Technology Alone Insufficient

Leaps in technology alone are not enough to adequately meet the explosion in demand for productivity, nor for cost-efficiency. To deliver our product faster and safer, we must urgently analyse and optimise the entire process of scheduling, performing, interpreting and delivering the signed report to our referring clinicians. And lest we forget, the patient experience is of paramount importance throughout this whole process. The patient-centric approach that results in highly consistent levels of patient satisfaction is key if we expect to succeed.

The medical centre took the lead here, embracing Patient Family Centered Care (PFCC) as the leitmotiv from which the entire enterprise is schooled in delivering care to the 'entire' patient. Put the patient first!

We must bear in mind that both the clinician and the patient can go elsewhere for their imaging studies. But, like any marathon, these efforts start with small steps. Recent key examples of process improvements in this area in our department include instituting:

- A patient safety committee;
- Shared governance councils;
- Mandatory departmental QA meetings and initiatives, and
- Changing the workflow for all from a modality-oriented department to an organ-based one.

All these efforts aim to place accountability at the heart of the entire care chain: and all of us share in making the end product the best we can provide. The following are some examples that newly formed

teams of radiologists, technologists, RNs and administrative staff are working on currently:

1. Scheduling

- *How difficult is it to make an appointment at our department of imaging sciences?*
- *Can we make the process equally simple for our administrative staff, patients and referring physicians across the enterprise?*

2. Protocols

- *Do we use the same imaging IV or PO contrast doses for our studies, so patients can be scanned more efficiently and consistently?*
- *Do our technologists use the same imaging protocols at all our locations, so they can work efficiently without having to call residents or radiologists?*
- *Are protocols in place to effectively apply the 80/20 rule for efficiency without compromising safety?*

3. Workflow

- *How do we make it easy and intuitive for our technologists to complete their portion of the imaging process so that putting their initials (i.e. their mark of expertise, their pride) on that study will satisfy the radiologist's imaging requirements?*
- *How do we ensure that most of our daily studies are signed, sealed and delivered by the end of the workday(or >95% within 24 hrs after completion)?*

In the last two years, significant headway into each and every one of these areas has been made. Part of the success is due to the tightening of the 'chain-of-command' of these entities, so that quick and efficient reactions can take place. Also, these are all examples of letting employees 'own' the process, and, with (preferably positive) feedback loops in place, rewarding individuals for contributions to a team.

A recent national employee satisfaction survey, two years after the last one, showed improvement across the board and the value points were well above average as compared to similar organisations.

What Does Organ-Based Mean?

A few years ago, our department adopted the title "Imaging Sciences" to better reflect the increasing variety of imaging done in our department and to emphasise that radiology is based on science and not just technique. More and more was imaging the central key, the 'spider in the web' of the diagnostic process. How do we stay on top of our game in this?

If we look at this evolution of Mr. Roentgen's creation from a helicopter-view perspective, we can break the medical professional side down into four categories of effort:

1. Communication and clinical practice support;
2. Image processing;
3. Decision support and knowledge delivery, and
4. Performance metrics.

Like businesses everywhere, in order to function as such, we must critically assess, check and, if needed, improve our processes. For imaging that means we must improve our customer (physician) service and the delivery of our product. Here at the URMC, this refers to optimal, safe and timely imaging. What we are really doing is reinventing radiology in a digital age - and rightly so: Imaging is a fixed 'stop' in the care of both inpatients (each admission generates over four visits to our department) and outpatients and represents a sizeable profit centre for hospitals.

The best way for us to add the most value to our system and all of the departments that utilise our services is to do the appropriate studies at the most appropriate time, optimising throughput in each modality, and have the expert on each body section finalise a user-friendly report and useful images as rapidly as possible. We are working on incorporating the Appropriateness Criteria of the ACR into the ordering process as well.

Faster Treatment Path

That patients receive a faster diagnosis, treatment and discharge is both good for the patient, our goal, and for URMC, as an inpatient stay that exceeds medical necessity is very costly to the hospital. Our department, as noted earlier, switched from a modality-based (MR, CT, ultrasound, etc.) to organ systems-oriented (abdomen, chest, paediatrics, etc.) workflow to optimise each of these steps, from order to exam to final report.

Major academic medical centres across the world have made this shift in the past decade. This is not surprising as the imaging department is really an information manager. For example, localisation and guided intervention are done by the IR division of our department for a variety of specialties including neurosurgery, vascular surgery and oncology. Implant orientation, fracture healing, following the course of curvature of the back (scoliosis) as well as the management of bone tumours for the orthopaedic department is done by our MSK section, or, if pertaining to the paediatric age group, by the PEDS section.

Now, in addition to the traditional report, many specialties also need the images in planning the treatment of their patient. Neurosurgery or orthopaedics would like to have an imaging roadmap to the tumour, provided by imaging. Who in imaging provides those? At several institutions, a special unit has been set up to produce these specialised reconstructions off-line. It became clear that having radiographers, residents or faculty do this on the fly at the console or while dictating is too time-consuming and impedes workflow. We needed to address this issue here at URMC and look at how this would affect the delivery of our product. Budgetary constraints so far have hampered this effort.

This focusing of expertise also extends into research programmes and teaching facilities as the amount of information

has so exploded that it is impossible to learn our field in the traditional time allotted. For instance, instead of the traditional four-year residency, starting with this year's incoming first-year residents, the curriculum has a basic three-year core to acquire the basic knowledge and then has a two-year period to allow for super-specialisation. Thus, those who want to specialise in neuro imaging will not learn other parts of imaging as intensively, again a shift to better define the 'value added' in a specific subspecialty of imaging.

Playing an Active Role

Clinical decision support means that we take an active part in deciding what happens to the patient with regards to therapy through appropriate imaging and timely communication of the imaging findings. There are many facets to this; the most important one is that we are visible and present when decisions on medical care are made. The digital age has made that more difficult: when the image was 'fuzzy' the clinician would travel to the radiology department to get educated. Currently, the image is looked at in the office or on the ward, and if the report is available and makes sense, no 'face time' between clinician and referring colleague is needed.

There are many ways to try and re-create this contact. The overriding probable solution is to be there: a live voice on the phone, a faculty imager always reachable (officer-of-the-day), etc. In addition to the above, we have implemented a distinct emergency department radiology imaging section. Not only does it allow us to finalise a report with a faculty radiologist's signature within minutes after the image was obtained, it also gives the ED physicians immediate access to live specialty interpretation.

This dovetailed with the realisation obtained through feedback throughout the whole enterprise that we were frequently woefully late with our reports. For example, calling the ICU with the report that the endotracheal tube was wrongly positioned approximately six hours after this endotracheal tube had been placed, was counterproductive and reflected badly on our professionalism. This paradigm can be extrapolated to pretty much any scenario where imaging is used.

Clearly, in acute patients, this means that we should give online decision support and thus deliver our knowledge minutes after the imaging has been concluded. It would also be nice if we were involved in planning the appropriate and most optimal study with the appropriate reasoning.

Hence our new officer-of-the-day (OOD) construct where we are physically present with our knowledge and imaging support from noon until the next morning 8:00 a.m. every day, traditionally the hours that most imaging is required in the emergency department, as well as when acute studies are requested by the rest of the hospital. This has been in place now since mid-2011. I can only report positive feedback!!

Measure what you Manage

How do we measure whether this new strategy is actually working? A well-known statement in business as well as in medicine is that 'you cannot manage what you cannot measure'. We have therefore set up a number of performance metrics that give us an idea as to how we are doing, but also warn us in real time fashion when correction and changes are required to meet our performance expectations. These include numbers with regard to scheduling, the performance of our procedures, as well as some QA issues, the most important one being critical findings.

The most noticeable improvements we have made recently are:

1) Scheduling – The number of no-shows per month, per modality were tracked and we set in place a system where the referring providers are notified that their patient has not shown for their appointment. Also, the patients that are scheduled for time and labour intensive studies such as IR are being called the day prior. We need more improvement here as compliance with ensuring every attempt has been made to contact the patients is low.

2) Study performance - We are also monitoring the time it takes from each study to go from I(ncomplete) to C(omplete) status, in other words, when the study is available for the radiologist to interpret. At this point, this metric is unsatisfactorily long but improving. Both our possibly outdated protocols, but also our technologists' less than optimal workflow might be the culprits here. The system does allow for better QA of the technologists' product: in the olden days we could track 're-takes'; in the digital age we cannot and thus must devise other ways such as time to completion and adherence to protocols.

3) Workflow - Our new ED coverage schedule has allowed us to look at the actual volume of studies that we do per modality from 8:00 a.m. to 12:00 noon, 12:00 noon to 5:00 p.m, 5:00 p.m. to 10:00 p.m. and from 10:00 p.m. to 8:00 a.m. in an 'acute' setting. The volume of completed, preliminary and final reports for these studies is also tracked and shows significant improvement already.

4) Time - We also measure the time it takes from order entry to completion of the study. Particularly in the ED this will help us avoid complaints about the imaging department being the reason for poor length-of-stay metrics in the ED. This is in progress.

5) Critical findings - Lastly, we look at how we manage the reporting of critical findings, for instance, pneumothorax or tube malplacement has to be reported within 30 minutes. Do we a) do that? and b) in a timely fashion so patient care is optimal?

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RADIOLOGY SESSION SCHEDULING

An IT-Based Flexible Reporting System

Traditionally, radiologists in the UK and other parts of the world have worked to timetables based on the radiographic list. Sessions, usually lasting a half-day, would be defined by modality. For instance, the CT or MRI scans performed during that session would be reported by the radiologist, to whom that session "belonged". Other sessions might be put aside for plain film or other reporting, for example nuclear medicine. Other sessions could be considered to be hands-on, such as interventional radiology, ultrasound (if performed by the radiologist) and "hot" duties. This can be seen as a rather inflexible way of working and does not optimise the efficient use of resources, in terms of both equipment and personnel.

"The departmental rotas and work lists are managed by a spreadsheet-derived in-house authored programme called Wizrad"

The creation of a system for the fair allocation of workloads, which is balanced for each member of the department, has long been a challenge. Another driver for change is the demand for extended hours working in diagnostic imaging, beyond the traditional office hours (Monday to Friday after 17.00 p.m.) with emergency on-call services only available beyond these hours. In The West Hertfordshire NHS Trust (WHHT) we have introduced an IT-based flexible generic reporting system, which also manages interlocking rotas, providing extended working hours.

Local Background

In 2009, a free standing 120-bed Acute Admissions Unit (AAU) with integrated diagnostics (plain film, CT, US and reporting facilities) was opened within our trust. This was in order to introduce a new service delivery model for acute care. The aim was to improve patient care and reduce length of stay, allowing fewer acute care beds and improving hospital-acquired morbidity. The model utilises seven days working with early senior clinical input and diagnostics in order to improve decision-making and diagnostic certainty. Consultant level ward rounds are held at least daily on a 365-day basis, supported by an extended day working in clinical support and therapy areas.

Activity mapping prior to the changes suggested that all emergency and in-patient investigations equated to approximately 20 hours of radiologist time. The radiology department agreed to provision this on an 08.00 a.m. – 20.00 p.m. basis Monday to Friday and to provide a radiologist on-site between 09:00 a.m. - 13:00 p.m. on weekends and bank holidays (the hours being constrained by financial and other staffing considerations), supported by radiographers and radiographic assistants. The AAU radiologists are responsible for all in-patient investigations and simple radiological interventions.

Use of Information Technology

The departmental rotas and work lists are managed by a spreadsheet-derived, in-house authored programme we call Wizrad. This programme has a scheduling function that identifies each of the radiologists on the individual rotas, a diary function with a record of each person's leave and a workload function that calculates the number of examinations of different modalities that each radiologist has the time to report on a weekly basis. A new version is currently undergoing commercial development designed to provide comprehensive business intelligence and clinical governance functionality. Radiology reporting is performed from individual work lists on a Radiology Information System integrated with PACS.

Radiologist Rotas

We have 18 radiologists who work to multiple rotas (see table 1). Most radiologists spend approximately one week in four in AAU either as AAU1 (08.00 a.m. – 16.00 p.m.) or AAU2 (10.00 a.m. – 18.00 p.m.). Specialties having greater fixed commitments, e.g. breast radiology, have reduced presence in the AAU. There are further evening, weekend and bank holiday rotas as well as a traditional out-of-hours on-call rota.

Rota	Time
AAU1	08:00-16:00
AAU2	10:00-18:00
Evening, M-Th	17:00-20:00
Weekend, Fr	17:00-20:00
Sat/Sun	09:00-13:00
Public holiday	09:00-13:00
On-call	outside above hours

Table 1

Radiologist Rotas

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Hertfordshire, UK

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DATE	DAY		AAU1 8 a.m. – 4 p.m.	AAU2 10 a.m. – 6 p.m	AAUE 5 p.m. – 8 a.m.	On call
22-Feb-09	SUN	AM	AA			
22-Feb-09		PM				EE
23-Feb-09	MON	AM	BB	CC		
23-Feb-09		PM	BB	CC	DD	MM
24-Feb-09	TUE	AM	BB	FF*		
24-Feb-09		PM	EE*	CC	GG	PP
25-Feb-09	WED	AM	BB	CC		
25-Feb-09		PM	BB	CC	HH	RR
26-Feb-09	THU	AM	BB	JJ*		
26-Feb-09		PM	BB	CC	KK	SS
27-Feb-09	FRI	AM	BB	CC		
27-Feb-09		PM	BB	CC	LL	TT
28-Feb-09	SAT	AM	MM			T
28-Feb-09		PM				TT

Table 2 (above)

Example of a departmental AAU rota with fictional radiologists.
*="filler"
Taken from "Wizrad"

The Job Plan

Most UK radiologists are employed by the NHS on a standard time-based contract. This is comprised of four-hour units known as programmed activities (PAs). A full-time consultant will typically be employed on between 10 and 12 PAs, equating to 40 - 48 hours. PAs are classified as direct clinical care (DCC), supporting professional activities (SPAs) and others (managerial, etc.). SPAs include activities such as clinical governance, audit and education whilst DCC includes all clinical activity, including multidisciplinary meetings.

Radiologist employed on 11 PAs	= 44 hrs
On-call allowance	-4 hrs
Evening/weekend rota	-4 hrs
SPAs	-8 hrs
MDT (including preparation)	-3 hrs
Biopsies, average two/week	-1 hr
Ultrasound lists x 2	-7 hrs
Screening list	-3 hrs
	=14 hrs available for generic reporting

Table 3

Worked example of a weekly job plan (radiologist available for all sessions)

Table 4 (below)

Example of a radiologist's workload for one week, taken from Wizrad.
An AAU session has replaced a reporting session. Dumping refers to the days on which that radiologist's work is to be allocated. N.B, this reflects more than eight hours of reporting time.

During AAU weeks, working hours are defined by the rotas. When not in AAU the radiologist performs traditional type work, although not with traditional lists (other than if hands-on). The radiologist's reporting workload is calculated by Wizrad. This system allows flexibility in the provision of "fillers" when the scheduled AAU1 or AAU2 radiologist is not available.

The reporting workload is allocated based on the amount of time available for this activity within the individual's job plan on a week-by-week basis. The calculation starts with the number of contracted PAs (see table 3). From this an allowance is subtracted for the evening and weekend rotas, on-call commitment, SPAs and other non-clinical activities. The remaining DCC time then has hands-on time removed. Only the actual time spent on these activities is credited, for example an ultrasound list running from 09:00 a.m. - 12:30 p.m. will credit 3.5 hours. The system can allow for activities performed on an irregular basis, such as multidisciplinary meetings attended on alternative weeks. Preparation time for such activities is also allowed for. Interventional procedures are averaged over the year.

The remaining time is allocated for generic reporting of a mixture of modalities, primarily plain films, CT, MRI and nuclear medicine. The ratio of the modalities is agreed on an individual basis and can be set at 0 percent if the radiologist does not do that modality. Individual examinations are apportioned a time tariff based on complexity, and this includes allowance for vetting, verifying, and so on. Wizrad can apply weightings for time-consuming activities such as voice activated dictation and teaching.

Workloads for the individual radiologist are then available to the radiographer modality leads. They are responsible for allocating the cases to the radiologists' digital work lists from where they are directly reported. The work is allocated allowing for subspecialty interest. There is some flexibility whereby capacity can be swapped between the modalities if necessary.

Outcome

Radiological output has increased by approximately 25 percent. The changes have proven popular with the radiologists; there is no desire to return to the previous system. They have a great deal of flexibility as to when they perform their reporting, and clock watching is a thing of the past. Morale has been greatly improved as reporting is apportioned on a transparent, equable basis.

This has also proven to be a powerful management tool. Reporting capacity is now fully mapped and can be accurately predicted. Potential staffing shortfalls can be predicted and re-allocated as necessary. As we have a clear idea of capacity, it is much easier to justify the size of the radiological establishment and negotiate new posts.

Conclusion

The timetabling model that I have described works well in my department, which does not necessarily indicate that it would be suitable in other settings. However it is clear that major improvements in radiologist working practices can be achieved with consequent advantages to both the practitioners and the service they support.■

25-Jan-10	*DUMPING*	TUE/ WED
No. of Reporting sessions		2
Standard Reporting sessions/ week		3
CT scan		
Mild		4
Moderate		1
Severe		4
MRI(Total/ Mild/ Moderate/ Severe)		18 | 3 | 13 | 2
Plain films		99
Nuclear medicine		0

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Our performance is within Joint Commission Standards, but there is room for improvement.

Conclusions

Most of these metrics, if not all, are visible for every person in this department via SharePoint, our new communication tool for the department. They are summarised in a so-called dashboard; this will give each section, each modality and each colleague insight into how we are doing, but also to see where he or she might be able to help in further improving these metrics. It is hoped that with timely advice, timely performance and timely interpretation imaging sciences has real, reproducible and reliable added value to achieving medicine of the highest order. ■

» CONTINUES FROM PAGE 23

allows us to make more accurate comparisons in our feedback reports. We consider this to be essential, and it distinguishes the ACR DIR."

Playbook names also provide substantial benefits in clinical applications. They enable more accurate ordering and scheduling, standardised image acquisition protocols, automated selection of reporting templates and more efficient and accurate coding and billing.

RadLex is being adopted by users and developers of imaging-related HIT systems and other applications that can benefit from radiology-specific coded terminology. Some early applications include radiology decision support and reporting tools and search applications for radiology research and education. Reporting templates developed by the RSNA Reporting Committee use RadLex terms in their content. Reports using RadLex terms are clearer and more consistent, removing potential for error and confusion. Clinical trials investigators can use RadLex terms to "tag", index, search and analyse radiology-related medical data. Developers of educational tools can likewise use RadLex to organise their materials and make their contents more definitive.

The RadLex project is led by a steering committee of experts in radiology informatics and medical terminologies and overseen by the RSNA Radiology Informatics Committee. In 2005, six RadLex organ system committees were formed in collaboration with more than 30 radiology professional and standards organizations, including ACR, DICOM, and IHE. In 2007, six additional committees were recruited, each focusing on a specific imaging modality. These modality committees have defined terms to describe the devices, imaging exams, and procedure steps performed in radiology, an effort called the RadLex Playbook. These committees support the steering committee in ongoing development and curation of RadLex.

RadLex is freely available for download and use in clinical, research and educational applications. Radiologists and developers of radiology reporting systems can incorporate RadLex terms into their diagnostic reports by adopting the RSNA reporting templates available here. Experts in radiology and medical informatics are invited to participate in the development and curation of RadLex. ■

MARKET PREDICTIONS FOR MEDICAL IMAGING

Top Five Technology Trends for 2012

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Many medical imaging markets experienced rapid decline as a result of the global recession, not just last year but in the years previous. Some segments of these markets are however, already recovering with strong growth prospects, while others are still struggling to return to pre-recession levels. InMedica analysts assessed a range of medical imaging markets to identify the key growth prospects for this industry in 2012.

Hot Trend # 1. Point-of-Care Ultrasound

The global point-of-care ultrasound market is experiencing strong demand, driven by key applications such as anaesthesiology, musculoskeletal, emergency medicine and critical care. Combined, these markets are forecast to increase by 44 percent between 2011 and 2015.

The use of ultrasound in point-of-care applications is well established in mature healthcare markets, such as Western Europe and North America. The capability for rapid patient diagnosis using flexible ultrasound platforms, as well as the development of new product innovations, has driven growth in these point-of-care markets. For example, improved procedural guidance and visualisation techniques have helped drive the use of ultrasound in anaesthesiology. In comparison, emerging ultrasound markets, such as in India and Latin America, are still in the early stages of point-of-care development. Increased physician education is needed to demonstrate the benefits, both clinical and financial, of using ultrasound in point-of-care applications. With this education becoming more widespread, along with the growing compact market, the significance of ultrasound in point-of-care is starting to become more recognised.

InMedica predicts that the point-of-care ultrasound market will grow at a double-digit rate in 2012.

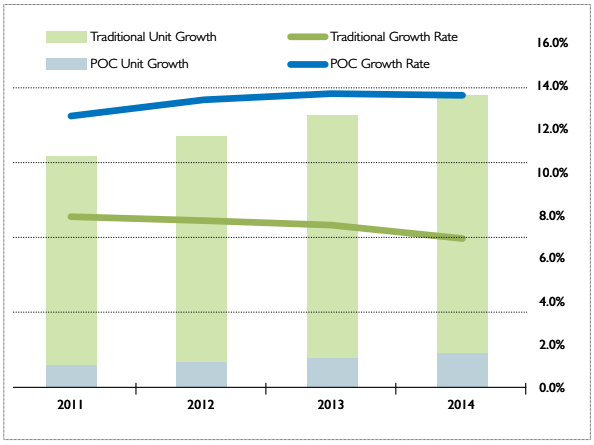

Figure 1

World Utrasound Market: Traditional vs. Point of Care Revenue Growth Rates. In-Medica

Hot Trend # 2 Mobile X-Ray

The newest generation of wireless flat panel x-ray detectors boast stronger casing, faster processing and longer battery life, clearly improving daily radiography workflow. Yet, their greatest benefit is not in their internal components, but in their method of application. The most notable beneficiary: mobile x-ray systems.

The technology of wireless FPD for x-ray usage has been available for the last few years. A higher price tag and risk of drop damage or theft initially dented market confidence. Yet, the first generation of wireless panels combined unique features for digital FPD: near instant processing in a cassette format. Now, the newest generation of wireless panels has been deployed in new mobile x-ray systems, providing a recipe for market success.

The impact of these new systems in clinical settings are clear; radiographers will no longer have to shuttle between patient bedsides and processing rooms, increasing exam time efficiency. Wireless panels also simplify patient positioning, as panels are not tethered. Digital FPD solutions also boast dose reduction benefits, especially important in clinical settings outside the radiography suite.

Consequently, InMedica forecasts that this surge of new wireless mobile X-ray systems will push global revenue growth for this market above 10 percent in 2012.

Hot Trend # 3 MRI, CT and Angio/Cardio X-Ray

The CT, MRI and angiography/cardiology x-ray markets are set for a challenging 2012. Less expensive modalities, such as ultrasound and general radiography, have bounced back from the economic downturn, buoyed by cost-efficient purchasing and significant advances in imaging technology.

In contrast, continued economic uncertainty continues to negatively affect healthcare expenditure, with many

orders postponed or cancelled. Combined with concerns regarding CT and x-ray dosage and less robust investment from emerging regions, these factors are set to prevent any significant global market rebound.

Despite this, a few areas of the "big iron" market look set to buck this global trend. The cylindrical 3T MRI market is set for global revenue growth of 7 – 10 percent, spurred by increased market penetration of wide aperture and short bore systems. Demand for 64-slice and above CT systems will offset market decline in 16 and under slice CT systems, driven by demand for greater image quality, particularly in CT angiography (CTA). Furthermore, the release of dynamic flat panel detectors for angiography, cardiology and fluoroscopy X-ray should boost this segment.

InMedica forecasts that the global markets for CT, MRI and angiography/cardiology x-ray will not exceed five percent revenue growth in 2012, despite stronger growth in some market segments, as outlined above.

Hot Trend # 4 Digital X-Ray in China

The Chinese digital x-ray market is rapidly evolving. Unlike most other regional markets, this comprises Computed Radiography (CR), Charged Couple Device Digital Radiography (CCD-DR), and Flat Panel Detector Digital Radiography (FPD-DR) systems. CCD-DR is only supplied by local Chinese manufacturers, who have over the last three years successfully penetrated the large Computed Radiography (CR) x-ray market. These gains are particularly obvious in tier two, county-based hospitals, where budgets are limited. Yet, this trend is already changing, with many local suppliers introducing FPD-DR products since 2010.

The Chinese government has had far less influence on the market recently, with the rapid shift in the products offered by local suppliers driven by the demands of hospitals. Increasing patient numbers are resulting in hospitals having larger budgets, thereby reducing dependency on state funding. More relaxed state legislation is also increasing hospitals' willingness to purchase FPD-DR systems, with the aim of improving working efficiency and improving image quality.

An increasing number of tier two county hospitals are investing in higher specification FPD-DR systems. However, for local suppliers, production of low-cost FPD-DR will be challenging. FPD-DR has been used in metropolitan tier three hospitals for a number of years, with many hospitals preferring to purchase well-known international branded systems, despite the higher cost. In some areas, government bidding may assist local providers to enter the market; however, many are unable to compete with the quality of international systems at present.

InMedica forecast that unit growth of FPD-DR in China will be 20 percent in 2012. In contrast, CCD-DR will decrease 25 percent in 2012.

Hot Trend # 5 Managed Services in PACS

Managed services (MS) refer to a model where the vendor owns and manages the IT infrastructure, providing service level management, application and system administration. The vendor is also fully responsible for maintaining this infrastructure, including the datacentre/storage, which may be housed locally or remotely.

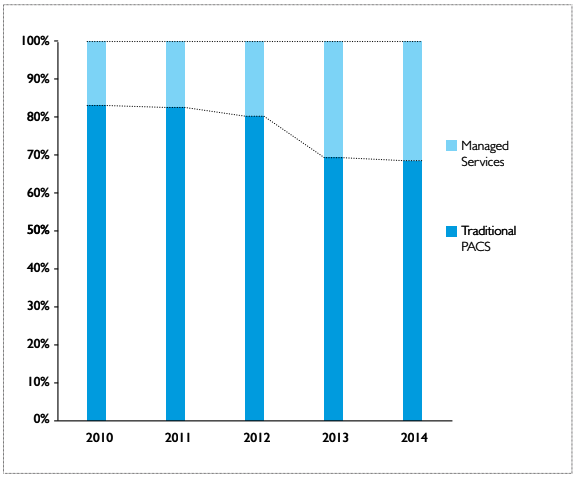

Figure 2

World Market for PACS: Revenues by Business Models. InMedica

The benefits of managed services include reducing the need for heavy capital investment in PACS, such as costly in-house IT support staff and IT infrastructure investment. It also provides regular access to the latest software upgrades and allows flexible storage capacity to suit end-users' needs. Managed service models also involve a fee-per-study option, where hospitals can switch from a capex to an opex model, only paying for studies and storage space as and when they need it. In the current economic climate as hospitals face reducing capital expenditure and reducing reimbursements, this is becoming increasingly attractive. Subsequently, managed service revenues in the PACS market are forecast with strong growth - a compound annual growth rate (CAGR) of 20.3 percent from 2010 to 2015.

InMedica projects that global revenues for managed services in the PACS market will reach 328.1 million U.S. dollars in 2012.■

IMAGING REFERRAL GUIDELINES

Update from RCR's iRefer Guidelines

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The Royal College of Radiologists (RCR) of the UK has just released iRefer: Making the best use of clinical radiology. Despite the new name, this is the seventh edition of the radiology referral guidelines, demonstrating through more than 20 years support, the RCR's commitment to the importance of guidelines in the delivery of radiology services for patients. Evidence from the increasing use of diagnostic radiation and publications on the percentage of unnecessary test requests indicates that such a resource is essential.

Diagnostic radiology in the USA accounts for as much per capita radiation as natural causes (up from 15 percent in 1980 to 48 percent in 2006) [NCRP 2009]. The number of CT examinations has increased at 10 percent per annum in the USA since 1980, from 3 to 80 million, driven by technological advances and combined with increasing complexity and multiple phases. Estimates are that up to 44 percent of CT exams may not be justified [Hadley et al. 2006].

> "There is evidence that justification is lacking for many radiological procedures and that the number of such procedures may be reduced by use of referral guidelines"

The RCR realises that the production of guidelines alone is not enough; the next step is to ensure that they are used effectively. This view is supported by the European Medical Directive [European Union 1997], World Health Organization (WHO) Global Initiative [WHO 2010] and several International Atomic Energy Agency (IAEA) workshops all advocating the use of, and compliance with, referral guidelines.

A project, sponsored by the European Commission, is under way to survey the use of such guidelines in member states, and in 2012 an IAEA workshop will address guideline methodology and distribution.

Why are Guidelines Needed?

Evidence-based referral guidelines help in the choice of the right radiological investigation and in so doing facilitate:

- Early exclusion of serious pathology which reassures and empowers patients;
- Prompt diagnosis and therefore earlier effective treatment;
- Referral to the appropriate specialty (if needed) reducing inappropriate specialist referrals, and
- Effective use of available resources.

Good guidelines build the best available evidence into the decision-making process and are there to help make the right choice and also for reference when the referrer might be in doubt. The right radiological investigation will always obtain maximum information with the minimum of radiation, inform clinical management, reassure the patient and add confidence to the clinician's diagnosis. The wrong investigation won't help – and it may add unnecessarily to patient irradiation.

RCR iRefer Guideline Development

The development of the iRefer guidelines (formerly referred to as Making the best use of clinical radiology services; MBUR) has evolved over its seven editions to incorporate a more evidence-based approach. The enhanced guidelines methodology has been accredited by NHS Evidence, managed by the National Institute for Health and Clinical Excellence (NICE).

This incorporates:

- Centralised literature searches;
- Expert panels from special interest groups which are system-based, age-based (paediatrics) or modality-based (especially for nuclear medicine);
- Delphi consensus to agree recommendations, comments and grading of evidence. These Delphi groups comprise approximately ten experts and a mix of specialty and modality base. Consensus is reached with 75 percent participation and 75 percent agreement at 5, 6 or 7 on a 7-point Likert scale. Expert bias is avoided by anonymising data and geographical bias avoided by use of Delphi experts from different centres;
- Wide consultation with colleges and organisations, and
- Consideration of additional evidence through

consultation in the editorial phase.

Stratification of recommended investigations is based on:

1. Evidence-based diagnostic impact. Selection of the best test is ensured for the clinical indication
2. Radiation effective dose. Low or no dose investigations are promoted
3. Cost-effectiveness.

Particular consideration has been made in the paediatric population recognising the different spectrum of diseases and the increased sensitivity to the biological effects of radiation.

Who Should Use Referral Guidelines

Referral guidelines are largely aimed at referring medical practitioners to select the best choice of investigation for their patient. In the UK, the RCR guidelines are seen as a resource for all referring clinicians. However, certain groups have been targeted, particularly doctors in training and general practitioners (primary care physicians).

Additionally, since 2006, imaging referrals in the UK have been accepted from appropriately trained, experienced healthcare professionals who are not medically qualified. Referral guidelines are also helpful to radiological practitioners for the ICRP level 2 [ICRP 2007] generic justification of investigations, particularly to avoid ionising exposures where a suitable and effective non-ionising alternative exists. Whereas the ICRP level 3 justification on an individual basis can only be made with dialogue between referring and radiological practitioners, guidance incorporating an up-to-date knowledge base informs this process of both efficacy and radiation dose. Such guidance must include choice – where appropriate – to enable the best test within resource constraints.

Do Guidelines Work?

There is evidence that justification is lacking for many radiological procedures and that the number of such procedures may be reduced by use of referral guidelines. After the publication of the first edition of the RCR referral guidelines in 1989, there was seen to be a reduction in referrals for plain radiographs by 13 percent, from 88.4 to 77.2 referrals per thousand patients [Royal College of Radiologists 1993]. The following year, a randomised controlled study by GPs in the UK showed significantly fewer referrals for lumbar spine radiography and a higher proportion of requests conforming to guidelines, in the group of GPs to whom guidelines were distributed [Oakeshott et al. 1994].

This early success by simple distribution of guidelines was not sustained in a longer study over four years [Matowe et al. 2002], and additional strategies were clearly required. Feedback of audit data regarding unjustified referrals for lumbar spine and knee radiographs was ineffective at reducing referral rates, but an educational reminder in reports for such incompletely justified investigations was helpful in producing a 20 percent reduction [Eccles et al. 2001]. This effect was sustained [Ramsay 2003].

WHAT'S NEW IN THE SEVENTH EDITION OF THE RCR GUIDELINES?

- New dose table based on recent publication from the Health Protection Agency [Hart et al. 2010]
- Methodology more uniform with Delphi consensus for all guidelines
- Further incorporation of clinical guidance. Use of red flag features helps clinicians to use of the appropriate guideline (Figure 1)
- Updating chronic back pain imaging in light of new evidence which shows no benefit of imaging for uncomplicated back pain (Figure 2)

WHAT ARE THE BENEFITS OF GUIDELINES?

The benefits of effective use of guidelines is clear

- To patients
  - The most appropriate test in a timely manner
  - Avoid unnecessary radiation or invasive tests
- To referring clinicians
  - Better care for their patients
  - Effective use of their time
- To healthcare funders
  - Cost-savings from reducing unnecessary tests

Challenges for Guideline Implementation

With so many benefits, the case for guidelines is obvious but despite this the RCR, like others, struggles to get healthcare professionals to embrace their use. It is difficult to get referring clinicians to use them without some form of encouragement, effective feedback or sanctioning. The reasons for this are many, including issues around time pressures, inaccessibility of guidelines, information overload, mixed messages from different guidelines, and patient expectations.

Clinical audit for improvement and monitoring

Clinical audit has been shown to be one way of improving compliance with guidelines. The power of such a voluntary process

should not be under-estimated with reported improvement in inappropriate utilisation of lumbar spine radiography by up to 70 percent [Patatas 2008]. Other examples of local internal audit may be found on the RCR website [RCR 2010]. More formal external audits are available in some regions, most notably in Europe [Faulkner 2010]. Monitoring of individual's radiation dose may now be made utilising a Smart Card [IAEA 2010].

Regulation

When voluntary methods for monitoring and ensuring compliance are ineffective or unwanted, the last resort is regulation either by legislation or by reimbursement by payers. Under such circumstances, the clear message for radiation protection through justification occasionally may be muddied by conflicting interests, usually to reduce costs. Audit may be usefully combined with a regulatory process [Hirvonen-Kari et al. 2010].

The Future

Added to the challenges of implementation is the ongoing production of up-to-date evidence-based guidelines. The RCR has relied heavily on the enthusiasm and dedication of a significant number of its members giving up their time to support this work. Even so, there is a considerable cost required to resource the process and the production of the final versions, particularly as the process becomes, rightly, more robust and the delivery more complex. In the past, this process has been supported by funding nationally outside the College, but recurrent support in its entirety has proved difficult and so the challenge is to look at other models of ensuring effective use of the guidelines.

The RCR is answering this challenge by innovating. The new name, iRefer, brings with it new methods of making the guidelines available. Gone is the old reliance on printed versions; the new guidance is predominantly web-based (Figure 2).

In addition, there is now an iRefer App for iOS and Android devices – so referrers need never be without the guidance.

The RCR is particularly keen to develop decision support software based on its guidelines, so that iRefer can be used exactly when needed – when the decision to refer is made.

Despite the challenges of implementation and the obstacles of lack of funding for the ongoing review and update of the evidence, the RCR and its members remain passionately committed to the ongoing production of guidelines and we will continue the look at novel ways to make them more available and more effective.■

Figure 2

The online version of iRefer

Figure 1

iRefer is available as an app for iOS and Android platforms

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PROFESSIONAL CHALLENGES FOR MEDICAL IMAGING

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High Technology Booming in Algeria

The radiology department of the University Hospital of Ben Aknoun hospital was founded 2007 and comprises three units: conventional radiology, ultrasonography, and CT. Two units are in the process of creation: MRI and vascular radiology. The activity of the imaging department is strongly linked to the direction of the hospital, which specialises in the musculoskeletal system. The hospital includes seven departments: rheumatology, neurology, orthopaedic surgery, functional rehabilitation, neurophysiology, laboratory and medical imaging. The imaging department's current activity centres around standard and specialised x-ray scans, including ultrasound, CT scans and echography.

The equipment onsite includes a room with remote controlled fluoroscopy, a bone and lung room and two Doppler echography machines, one of which is equipped with an 18 MHz linear probe for the practice of musculoskeletal examinations. The equipment we are now awaiting to complete the unit includes a room with remote solar panel, a table with bone-lung plate collector, two latest generation Doppler echography machines, a dental imaging machine, and completion of the digitisation of radiology with a PACS and RIS.

Future Development of the Imaging Department

We are planning to develop our technology during the last quarter of 2012 in terms of MRI, angiography and mammography. The department is currently being restructured and activity is limited to approximately 6,200 patients per year and 6,550 examinations. Private radiology departments and imaging centres are concentrated in big cities, and private clinics are well equipped with the latest imaging technology, so we strive to provide a similar high level. Some regions within the country and especially the southern areas aren't very well equipped but a special effort is made by the authorities to equip these areas, which suffer from a lack of human resources as well as geographic remoteness. At present, cephalometric analysis and remote imaging are both in their infancy and are coming up against internet access problems such as low bandwidth and connectivity issues.

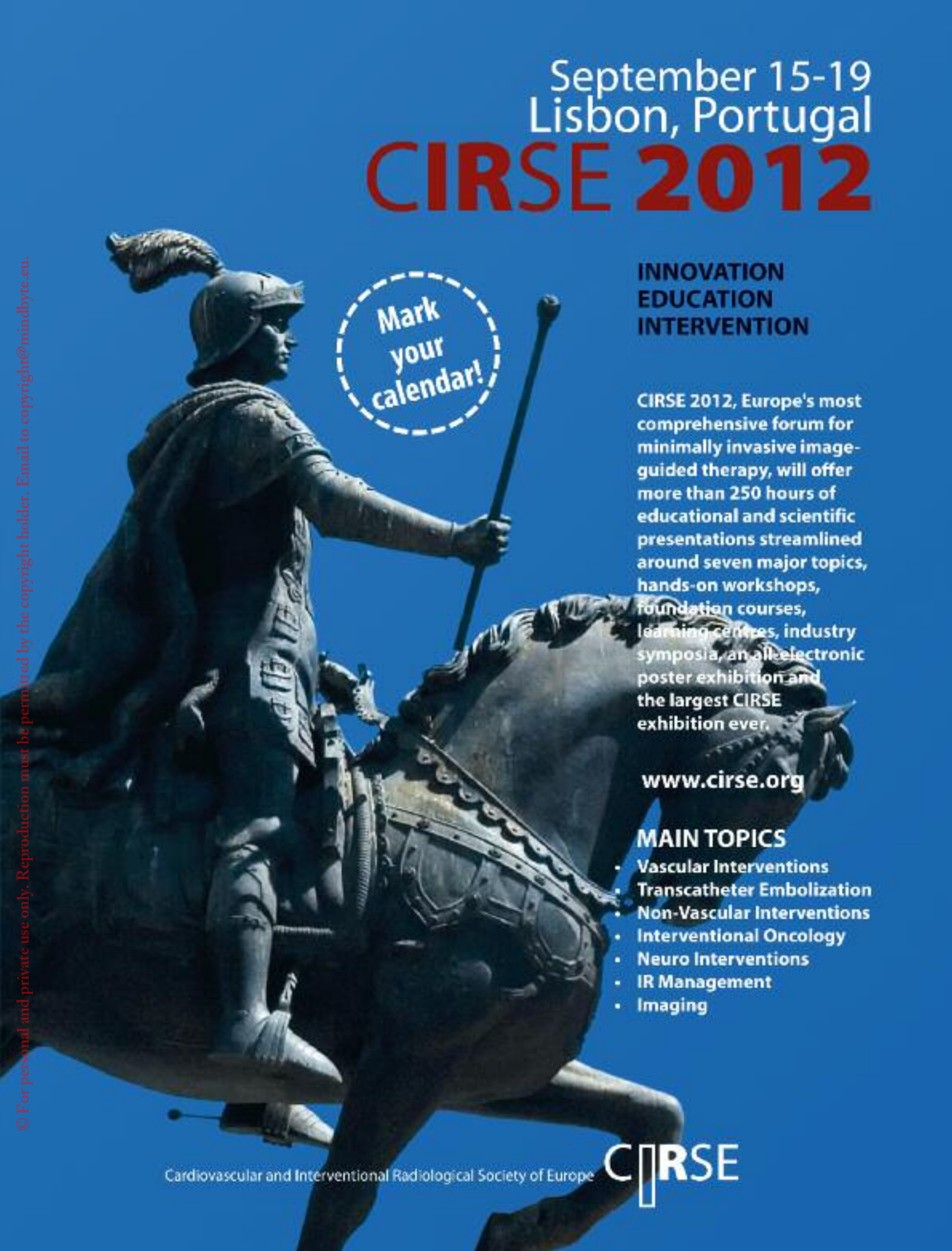
Training of Radiologists

Residents are recruited by competitive examination after obtaining a doctorate in medicine. Their training lasts four years, with annual reviews and a specialised studies diploma. Some receive training abroad during their studies. Once the specialty diploma is obtained, the majority are allocated within health facilities across the country (Algerian specialists are bound by civil service lasting from one to four years depending on the place of employment: one year in a landlocked city and four years in a big city). Some go to find work abroad, mostly in France or Belgium, for additional training or sub-specialisation, while others leave the civil service, working in private clinics "in the hope of better days to come". Algerian residents undergo clinical practice during their studies and are on call before becoming qualified. We currently have about 65 percent of radiologists in the public sector and 35 percent in private. The trend is towards developing the private sector. The two are complementary despite the boundaries of state structures.

High Technology Booming in Algeria

High-tech imaging is booming in Algeria, with about 340 scanners located throughout the Algerian territory, 34 MRI machines, dozens of imaging facilities, 202 mammography units and so on, so we are driving growth in high technology to remain competitive and ensure a high standard of care for our demanding patients. Our society has identified 1,012 radiologists and 270 residents in Algeria. The Algerian Society of Radiology and Medical Imaging (MARS) was founded in 1996 and its main goal is training. Its most important activities are organising international scientific events (congresses, training courses, workshops, etc.). Up to six events are organised each year.

During my career, there are certain achievements in the development of medical imaging in Algeria, of which I am most proud; the creation of JARIM (the Algerian Journal of Radiology and Medical Imaging), the links we developed with the French Society of Radiology (SFR) and soon with the Belgian Society of Radiology; the consolidation and development of relations and exchanges within the Maghreb radiology federation comprising Algeria, Libya, Morocco, Mauritania and Tunisia and, of course, the training of young radiologists. ■



HOT TOPICS FOR **MEDICAL IMAGING IN ALGERIA**

Business Management for Radiologists

Interviewees
Prof. Ag. M. Yaker

Owner and Medical Director

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F. Tala-Ighil (above)

Business Manager
Center of Medical Imaging of Algiers (CIMA)
Algeria

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Please tell us about your professional career.

Prof. Yaker: I specialised in interventional radiology techniques during four years of training in Paris in the public sector, and then returned to introduce interventional radiology to Algeria. Since 1993, I moved to the private sector and founded the Centre of Medical Imaging of Algiers (CIMA), which offers all imaging exams, including nuclear medicine. Our technology capabilities include a 1.5T MRI, a 16-slice CT, five workstations, two gamma cameras, a digital mammography unit, four ultrasounds, two digital radiology tables, an osteo-densitometry unit and a digital dental panoramic imager. In addition, we have five workstations, a PACS, and a RIS. The centre employs 13 radiologists and two anaesthesiologists among 90 staff. We performed 80,000 exams during last year. In addition to my daily work as a radiologist, I am the Medical Director. In this context, I orientate the radiologists' activity towards a specialisation by organ and encourage the continuous improvement and the regular updating of our work practices.

F. Tala-Ighil: After graduation in a French management school (EDHEC Lille), I worked in an international pharmaceutical company in Algeria as a sales manager in charge of import and distribution of medicines. I managed 180 employees working in three distribution centres. This taught me a lot about how to manage and motivate people and showed me the power of a motivated staff. I began to work in the CIMA as a Financial Director first then as General Manager since 2008. My main mission as a manager is to make 90 individuals work as a team, like musicians form an orchestra. Success lies in alchemy and taking pleasure in teamwork, but this requires the ability to listen and to show respect for others.

What sorts of qualifications does one require to work as a business manager in a department of medical imaging in Algeria?

F. Tala-Ighil: A business manager needs to have management qualifications from a business school or equivalent institution that provide strong knowledge of accounting and finance, human resources, organisation, marketing, quality assurance, information systems, and so on. In a medical imaging centre, the relationship between the medical staff and the manager is very specific and delicate to manage. It is not a hierarchical one and it needs to be built up step by step. In Algeria, public medical care is still free of charge. It's why Algerian patients used to think that a private service must be better than a free one and they are very demanding concerning service quality.

How is cooperation organised between the Chairman and the Business Manager?

Prof. Yaker: It's built around formal monthly meetings where the manager presents quantitative results of the activity and informal daily meetings where we talk about current problems and the different possible solutions.

F. Tala-Ighil: I have six administration direct reports (from human resources, accounting, IT, QA, stock management and sales) and five other medical direct reports (from MRI, CT, X-ray and US, Nuclear Medicine and Mammography). I meet each once a week for a review of the problems and an overview of work in progress. I also often work with them in their own environment; it gives me an opportunity to better understand their specific problems.

Can you tell us how budgeting and financial issues are decided and implemented in the department?

F. Tala-Ighil: Prof. Yaker and I decide budgeting and financial issues. The accounting and finance manager is in charge of accounting, preparing business plans, budgets, salaries, equipment inventories, and so on. We've also set up a cost accounting system since January 2012. Our equipment is financed by bank loans.

Is there a dedicated manager for staff and human resources?

F. Tala-Ighil: We have a human resources manager in charge of selecting CVs and interviewing candidates when we recruit, following career advancement, organising staff planning, resolving internal conflicts within the centre, managing hygiene, security and safety. She has a crucial role: she's listening daily to employees' problems and collecting suggestions. She and the department managers are the main people who make the staff participate in the centre's management.

What about waiting lists?

F. Tala-Ighil: We've worked these few last years to optimise patient workflow. We're able now to receive almost all the patients without appointment. We've maintained appointments only for MRI and few other exams for medical reasons (HSG, myocardial scintigraphy, biopsy, interventional radiology). To minimise the time spent by the patient and the waiting list in the MRI department, we've adopted the following measures:

- Two MRI beds available to prepare patients outside the MRI room;
- All the coils are duplicated;
- Offer 7/7 working time due to increasing demand, by streaming our five technicians into three combined teams and recruiting a new full-time radiologist, and
- A dedicated telephone reception facility for MRI appointments.

Thanks to this, activity increased by 30 percent in 2011.

What sort of methods do you use to monitor quality control?

F. Tala-Ighil: Quality control must be based on measurable quality criteria. Currently, all our efforts are focused on measuring the delays because the first patients' demand is to minimise them and to respect the appointment time. The main tool to measure delays is the RIS. It gives the information below through three steps: appointment (see fig. 1), examination (see fig. 2) and results delivery (see fig. 3)

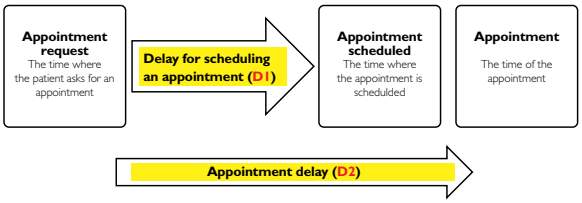

Figure 1

Appointments

In the MRI department, the patient sends their request for an appointment by mail, phone or by moving to the centre. The request is dealt with by receptionists who schedule a date. Therefore, we need to reduce both the delay to phone back the patient and give him an appointment (D1) and the time between the request and the appointment (D2). After the examination, we give the patient a promised date for the results delivery. This date is entered into the RIS and compared later to the real time where the results were delivered.

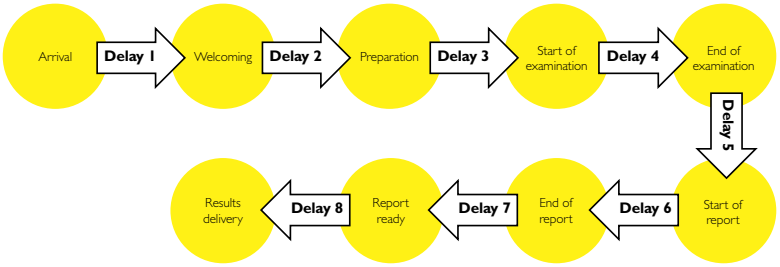

Figure 2 (above)

Examinations

Why should management be an important part of the education of a radiologist, and do you think that this belief is growing?

F. Tala-Ighil: Actually, radiologists are often both radiologists and managers. When one recruits or invests in new equipment and need to ask the bank for a loan, when one buys software solutions, etc, that person is in a manager's role and not in a radiologist's one and needs therefore good qualifications to do it well.

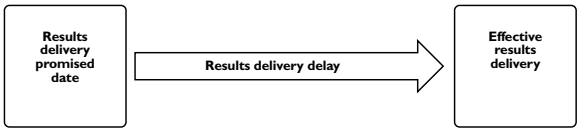

Figure 3

Delays in Results Delivery

How can the Chairman of the medical imaging department balance their workload, between managerial duties and scientific ones?

Prof. Yaker: In our centre, the importance of management requires a specific competency that a Medical Director couldn't have; he spends his main energy on medical and scientific activities. A manager and a sufficient number and level of administrative staff are essential to the management of the centre, which is a real company in the economic sense of the term, because of the importance of the investments and the significant number of employees.

Finally, please share your top pieces of advice for the optimal management and administration of a medical imaging department, with our readers.

F. Tala-Ighil: My advice would be to entrust management to a professional manager, but recognise the necessity of the radiologists' involvement in management; and to use two strong tools when commencing new business activity. These are employees' motivation, which involves respect, interesting wages, opportunities for career progression, good working conditions, a participatory management, and finally great organisational skills. ■

KEY CONFERENCES & EVENTS

MARCH 2012

01 – 05 **European Congress of Radiology (ECR) Annual Meeting**
Vienna, Austria
www.myesr.org

25 – 30 **Abdominal Radiology Course / Society of Gastrointestinal Radiologists & Society of Uroradiology**
Arizona, U.S.
www.sgr.org

25 – 30 **44th International Diagnostic Course Davos (IDKD)**
Davos, Switzerland
www.idkd.org

APRIL 2012

14 – 17 **34th Charing Cross International Symposium**
London, UK
www.cxsymposium.org

15 – 18 **The Breast Course 2012**
Lisbon, Portugal
www.thebreastpractices.com

20 – 21 **ESIR 2012 Embolisation Course**
Amsterdam, The Netherlands
www.esir.org

25 – 28 **2nd European Congress on Interventional Oncology (ECIO)**
Florence, Italy
www.ecio2012.org

JUNE 2012

12 – 15 **ESGAR 2012**
Edinburgh, UK
www.esgar.org

27 – 30 **CARS 26th International Congress and Exhibition Joint Congress of CAR / ISCAS / CAD / CMI / EuroPACS**
Pisa, Italy
http://www.cars-int.org

SEPTEMBER 2012

15 – 19 **CIRSE**
Lisbon, Portugal
www.cirse.org

OCTOBER 2012

11 – 12 **Management in Radiology (MIR) Annual Scientific Congress & Meeting**
Milan, Italy
www.mir-online.org

19 – 23 **Journées Françaises de Radiologie 2012 (JFR)**
Paris, France
www.sfrnet.org

27 – 31 **EANM Congress**
Milan, Italy
eanm12.eanm.org

NOVEMBER 2012

20 – 21 **ESIR 2012, Embolisation Course**
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