Few people have had greater individual impact on the evolution of CT scanners than Prof. Dr. Willi A. Kalender, the pioneer of spiral systems. As the director of the Institute of Medical Physics at the Friedrich-Alexander University of Erlangen-Nürnberg in Germany, he is currently overseeing projects relating to CT imaging of the heart, micro CT, and image-based navigated interventions.

Patient dose estimates represent a dilemma. Even though there has been a significant amount of research regarding patient dose assessment, international consensus has not yet been reached and further improvements are needed, according to Kalender.

Patient dose estimates from CT examinations are based primarily on Monte Carlo (MC) calculations using anthropomorphic phantoms. Direct measurements are neither practical nor do they allow for the assessment of the spatial distribution of dose. Today’s CT dose index (CTDI) concepts are excellent for scanner characterisation, and acceptance/consistency testing, dose estimates are based on standard CTDI phantoms, but they do not take into account the specifics of a patient’s individual body habitus and do not provide patient dose or organ dose values.

Size-specific dose estimates (SSDE) have been proposed by a task group of the American Association of Physicists in Medicine (AAPM), but in Kalender’s opinion, further consensus decisions and methods to determine patient diameters are needed to achieve a general acceptance of this concept. Calculating an effective dose can be valuable for comparison of technologies and specific patient population groups, but its limitations do not make it an appropriate measure for individual patients.

Kalender has proposed a different approach to patient- and organ-specific dose estimates (POSDE). Patient CT data are used to provide comprehensive information about a patient’s body shape in the region that was scanned. The data are appended at the top and bottom of the available image volume by data taken from patient CT examinations are based primarily on Monte Carlo (MC) calculations using anthropomorphic phantoms.

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size-adapted anthropomorphic voxel phantoms. The result is a patient-specific whole-body voxel phantom suitable for MC dose calculations that provides definitions of organs inside and outside the scanned range. Reliable scanner- and scan protocol-specific information is then obtained, but this estimation is limited to dose for organs that are clearly delineated, and does not include skin, mucosa or bone marrow.

Like SSDE, the FOSDE approach is still a work-in-progress. Kalender believes radiologists need to realise that while organ doses can be estimated with high accuracy, this process is complex and time-consuming. It should be limited only to patients where this knowledge can have impact on patient management with respect to imaging.

DOSE REDUCTION STRATEGIES

“The use of imaging is growing globally. It is imperative that radiology trainees recognise that more CT imaging procedures will be performed in the generations of patients they will be treating as compared to mid- and advanced career radiologists,” stated Mahadevappa Mahesh, PhD, chief medical physicist at Johns Hopkins Hospital in Baltimore, Maryland, US. “Radiation protection is of paramount importance for both patients and professionals performing imaging. New radiologists need to be proactive about this and maintain diligence about reducing radiation dose whenever possible without jeopardising image quality.”

Radiology trainees need to be champions of radiology department culture to maintain image quality and examination dose. They should be willing to request review ‘outlier’ examinations they have performed or interpreted with lead radiologists of the department or imaging section. Outlier exams are ones that either have a higher than expected dose or have poor image quality for the indication, which may suggest the case of overly aggressive dose reduction strategies.

“The primary goal with dose reduction efforts is to preserve the diagnostic performance of CT. This in turn, is influenced by the image quality. For this reason, indication-based image quality delivery is the most desirable approach,” he added.

Mahesh said that maintaining image quality is critical for protocols involving liver or pancreas CT scans, for example. By comparison, CT angiograms, CT colonoscopy, and CT enterography can use protocols with slightly lower image quality.

Mahesh noted that current scanners are complicated, and protocols should be tailored to specific patient size, anatomy imaged, and clinical indications for the exam. He offers these practical steps to update and modify CT protocols with the goal of dose reduction:

- Adopt manufacturer-specific CT protocols developed by subspecialty societies such as the AAPM, and organisations dedicated to dose reduction, including Gently and Image Wisely.
- Tailor protocols to the clinical indication.
- Review protocols examining section collimation and be creative. It is possible, for example, to reconstruct thinner coronal and sagittal reconstructions from volumetric/ isotropic CT data to complement thicker axial images.
- Use tube current modulation software that has the ability to lower dose by as much as 40%.
- Use tube current overrides when a patient is not average-sized.
- Vary tube voltage based on patient size and the examination indication, using patient weight, diameter and/or body widths as guides for selecting tube voltage values.
- Ensure that patients are correctly positioned in the isocentre of a CT scanner. If a patient is placed closer to the tube rather than in the isocentre, the scout image will appear to be larger and the automatic tube current modulation will mistakenly create settings for a larger-bodied patient.
- Limit phase and image creep.
- Use iterative reconstruction algorithm software if it is available.
- Establish a dedicated CT protocol team to regularly monitor protocols and techniques to further reduce dose. Maintaining image quality and patient safety is an ongoing process.

These two overviews on CT dose provide excellent primers for both radiology trainees and experienced radiologists.


Dose monitoring software like DoseWatch can automatically evaluate the SSDE (size-specific dose estimate) following the American Association of Physicists in Medicine’s (AAPM) Task Group Report 204 version. The SSDE is a metric developed by the AAPM to evaluate dose according to patient size.

(Provided by General Electric Healthcare)
Expert Courses
Expert courses are specially designed for experienced practitioners already familiar with the topic’s theoretical aspects and the relevant literature. Distinguished faculty members guide these sessions, but considerable emphasis is also placed on facilitating exchanges amongst participants. Sessions include a variety of practical exercises, while lecture times are limited and primarily focused on outlining specific “Tips & Tricks”.

Fundamental Courses
Recent structural changes have proved immensely popular, so fundamental courses will continue to cater to doctors who are beginning their IR career, or would like to refresh or broaden their existing portfolios. Lectures will cover both theory and clinical application, with ample time devoted to hands-on learning. The course content is specifically tailored to reflect the priorities and goals outlined in the European Curriculum and Syllabus for Interventional Radiology.

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Exclusive interview with incoming ESR President
ESR to address issues on all fronts in 2015

ECR Today spoke with the incoming ESR President Prof. Lluís Donoso Bach, Director of the Diagnostic Department of the Hospital Clinic of the University of Barcelona and Executive Director of the UDIAT Diagnostic Centre at the Health Corporation Parc Taulí.

ECR Today: What will be your priorities as ESR President?
Lluís Donoso Bach: The ESR has a good track record in education and we will continue to innovate through the ECR. We will also open new learning centres in Vienna and Bogotá and are planning a further expansion in Europe.

Because of the financial crisis, it is more important than ever that we develop efficient systems, so we will increasingly rely on electronic, web-based services for our members. This is why we decided to launch the ESR 4 learning Platform. This represents a big challenge, and we will see how it works as a business model and how our members use the platform throughout the year. We will also try to offer an examination for the European Diploma in Radiology online. There are a lot of experiences and successful models to draw inspiration from.

We will also continue our efforts in research through the European Institute for Biomedical Imaging Research (EIBIR). The ESR Research Committee has been working a lot on the quantification of data using biomarkers and biobanks, focusing in particular on oncology and trying to have more influence in that area. Quality and safety is another very important issue for us. During ECR 2015, we launched ESR iGuide, a clinical decision support system for European imaging referral guidelines. Following the example set by the American College of Radiology with ACR Select, we also want to offer our members tools to improve quality in their departments. The ESR Quality, Safety and Standards Committee has thus created Level 1 clinical audit templates based on safety. We should also explore the possibility of performing quality controls at the level of department management.

Lobbying with European institutions has been an important field of battle for us in the past few years, and we will consolidate our action in this field keeping the momentum and relying on the personal contacts and networks established over the past years. We launched a Call for a European Action Plan for Medical Imaging in the European Parliament on November 4, to highlight existing heterogeneities in medical imaging in Europe in the areas of quality and safety, education, research, and eHealth, and to call for joint targeted actions to improve harmonisation in these areas.

ECRT: Radiology is facing many threats but probably the biggest is the commoditisation of its services through excessive outsourcing. How do you plan to tackle that issue?
LDB: I have been working with teleradiology for the past 14 years and I think it’s really important to differentiate between the types of teleradiology. There’s the case when we occasionally work from home or other parts of the hospital, then there’s teleradiology in regional networks where hospitals have an agreement, and then there’s outsourcing, where a hospital contracts an external provider. And this is where radiologists are more and more critical, because bad outsourcing can lead to commoditisation of their services.

The ESR has always argued that teleradiology should be a medical act, which includes not only a report but also consultation with the patient, justification and control of the examination, and follow-up of the outcome. Outsourcing can also do that, but the problem is that some companies only offer the report for very low fees, and in our opinion this is what endangers the clinical part of our work.

We have published many position papers and work tirelessly with the EU Commission and Directors General (DG) in the European Parliament to defend our position, the problem is that we are not always heard.

ECRT: Harmonisation of training in Europe is still a challenge. The ESR European Training Curriculum for Radiology proposes a five-year plan, but not every country applies it. How can you encourage these countries to follow your recommendations?
LDB: Many countries have endorsed the curriculum (38 ESR institutional member societies and 28 ESR associate institutional member societies) and we have just finished writing up level III (specialisation). ECR 2015 has been organised around the curriculum, which is a good step. Our limitation is that we can only recommend, not oblige; in the end it remains a national decision.

ECRT: Will more candidates be able to pass the European Diploma in Radiology (EDiR)?
LDB: Yes. EDiR will be a sustainable model when more people have the qualification; it’s a virtuous circle. The diploma is only three years old but there are already 30 or 40 candidates per examination session organised for national societies. For the session held during ECR 2015, almost 150 candidates have sat the examination. ECR 2015 has definitely been a milestone, since the programme has featured sessions to help young radiologists prepare for the diploma. The diploma is growing steadily and our objective is to have 1,000 candidates per year within three years.

ECRT: How well developed is e-health in Europe? What is the ESR’s agenda concerning this issue?
LDB: Through EHRIT, we are currently exploring opportunities to include European topics in IT in the European research agenda. There are attractive initiatives, and our idea is to develop projects that the European Commission (EC) will want to get involved in and support. We are in contact with several Directorates General of the EC to raise awareness of our initiatives and we will invest a lot in this field.

ECRT: Bimarkers still have a long way to go before they are used in clinical practice and can unfold their full potential. Last year, the ESR began working with RINA’s Quantitative Imaging Biomarkers Alliance (QIBA) and will offer the chance to define the structure of a similar alliance in Europe. How far has this project gone?
LDB: In research you need repositories, interoperability, anonymisation, quantification and standardisation to share your work. In the United States, QIBA is tackling standardisation. Here in Europe, we have decided to continue collaborating with QIBA, but our strong point is really clinical application and validation. So instead of doing the same thing as the RINA, we have decided to create a European Imaging Biomarkers Alliance, which will operate as a subcommittee of our Research Committee. This new group will be the European counterpart of QIBA and will accommodate our numerous activities in the field of biomarkers, personalised medicine and biobanks.

ECRT: The ESR launched the EuroSafe Imaging campaign last year to help improve radiation protection in Europe. What are the first results, a year later?
LDB: The campaign now has over 1,000 friends. We are working on the promotion of the campaign among the various stakeholders, including policy-makers at both European and national levels. For instance, we will take the opportunity to present the campaign when visiting some of the host countries of upcoming Society meets ESR sessions in 2015 (Sweden, Denmark and Bulgaria). Then, in our own environments, we all try to raise the awareness of health professionals, patients and governments of radiation protection.

ECRT: As the current 1st Vice-President of the society, you must have a pretty good idea of what is awaiting you next year. What do you think are the necessary qualifications for the job?
LDB: One first needs experience. The ESR is the largest radiological society in the world, so it’s better if you’ve been working on some of the committees for at least five years beforehand. You also need an open mind to enjoy what you are doing and to like the opportunity to meet people. This kind of leadership experience is very positive for your daily practice, and it’s also an opportunity to grow on a personal level.
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Turkey is now leading the way in several areas of radiology and playing an increasingly important role in the ESR, following a series of health system reforms and government-led drives to improve imaging in particular. In today’s host session, ‘Turkey welcomes ECR’, key figures from the country’s community of radiologists will provide delegates with a snapshot of their work, notably functional brain MRI, percutaneous treatment of liver hydatid cysts and advanced hepatopancreaticobiliary imaging.

BY FRANCES RYLANDS-MONK

Heavy investments in imaging enable Turkey to shine in European arena

Building on their long experience in established diagnostic methods, Turkish radiologists have developed new interventional techniques that allow patients faster, more accurate diagnosis and tailored treatment. In his introduction today, the President of the Turkish Society of Radiology (TSR), Prof Abdülhakim Coşkun, head of radiology at Erciyes University Hospital, Kayseri, plans to discuss the challenges still facing the country and the impact on radiology, as well as the revolutionary health reforms which place imaging at the heart of patient care and ensure that more citizens than ever have access to quality services.

Turkish advances in interventional techniques will take centre stage among the scientific talks, specifically the role of Modified Catheterisation Technique (MoCaT), a percutaneous treatment which can be used instead of surgery for complicated cases of cystic echinococcosis (CE), otherwise known as hydatid cysts.

Given the prevalence of CE at around 1% in rural Turkey, most imaging departments in the country encounter this condition on a daily basis. It is also endemic in the south of Europe, including the Balkan countries, southern Italy, France, Spain and Portugal. At this meeting, the MoCaT procedure will be demonstrated,

In established diagnostic methods, ultrasound is the first-line treatment option indicated, continued Akhan. Surgery is the preferred choice, but this could lead to complications and recurrence was high. In an era of interventional treatment, new techniques are now associated with lower major complications, lower mortality rates and shorter hospital stays, as well as lower recurrence rates. Therefore whenever possible, instead of surgery, the disease is treated by different percutaneous techniques which in the long term are 98% successful,” Akhan noted.

Following on from their experimental study in sheep using a catheterisation technique with hypertonic saline and alcohol, the Ankara group worked on a non-surgical modified catheterisation technique (MoCaT) based on complete evacuation of all cyst content, including the generated membrane and daughter vesicles, namely the fluid and the solid parts of the cyst. MoCaT, first described in 2007, has generated good results and low recurrence rates.

Radiologists should take a ‘stage-specific approach’ to percutaneous treatment, Akhan believes. “Although there are several classification systems for cyst subtypes, I prefer to use the WHO system as it reflects the natural history of the cysts better and gives us a chance to make differential diagnosis between the active and inactive subtypes, he said. According to the WHO classification system, the major indications for percutaneous treatment of liver hydatid cysts include CE 1 (which should be treated by puncture, aspiration, injection and reaspiration [PAIR] or catheterisation technique), CE 2 (to be treated by catheterisation or modified catheterisation technique or MoCaT, CE 3a is treated by PAIR or catheterisation technique and CE 3b treated by modified catheterisation technique).

Patients with CE 4 and CE 5 cysts should be followed up once a year by ultrasound using a ‘wait and watch’ approach because no treatment is indicated continued Akhan. Surgery is the first-line treatment option for these cases.

Ultrasound shows a liver CE 1 on the right side before the procedure in 1991 and a solid remnant with pseudotumour appearance 23 years after treatment. (Provided by Prof. Okan Akhan)

Diagnosis and classification of liver CE is based mainly on ultrasound, which is easy to use and allows visualisation inside the cystic cavity to determine the contents and thus the subtype of cyst, he explained. After ultrasound, MRI and MR cholangiopancreatography (MRCP) are useful when communication between the cystic cavity and the biliary system is suspected. CT is less sensitive for demonstrating cyst content, but can be useful in defining the exact location of the cyst in the abdomen or liver if indicated, usually because the doctor suspects some kind of dissemination in the abdomen or thorax.

“Traditionally treatment was surgery but this could lead to complications and recurrence was high. In an era of interventional treatment, new techniques are now associated with lower major complications, lower mortality rates and shorter hospital stays, as well as lower recurrence rates. Therefore whenever possible, instead of surgery, the disease is treated by different percutaneous techniques which in the long term are 98% successful,” Akhan noted.

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Comprehensive personalised imaging transforms cardiothoracic disease management

Besides personalised imaging, a new paradigm is emerging in radiology that should re-shape clinical practice and benefit the patient immensely. Supported by new technologies that enable radiologists to image the body faster and better, radiologists are now trying to broaden their focus during examinations.

If there is a field where these advances make a tremendous difference, it is cardiovascular imaging, an area where diseases are more often than not interconnected. Cardiac and chest radiologists will explain how the comprehensive personalised approach is changing their practice and try to convince radiologists on both sides to take an interest in the other, today in a New Horizon session at the ECR.

For years, the trend was for radiologists to specialise as much as they could. Cardiovascular radiologists, for example, would focus on their own area with little or no interest beyond that. But among these subspecialists, an increasing number are now changing their approach, focusing more on the whole. This direction, driven in particular by CT examinations, demonstrates that diseases of the heart and chest are very often related, according to Dr. Christian Loewe, deputy head of the section of cardiothoracic and interventional radiology at the Medical University of Vienna, Austria.

“In the past patients were investigated by either focusing on chest or cardiovascular diseases. This was mainly driven by clinical examination. However, there are a lot of situations and diseases where chest problems are caused by cardiovascular diseases and vice versa. There is a huge interaction between heart and chest, and that’s why it’s interesting and important to look at this relationship in more detail today,” he said.

To prove his point, Loewe, a cardiovascular radiologist, will talk about acute and chronic chest pain during the session. Some of the most severe causes of chest pain are due to cardiovascular diseases, including myocardial infarction or acute aortic dissection. However, acute chest pain can also be caused by a number of pulmonary diseases, including pulmonary embolism, pneumonia and others. Therefore, radiologists must learn the different life-threatening causes that can cause chest pain, whether they are respiratory or cardiovascular.

Radiologists must also understand the role of imaging in acute and chronic chest pain, and how to read the image correctly. “We should not focus on single organ, like the coronary arteries, but we should rather try to see the heart and do a complete assessment of anatomy and function.” When reading the chest, more imaging examinations now have very good quality, and CT and the heart also depict the lung in exquisite detail – just as CT of the lung can depict the heart. So we have to learn to look at other organs at the same time,” he said.

Technology is driving medicine, and it has more impact on radiology than any other medical specialty. Prof. Martine Rémy-Jardin, professor of radiology and head of the department of cardiothoracic imaging at the University Centre of Lille in France, who will also speak in this session, will stress this point in her presentation on the early detection of cardiovascular diseases in younger patients. “Ten years ago, it was impossible to detect coronary calcium because machines did not offer this possibility. But since then, technological advances have been so tremendous that we can now visualise very thin vessels and calcium deposits in those vessels,” she said.

It is important to examine the patient carefully because patients at risk of cardiovascular diseases are usually at risk of atherosclerosis or lung cancer too. “If a patient comes in for a lung cancer examination, we should try to find ways to examine him/her for cardiovascular disease in the same examination. In patients suffering from emphysema or COPD, smoking-related coronary disease, we should also look for signs of lung cancer because many of them are smokers and we’re talking about the same risk population,” Loewe said.

Additionally, there are chest diseases that do not have a major shared risk population but can cause secondary cardiovascular problems, such as emphysema, chronic obstructive pulmonary disease (COPD) or asthma. If these diseases are present for a long time, patients may suffer from secondary cardiovascular disease, which may limit their life expectancy. “Despite the well-documented atherogenic effects of smoking, the radiologist’s attention remains directed mainly towards the depiction of emphysema and airways disease in smokers. However, recent guidelines for COPD patients have underlined the major impact of cardiovascular comorbidities, recommending that they should be actively looked for and appropriately treated if present, according to Rémy-Jardin.”

Cardiovascular comorbidities in smokers include atherosclerotic coronary disease and ischaemic cardiopathy, atheromatous lesions of the aorta and supra-aortic vessels, which can trigger stroke. They also include the consequences of pulmonary vascular diseases on the right heart and much more.

Theoretically, this recommendation could have a major impact on the way chest CT examinations of smokers are performed and reported. These represent a common category of patients for specialised but also non-specialised radiologists. The impact on the clinicians’ understanding of patient symptoms is important because a given symptom can have a pulmonary or cardiovascular origin, such as those encountered in the presence of chronic or acute dyspnoea, chest pain, haemoptysis or hypoxemia,” Rémy-Jardin said.

In the pretherapeutic assessment of bronchopulmonary carcinoma, chest radiologists should look for signs of COPD, smoking-related inflammatory lung disease and cardiovascular comorbidities. Depending on the location and extent of lung carcinoma, the presence of signs suggesting cardiovascular invasion are also worth reporting.

“During surgical procedures for lung disease, for instance lymph node sampling, there is a risk of pre-surgical and postsurgical stroke. Therefore, we have to inform the surgeon about the number, thickness and location of atherosclerotic plaques on the ascending aorta and collateral arteries, as well as at the level of the aortic arch. We must also inform the surgeon about the presence of coronary calcifications even by a known existing coronary disease, we should also look for signs of lung cancer because many of them are smokers and we’re talking about the same risk population,” Loewe said.

Radiologists must also warn the surgeon when they identify a patient foramen ovale prior to a lobectomy or right pneumonectomy.

When examining coronary disease with CT, radiologists should also look for bronchopulmonary carcinoma, signs of COPD or smoking-related inflamatory disease in the explored volume, depending on the age of the patient and their degree of smoking.

Hopefully, the session will raise awareness among radiologists about the necessity to think outside the box. “If you’re a cardiac radiologist you should also know about the chest. This is the main aim of the session. Many diseases of the heart cause lung problems and vice versa,” said Loewe, who will also discuss the emerging role of CT in diagnosing suspected myocardial infarction in patients with severe chest pain.

“It’s not in the guidelines yet, but there are a lot of papers underlining that CT could be a very important tool. Some myocardial infarctions cannot be diagnosed by looking at the ECG, so patients with suspected myocardial infarction who showed no sign on ECG can only be diagnosed or ruled out after eight to ten hours looking at the laboratory values. But the longer we wait, the more complicated it becomes to perform revascularisation. Early CT might therefore be very helpful in those patients, by helping them to either undergo revascularisation in time or be discharged earlier,” he said.

New Horizons Session

Sunday, March 8, 08:30–10:00, Room E2
NH.17 Comprehensive personalised imaging of cardiothoracic diseases

» Chairman’s introduction: how to prepare for the future?
T. Breuer; Zagreb, Croatia/HR
Patients with acute and chronic chest pain
C. Lowe; Vienna, Austria
Patients with acute shortness of breath
J. Bremmerich; Basle, CH
» Patients with chronic shortness of breath
E.J.R. van Beek; Edinburgh, UK
» Early detection for cardiothoracic disease in smokers
M. Rémy-Jardin; Lille, France
» Panel discussion: Comprehensive imaging and education in cardiothoracic diseases

Prof. Martine Rémy-Jardin is head of the department of cardiothoracic imaging at the University Centre of Lille in France.

Dr. Christian Loewe is deputy head of the cardiovascular and interventional radiology section at the Medical University of Vienna, Austria.
A panel of experts will present the latest available resources to support clinical research in radiology during today’s dedicated Special Focus session at the ECR.

If you think of the most widely used IT tool in radiology, you probably think of PACS. A patient and examination centralised system, PACS is used in daily clinical practice to view most straightforward and routine radiology examinations. However, when performing research, one needs totally different settings and what might be an advantage in clinical practice can turn into a disadvantage in research, according to Prof. Davide Caramella, professor of radiology at Santa Chiara Hospital in Pisa, Italy, who will chair the session.

“There are tools developed for clinical practice but they are not applicable to research because the criteria are totally different. For instance, in clinical practice you need to have a very clear identification of the patient, you need to know their age, sex, birthdate, etc. On the contrary in research, the study must be as anonymous as possible. Consider our volume rendered images; you do a head 3D acquisition and you end up with very precise image of the face of the patient. When you do clinical research, you have to find a way to blur the anatomy, otherwise it’s like you’re giving out his or her photograph,” Caramella said.

With PACS, radiologists can compare examinations of the same patient to avoid making mistakes. But it’s almost impossible to compare the examination of two patients. PACS is the tool for patient A with patient B, which is exactly what researchers need to do when they evaluate the effectiveness of a drug in different patients.

“When current PACS, this option is very difficult if not downright impossible. As of now we try to address most of the research requirements by using tools that are sometimes just pencil and paper, and are very often not integrated with our PACS and IT tools,” he said.

Indeed, an additional problem with PACS is that it does not support the integration of other software. For the moment manufacturers offer add-ons to bridge the gap, but this is not good enough for research work.

Bringing clinical practice and research together within PACS seems to be a long way off, as the field is not lucrative enough for the industry many researchers. Fortunately researchers have alternative and can export their data to other software. There is actually a whole range of tools at their disposal. Caramella uses open-source software like OsiriX, which is freely accessible and designed to accommodate for the needs of clinical research.

One tricky task with PACS is to extract image metadata when radiologists do a follow-up study of a patient who has undergone some chemotherapy, in order to evaluate how the lesions changed in terms of shape, size, vascularity etc. These metadata are used to establish the response criteria. They are not easy to extract from conventional PACS, but they are with commercial software, such as RECIST Tracker (PfuiJif) and mimlession (Mint Medical).

There is a range of free web applications that can help improve research efficiency. Dr. Andrew Scarsbrook, clinical associate professor of radiology at Leeds University, U.K., has incorporated open-source software into his academic practice for over a decade. He will explain to delegates how to harness free applications and open-source software to enhance the performance of imaging research.

“It’s possible to create a comprehensive suite of IT tools for imaging research which can compete PACS. You can achieve this using freely available software which is pretty good quality,” he said.

Researchers can improve effectiveness by making use of highly specific search engines; they can either create their own bespoke search engine or utilise radiology-centric search engines over and above Google, which are available on the net.

To stay up-to-date with radiological developments and literature in an area of interest, and keep up with others’ work, researchers can configure customised citation alerts. Stanford University in the United States has an electronic journal library called High Wire which has a range of highly-citable alerts which can be set-up by any interested party – this allows imaging researchers to create a concise summary of what is new in a particular area of study covering thousands of different electronic journals.

Some pieces of software also increase efficiency and organisation, such as Dovemo, according to Scarsbrook. “Evernote is a great free cross-platform storage application that works on mobiles, iPads, laptops and PCs. It synchronises your data across multiple devices. Whenever you capture a new paper or meeting abstract, make notes, acquire images or find new web resources this application will catalogue everything so that you have a simple source of reference and data can be easily retrieved,” he said.

Scarsbrook will also present a variety of applications, most of which are free, that can be used in the process of data analysis and the writing of studies for publication in journals. DICOM imaging software is, for example, particularly useful for the evaluation of imaging research data.

Synchronisation is another key issue when undertaking a multi-centre study and collating data from multiple sources, and work on manuscripts across institutions can be a challenge. There are various web-based apps that can facilitate more efficient data sharing and real-time collaboration rather than a person writing a draft and sending it to others.

Researchers can use software to create their own web portal, which pulls all of these tools into a single dashboard. “It takes a little bit of time to get started but it more than pays off in the long run,” Scarsbrook said.

He will caution against putting any patient identifiable data on available cloud storage services, and refer to other more secure archiving resources. “I would be nervous about putting any patient sensitive information in the cloud with all the recent media reports regarding leaks,” he said.

BY MÉLISANDE ROUGER

Imaging researchers have been hungry for software tools to help improve their jobs for years. In the absence of such a system, or hopeful projections from manufacturers, they have found alternative solutions.

You can only do this if you have the right software, and this software is not good enough for research work.

No PACS for research but plenty of other tools available

"My research cannot be done without the use of a PACS," said Dr. Andrew Scarsbrook, clinical associate professor of radiology at Leeds University, U.K., who will speak about the tools and software solutions available.

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Experts to provide insights into on congenital heart disease imaging

Congenital heart disease (CHD) is found in up to 1% of the global population, and its consequences can be lethal and are at best life impairing. If simple pathologies do not require sophisticated imaging, complex CHDs have to be imaged using CT or MR. Experts will comment on the role of imaging in CHD from infancy to adulthood in pre- and postoperative periods, focusing on the benefits and limitations of CT and MR in today’s session at the ECR.

Simple CHDs such as ventricular septal defect or atrial septal defect are usually detected by echocardiography through the initial clinical examination, followed by echocardiography performed by the paediatric cardiologist. However, for complex CHDs, such as severe aortic insufficiency, nothing less than a CT or MR scan will do.

CT is widely and increasingly available, which makes it a preferred option for the evaluation of complex disease groups. However, radiation dose exposure is a serious limitation. According to Prof. Mithat Haliloglu, a professor of radiology at Hacettepe University, Faculty of Medicine, in Ankara, who will chair the session, several symptoms have thus been developed to reduce that exposure and minimise the associated risk.

Haliloglu pointed out that children are more vulnerable to radiation exposure, as radiologists who perform CT in young patients must be familiar with paediatric anatomy and pathological conditions. Various dose-reduction techniques have also been specifically designed for paediatric patients in cardiovascular imaging by a number of major CT manufacturers.

“This is an important issue. To make CT examinations safer, you must set up and optimise parameters, for instance the mA and mAs of the examination or using an ECG-gated system. In some selected patients, you need to perform a CT scan because MR does not solve a large part of CHD questions, whilst CT is of great help for instance to assess thoracic vasculature and anatomy of the whole heart,” Haliloglu said.

CT can also be used to evaluate the aorta, pulmonary artery, pulmonary vein, cardiac chambers, ventriculoarterial connections, coronary artery, valves, and systemic veins like the hepatic veins, and to gain an understanding of the anatomy of the cardiovascular system during the pre- or postoperative period.

Prof. Mustafa Kantarci from Atatürk University, Faculty of Medicine in Erzurum, will give an overview of CT indications in CHD management. Other advantages of CT are that it is fast, has few artifacts and does not require patient sedation. It is usually regarded as a preliminary diagnostic option for CHD patients with implanted pacemakers and metallic surgical hardware – a counter indication in MR.

CHD diagnosis can be very challenging for radiologists who have not had years of experience in that area. But, according to Prof. Andrew M. Taylor, professor of radiology at the Great Ormond Street Hospital for Children in London, the diagnostic process can be broken down into a set of simpler building blocks, and into simple language that can be used to describe cardiac anatomy in what is known as “sequential segmental analysis.”

Taylor will show how such analysis can be carried out with both CT and MR, and how to correlate the imaging features with the actual anatomy of the patient. He will also explain how these building blocks can be brought together to describe the common CHD anomalies.

Applications for MR currently include follow-up of atrialess therapy and transplantation of great vessels.

“Just like CT, MR is very helpful for postoperative evaluation of these particular patients. It is also crucial to the evaluation of cardiac functions such as right ventricular ejection fraction in postoperative patients especially those who have been operated for ‘Tetralogy of Fallot,’” Haliloglu said.

Another important issue in imaging adult congenital disease is the increasing number of patients with symptoms and complex CHD. More and more children with CHD survive until adulthood and they must be followed up properly and regularly.

Prof. Mithat Haliloglu, a professor of radiology at Hacettepe University in Ankara, will chair today’s session on congenital heart disease.

Special Focus Session
Sunday, March 8, 08:30–10:00, Room F1
SF 17b Congenital heart disease: from infancy to adulthood

» Chairmanship introduction
M. Haliloglu, Ankara/TR

» Cardiac CT: challenges in congenital heart diseases
M. Kantarci, Erzurum/TR

» Segmental approach to MR imaging of congenital heart disease
A.M. Taylor, London/UK

» Imaging of congenital heart disease in adults
S. Leschka, St. Gallen/CH

» Panel discussion: What is the impact of radiologists in the evaluation of congenital heart disease?
Case-Based Diagnosis Training: You can only see what you already know

BY SORAYA Robinson

Despite the effects of the global economic crisis, a number of critical political situations around the world and severe healthcare issues, the European Society of Radiology (ESR) and its annual European Congress of Radiology (ECR) continue to grow year on year. Despite a whole bunch of national differences, there is an increased awareness of the necessity of life-long learning and further training, hence this year’s motto ‘radiology without borders’. It helps to harmonise training for radiologists and enhances the quality for patients. To keep the audience interested, many different sessions are on offer. The needs of consultants with many years of practical experience and keen researchers with ambitious and highly specialised interests, as well as students, residents and young radiologists are met. To facilitate a personalised selection of lectures, all presentations are grouped into three different levels of experience and specialisation. In accordance with the European Training Curriculum for Radiology, Level I lectures are designed for residents within their first three years and Level II for their final two years. Level III presentations are aimed at radiologists with a particular interest in subspecialisation. Gerhart Hauptmann, who was awarded the Nobel Prize for literature in 1912, wrote that as soon as you have mastered one skill, you should start learning another one (Schöpflin in einer Sache Meister geworden ist, solle er in einer neuen Sache Schüler werden). Bearing this in mind, we and the management of our patients can benefit from many different kinds of knowledge, like little pieces in the mosaic or jigsaw puzzle of radiology. By avoiding unnecessary examinations, when detecting normal variants or post-therapeutic sequelae, while paving the way for fast investigation, when needed, we can make a difference. Patients can be spared unnecessary worries and healthcare bills from pointless investigations. One such format, which should offer interesting topics for residents, as well as general radiologists, was introduced in 2014. The Case-Based Diagnosis Training course was highly successful. On the last afternoon of the conference, it attracted about 100 participants, and a convincingly large majority found the course, in terms of practical training and learning experience, good or even very good, and they wanted to do it again. The focus is not to cover each topic comprehensively or highlight the rarer entity. It should imitate daily working conditions. This way you can get to know the patient’s typical symptoms and see a couple of characteristic images and really have time to take in the information. Multiple-choice questions can be answered using electronic devices. Afterwards, the presenter will explain the pathology with the most pathognomonic signs, most efficient imaging algorithm and highly probable or less likely differential diagnostic entities. Each presenter will show one general case and one post-therapeutic case reflecting one of the big themes of ECR 2015: ‘the treated patient’. Thus, you will have a chance to see cases from different subspecialists in one go. Before the interlude, the areas of neuro, musculoskeletal, liver and breast imaging will be covered. Afterwards, the update will include head and neck, chest, spine, gastrointestinal and genitourinary radiology. While the global radiological community was asked to submit unusual images, lookalikes and freak coincidences in their ultrasound images, x-rays, CTs and MRIs for the interlude presentation in 2014, this year, we will see a wide range of implants and devices in the human body. We all know about total hip and knee prostheses, pacemakers and cardiac pacemakers. But patients also move and we might not know about the stimulators, expanders or hearing aids used by surgeons in other countries. Nonetheless, we should be able to recognize them and their typical complications (Fig. 1 and 2). Be sure not to miss this highly informative, but also humorous presentation. Speaking with the wisdom of Johann Wolfgang von Goethe, “You can only see what you already know and understand.” (Man erblickt nur, was man schon weiß und versteht.)

Prof. Soraya Robinson is professor of radiology at the University of Vienna and works at the Diagnostic Center Unima in Vienna, Austria.

Case-Based Diagnosis Training
Sunday, March 8, 13:00–14:00, Studio 2015
Case-Based Diagnosis Training – Part I
Moderators: K.M. Friedrich; Vienna/AT
S. Robinson; Vienna/AT

- Neuro
D. Prayer; Vienna/AT
M. Toepker; Vienna/AT

- Musculoskeletal
S. Robinson; Vienna/AT
F. Kainberger; Vienna/AT

- Liver
L. Marti-Bonmati; Valencia/ES

- Breast
M.H. Fuchsjäger; Graz/AT

Case-Based Diagnosis Training
Sunday, March 8, 14:00–15:30, Studio 2015
Intermediate case-based presentation – Part II
Moderators: K.M. Friedrich; Vienna/AT
S. Robinson; Vienna/AT

- Head and neck
C. Czerny; Vienna/AT

- Chest
H. Prosch; Vienna/AT

- Spine
K.M. Friedrich; Vienna/AT

- Gastrointestinal
W. Schima; Vienna/AT

- Genitourinary
M. Toepker; Vienna/AT
Restrictive allograft syndrome after lung transplantation: new radiological insights

BY ADRIANA DUBBELDAM, CAROLINE BARTHELS, JOHNY A. VERSCHAKELEN, WALTER F.M. DE WEVER

Long-term survival after lung transplantation (LTx) is limited to 75% after five years, due to the development of chronic lung allograft dysfunction (CLAD). Conversely, known as bronchiolitis obliterans syndrome (BOS), it has been determined that chronic allograft dysfunction consists of more than one subtype: BOS, neutrophilic, reversible allograft dysfunction (NRAD) and restrictive allograft syndrome (RAS). Of these, RAS is the most recently discovered and the most detrimental. Pathogenesis is not yet completely understood, and there is no treatment to completely stop or reverse the disease progression. Therefore, the development of better diagnostic tools and a better understanding of the disease, in order to develop more efficient treatments, are of great interest.

RAS is a disease in which (parts of) transplanted lungs become fibrotic, with progressive signs of interstitial disease and volume loss, mostly affecting the upper lobes (see figure). Pulmonary function testing is characterized by a restrictive pattern of function loss. Besides in the decline in the forced expiratory volume in one second (FEV1) as seen in all CLAD types, there is also a loss in total lung capacity (TLC) of 10% or more. In our retrospective study we analysed the CT images of 22 confirmed RAS patients. We evaluated the onset and progression pattern of this disease in these patients. We also gathered clinical data, including pulmonary function tests and available histopathology. We found that small, progressive abnormalities can be found months to years before an RAS diagnosis is made. In this onset pattern, a dichotomy was found: patients with a discrete, focal, bilateral pattern, as part of the initial onset non-regressing CT abnormalities, show a slower progression to RAS and longer survival than patients in which initial non-regressing CT abnormalities start with a more diffuse, peripheral consolidation pattern. In scientific session 1904, today from 14:30 to 15:30, we will show these abnormalities, and we will present our data on progression time and graft survival, which is strikingly different for both groups.

Our institute, the Heart and Vascular Center, Semmelweis University Budapest, has an outstanding sports cardiology profile, and it’s also a FITA Medical Center of Excellence as well. As part of a thorough scientific sports cardiology screening programme, we have performed cardiac magnetic resonance scans in many athletes over the last eight years at our clinic. We have also examined athletes with cardiac signs and symptoms, unfortunately sometimes only after an abrupt sudden cardiac death.

Diagnostic challenge
As we all know, top athletes are three to five times more at risk of sudden, cardiac death than the general population. We also know that regular and intensive physical training leads to physiological cardiac hypertrophy or remodelling, the so-called athlete’s heart. However, sometimes in our daily routine we face the diagnostic challenge of differentiating between normal cardiac adaptation and pathological forms (e.g. hypertrophic cardiomyopathy, left ventricular non-compaction, etc). These conditions can serve as an arrhythmogenic substrate.

Power of cardiac magnetic resonance (CMR)
CMR is a reference method for determining several cardiac parameters: left and right ventricular volumes, ejection fractions and masses. It’s a highly useful way to do follow-up in athletes because of its low intra-observer and inter-observer variability. This is very important because of the progressive nature of the cardiomyopathy. However, there is only a small amount of data available concerning normal CMR values for top athletes. As I have already mentioned, we have performed CMR scans for more than 100 athletes in the last eight years. All these athletes were professionals, most of them members of an Olympic or other international team. We also carried out CMR examinations in healthy age-matched and gender-matched volunteers.

Trabeculations
Anatomical structures such as the papillary muscles and subendocardial trabeculations (NRAD) and restrictive allograft dysfunction (RAS). However, there is only a small amount of data available concerning normal CMR values for top athletes. As I have already mentioned, we have performed CMR scans for more than 100 athletes in the last eight years. All these athletes were professionals, most of them members of an Olympic or other international team. We also carried out CMR examinations in healthy age-matched and gender-matched volunteers.

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Preoperative CT texture analysis predicts outcome in patients with colorectal liver metastases after liver resection

CT texture analysis of standard contrast-enhanced CT images in patients with colorectal liver metastases prior to treatment showed promising results in predicting outcome prior to liver resection. TexRAD research software was used for analysis.

In oncology, imaging plays a crucial role during the patient's management. A radiologist looks at the images of the tumour and tries to perceive the patterns and report whether the tumour appears to be heterogeneous or homogeneous. This process depends heavily on the experience and knowledge of the radiologist and hence is quite subjective. Simple routine measurements, e.g. tumour size and attenuation, have proven to be useful in assessing tumours. However, these measurements do not provide key information about the heterogeneity or complexity of the tumour, which is a hallmark of cancer biology. Texture is a key component of image analysis, and texture analysis of these tumour images can provide vital heterogeneity information in a standardised and objective manner. In particular, texture analysis can measure and quantify heterogeneity within a tumour, potentially caused by local variation in hypoxia, necrosis, metabolic activity, proliferation and neovascularisation (different hallmarks of cancer). Differences in heterogeneity could be associated with different tumour disease severity, prognosis or response to treatment.

TexRAD (TexRAD Ltd – www.texrad.com, part of Feedback Plc, Cambridge, UK) is commercially available research software which employs a patented image filtration histogram-based texture analysis technique. The filtration step extracts and enhances features (or objects) of different sizes, number and density variation, key image components of what makes a tumour appear heterogeneous or homogeneous. This filtration step is followed by quantification of the distribution of the histogram through statistical parameters, such as mean grey-level intensity, standard deviation, kurtosis, skewness and entropy, which could reflect the different aspects of heterogeneity. TexRAD has initially been applied in CT (with and without contrast) and recently in MRI (different sequences). It has also been evaluated in different tumour applications (lung, colorectal, primary and occult liver metastases, breast, oesophagus, prostate, gliomas, head & neck, lymphoma, kidney, pancreas, sarcoma and melanoma as an imaging biomarker (prognosis, disease severity and response-evaluation)). TexRAD is user-friendly software and can easily be integrated into hospital PACS/IT systems and employed in routine clinical practice.

We have studied the application of TexRAD on standard contrast-enhanced CT images to predict the clinical outcome of patients with resectable colorectal liver metastases (CRLM) prior to treatment. Seventy-two patients were treated with open liver resection between July 2007 and December 2009. According to our exclusion criteria, 26 patients were excluded due to previous liver resection, which resulted in our final study population of 46 patients. The study was performed in collaboration with Dr. Balaji Ganeshan, senior imaging scientist at University College London, U.K. and one of the main inventors of TexRAD technology. The optimal parameter for overall survival (OS) was mean grey-level intensity with lower unfiltered values (threshold 58.6) indicating shorter survival (1216 vs. 1873 days), which corresponded to a hazard ratio of 5.6. The best parameter for predicting recurrence-free survival (RFS) was entropy with higher values at fine texture scale (threshold 4.9) indicating shorter recurrence-free survival (927 vs. 1398 days), which corresponded to a hazard ratio of 3.3. Both mean grey-level intensity and entropy were significant in uni-variate and multi-variate analysis. The CT texture analysis showed promising results in predicting outcome prior to liver resection for CRLM, with the potential to be a novel and independent preoperative predictor of both OS and RFS. As a future prospect, TexRAD could potentially play a vital role in personalised/precision medicine for optimising individual patient management, for example to identify patients who will benefit most from surgical resection of their colorectal liver metastases.

Dr. Anselm Schulz is radiologist at the Department of Radiology and Nuclear Medicine at Oslo University Hospital, Norway.
Successful ageing of cervical spine: an attempt to unravel the mystery

Successful ageing of cervical spine: an attempt to unravel the mystery

Stereotypes regarding ageing, which have dominated the Western world’s public consciousness in the last half-century, indicate that old people are weak, dependent, and useless to society.

Aging has also been commonly defined as a time of progressive decline in physical, cognitive, and social functioning. However, according to European Commission data, more than 20% of Europeans will be 65 years or older by 2025, with a particularly rapid increase in the number of those over 80 years of age. Therefore, ageing is considered to be one of the most important healthcare and economic problems of the future, and the coming wave of ageing baby boomers has been called a ‘silver tsunami.’

This pessimistic perception of the elderly is in contrast to the significant observed population of older adults who have maintained adequate function and are ageing successfully. Such a group of interest to researchers because discovering modifiable factors promoting successful ageing may lead to the introduction of healthcare strategies to improve the quality of life for elderly people.

The most common definition of successful ageing includes freedom from chronic disease and disability, with good physical and cognitive function and social engagement, while some authors underline the importance of self-reported well-being. According to the literature, approximately one-third of elderly adults may be classified as ageing successfully. However, successful ageing does not exclude some subclinical morphological and functional changes that can be found using imaging. Degenerative cervical spine disease is one of the most common pathologies in the elderly, but clinical presentation of the disease varies significantly between patients. Therefore, you could ask why only a portion of old people who develop morphological features of spondylosis have clinical symptoms. In other words, is successful ageing related to a lesser extent of the disease or rather to a different perception of structural changes?

In our study, we used MRI to verify the morphological appearance of cervical spine in elderly subjects (aged 65-81 years) who were free of any neurological symptoms that could be related to cervical spondylosis. We also looked for any functional changes in the spinal cord that could be detected using diffusion tensor imaging (DTI), which has the potential to detect microstructural alterations of the white matter. Structural changes indicative of degenerative cervical spine disease were seen in all patients, and 90% of them had a posterior prolapse of the intervertebral disc. What is interesting is that the cervical spine segments presenting disc prolapse showed significant differences in fractional anisotropy. We therefore hypothesise that elderly patients who appear to be ageing successfully, i.e. without neurological manifestations of spinal degenerative disease, actually demonstrate significant subclinical morphological and functional changes that can be assessed with MRI. Thus, factors other than simple neural structure compression play an important role in the wellbeing of this group.

In the literature, there are several mechanisms discussed as possible sources of clinical symptoms in degenerative spinal disease. These include acute neural structure compression, chronic muscle spasms, facet joint instability and general psycho-neurological instability, which may be based on the disruption of natural biofeedback between pain and its inhibition. Our study is a preliminary attempt to describe the nature of successful cervical spine ageing. The study is also a part of a larger programme aimed at uncovering imaging, neurological, cognitive, and biochemical biomarkers that differentiate between elderly adults that are ageing successfully and unsuccessfully. Finding such differences may lead to defining modifiable factors of healthy ageing and introducing appropriate healthcare programmes.

Prof. Zbigniew Serafin is professor and head of the department, Jakub Cieściński is a radiologist, both at the department of radiology and diagnostic imaging, Nicolaus Copernicus University, Collegium Medicum, Bydgoszcz, Poland.
Latest wave of technical innovation keeps digital x-ray at the cutting edge

In most European hospitals, x-ray is still the workhorse of the radiology department, despite the emergence of more sophisticated and specialised imaging modalities. The technology is valued because of its convenience, robustness and clinical utility, and in ECR 2015’s technical exhibition, vendors are demonstrating innovations that support all three features of this modality.

Many of these new advances are designed to improve workflow by getting mobile units more quickly to the patient’s bedside, cutting set-up times for both fixed and mobile systems and reducing down-time when the equipment is unavailable for use. On the Samsung booth, there is a good example of the latter approach, a solution which – like digital radiography itself – is relatively straightforward technologically but provides considerable practical benefits. Its S-Share solution is a software update that helps users to avoid the frustration of delays caused by a broken or malfunctioning detector, through increased interoperability with other products in the company’s product range.

“Our focus is to provide increased usability and operational efficiency that enable radiologists to serve greater numbers of patients over various examination rooms, care units and wards. Through our latest feature, downtime can be significantly reduced by using detectors from other Samsung devices, especially when in need of replacing broken detectors immediately. It’s a backup solution that supports simplified workflow which eventually benefits patients through a continuous care without interruption,” a Samsung spokesman explained.

The vendor is also unveiling a new range of wireless detectors, which it believes will allow radiographers to produce higher quality images using a lower dose than existing products.

continued on page 18

Samsung’s latest product range makes it easier to display clear and distinct dividing lines of anatomical structure, according to the vendor.

Musica, Agfa HealthCare’s ‘gold standard’ in digital image processing, uses fractional multiscale processing (FMS) to show a high level of detail in digital radiographs.
The redesigned Mobile/tt Mira Max mobile digital radiography unit is proving useful in the emergency room, intensive care unit and paediatric department. (Images provided by Siemens)

Visit the Arts & Culture Booth in the Entrance Hall

continued from page 17

to an ideal detector, is calculated at around 85%, significantly higher than the 66 and 67% estimated for other current systems.

“The S-Detector’s high DQE level helps display clear and distinct dividing lines of anatomical structure. This is due to improved efficiency of radiation and spatial resolution, which requires a reduced amount of radiation to provide clearer image quality. The lower dose usage secures the patient’s safety, increasing the confidence of the healthcare providers,” the company said.

Siemens Healthcare is showing off its Mobile/tt Mira Max mobile digital radiography unit, which features the advanced functions of its MAX (multiple advances in x-ray) technologies that have proved successful over the past year in its high-end radiography, fluoroscopy and urology systems.

The company has redesigned the drive mechanism to get the unit quickly to where it is needed and ensure that it can be manoeuvred into the tightest of spaces, particularly in the emergency room, intensive care unit and paediatric department.

At around 375kg, this is one of the most compact and lightest systems on the market. It is equipped with a tube arm that can be rotated 360 degrees, and buttons on the arm itself which enable it to be positioned with great precision, to the nearest millimetre, explained Sabine Schaeffer-Kundler, head of product marketing with Siemens’ x-ray business unit.

The system is also equipped with two rapidly interchangeable wireless detectors, with the smaller measuring only 24 x 30 cm and weighing 1.6 kg, designed to show less rigidity on paediatric patients, even inside an incubator.

The company intends the system to be available for use at any time, as it runs on batteries, but can be switched to an external power supply, allowing images to be generated immediately even when the system batteries are completely exhausted.

Any equipment moving freely around the hospital may increase the risk of transferring infections, and so with Agfa Healthcare’s latest mobile digital radiography system, the DX-D 100, the emphasis is on its bacteriological safety features.

“We have redesigned the storage bin, to make it more robust and we’ve also enhanced its convenience, with three magnetic holders ideal for a packet of gloves, a bottle of hand sanitizer and a pack of sanitary wipes. This emphasis on increased hygiene is also reflected in DX-D 100’s existing wireless capability, which already helps the user to keep things clean by eliminating the trailing cable. Of course, hygiene is everyone’s business, but this functionality is especially appreciated in intensive care unit, neonatal and paediatric environments,” said Louis Kuitenbrouwer, vice president of the company’s imaging division.

He also highlights the combination of the product’s ruggedness and ease of use.

“This compact, mobile system is motorised and heavy-duty – ideal for coping with challenging imaging tasks. It can be operated by one person, thanks to the secondary controls on the system’s arm that allow them to refine positioning, while staying next to the patient. We’ve further increased the manoeuvrability of this already flexible and easy-to-operate system, with a telescopic arm and collapsible column. Together they give the user an unobstructed view, and let them get to the patient more quickly and safely,” Kuitenbrouwer said.

A physically robust system is an even greater asset in the main radiology unit, where radiographers face the challenge of dealing with increasing numbers of obese patients. On the Shimadzu stand, the staff are demonstrating the RADspeed fit general radiography system, which has a 220 kg weight capacity. The system can therefore be used to examine larger patients without any concerns.

The system also has powerful clinical features, equipped with a high voltage x-ray generator capable of tube current levels up to 150 mA (25 kW model) or 300 mA (32 kW model), well above the capabilities of previous integrated radiography systems. This results in shorter exposure times and minimises blur, even in images of larger patients, and contributes to its capabilities.

According to a company statement, this system includes a removable grid mechanism that allows it to be removed to reduce radiation dose levels for children or other patients. A function that calculates and displays the estimated dose before exposure or a function that measures the dose area product are other optional features.

An important addition to Philips’ digital radiography portfolio is the new SkyPlate portable detector, which offers cassette-sized wirelessly sharing across the company’s compatible systems. In addition, the vendor’s SkyFlow technology, available on its DigitalDiagnost and MobileDiagnost wDR models, keeps users at the forefront of clinical performance by allowing their clinicians to combine the ease of the gridless acquisition workflow for bedside chest radiography with detailed contrast, offering grid-like images, the company said.

Technical Exhibition Opening Hours
Sunday, March 8
10:00–14:00
EIBIR’s seven Joint Initiatives

Leading the way for biomedical imaging research

As an organisation dedicated to the coordination of research, the European Institute for Biomedical Imaging Research (EIBIR) supports research networking activities and plays a key role in promoting common initiatives and interoperability in the field of biomedical imaging research. As such, EIBIR supports a number of Joint Initiatives which represent interdisciplinary groups working towards a common goal.

CHEMISTRY PLATFORM
Active in many areas, the platform continues to see results via the COST Action TD1000 on Theranostics, with 13 participants at the Annual Workshop in 2014 and an increasing number of inter-laboratory collaborations. The legacy of the EU ENCITE project has led to the multi-site cluster initiative for training in the field of visualisation of cell tracking and therapy. Furthermore, the Platform contributed to a session devoted to Chemistry for Imaging at the major European Chemistry Conference (Euchem 2014).

BIOMEDICAL IMAGE ANALYSIS PLATFORM
The Platform actively contributed to the ESFRI project Euro-Bi-olaging, which in 2014 concluded its preparatory phase. In addition, two European projects, VHVI-Frise and VHVI-DAReIGT are running, with EIBIR involved in management and/or dissemination. New research projects in the field of medical image analysis and imaging biomarker development were supported by EIBIR and submitted as proposals under Horizon 2020.

EUROPEAN NETWORK FOR THE ASSESSMENT OF IMAGING IN MEDICINE (EUROAIM)
In 2014, EUROAIM published a systematic review evaluating the role of radiologists and nuclear physicians (imaging specialists) as authors of systematic reviews and meta-analyses on diagnostic and interventional imaging procedures. Only 3% of such systematic reviews included imaging specialists in the authorship and a significant reduction in scientific quality of papers (JAMSTAR checklist) when imaging specialists were not included among authors was revealed (Radiology 2014; 272(2):533-40). EUROAIM is now discussing the need for analysis of the quality of guidelines on imaging.

CELL IMAGING NETWORK
The Initiative focused on forging networks to apply for funding to allow for Europe-wide cell imaging application in the field of visualisation of cancer progression based on multi-modal imaging and develop in-vivo Idiopathic Arthritis (JIA) was launched during 2014. The study addresses the current lack of imaging markers for JIA through developing precise and valid, child-specific imaging biomarkers and scoring systems to allow for evidence-based clinical practice as well as for robust drug trials. The initiative is also involved in a second Horizon 2020 proposal co-ordinated by EIBIR, aiming at examining the effectiveness, efficiency and safety of paediatric imaging at three junctures: referral, examination and examination reporting.

PAEDIATRIC RADIOLOGY
A multinational project on Juvenile Idiopathic Arthritis (JIA) was launched during 2014. The study addresses the current lack of imaging markers for JIA through developing precise and valid, child-specific imaging biomarkers and scoring systems to allow for evidence-based clinical practice as well as for robust drug trials. The initiative is also involved in a second Horizon 2020 proposal co-ordinated by EIBIR, aiming at examining the effectiveness, efficiency and safety of paediatric imaging at three junctures: referral, examination and examination reporting.

IMAGING GUIDED RADIOOTHERAPY
In 2014, a cohesive group representing all the professionals involved in the delivery of radiation oncology physics, RTT, radiobiologists, radiation oncologists was created, which deepened its knowledge of EIBIR and its modus operandi, investigating the possible areas of research where the collaboration between radiation oncology and radiology is imperative. Prof. Valentinis, chair of the joint initiative, notes that “investigation on imaging will be crucial for improving tumour control.”

For more details about EIBIR, please visit www.eibir.org or visit us at our booth in the entrance hall.

Dr. Michal Neeman from Rehovot, Israel, is Director of the Cell Imaging Network.

Dr. Karen Rosendahl from Bergen, Norway, is Director of the Joint Initiative for Paediatric Radiology.

Dr. Vincenzo Valentini from Rome, Italy, is Director of the Joint Initiative for Image Guided Radiotherapy.

Dr. Silvio Aime from Turin, Italy, is Director of the Chemistry Platform.

Dr. Fransesco Sardanelli from San Donato Milanese, Italy, is Director of the European Network for the Assessment of Imaging in Medicine (EuroAIM).

Dr. Noordhout deOuwe from Sutton, U.K., is Director of the Cancer Imaging Working Group.
Purchasers choose combined x-ray over single systems in Europe

X-ray equipment has traditionally had dedicated systems for specific exams. In 2014, we started to see the market shift towards having one combined system that can be used for multiple exams. One of the main drivers behind this trend has been cost especially given health spending cuts. Having a room that is only being used for 40% of the day is a waste of resources for hospitals and imaging centres. Being able to utilise a room more not only reduces operational costs but provides new avenues for additional revenue. This trend is being seen across x-ray in general radiography and fluoroscopy, interventional and mammography x-ray equipment.

**MAMMOGRAPHY X-RAY**
In mammography, the debate on 2D vs 3D tomosynthesis continues in Europe. During 2014, uptake of 3D technology started to increase further in Europe, partly due to some new studies showing the benefits. Those looking to update existing analogue or 2D systems have chosen to purchase new mammography systems that use flat panel detector technology to provide a 3D system that can be configured for tomosynthesis with a software upgrade at a later date. Other types of systems have been introduced to the market, including 2D combined with 3D systems. These types of systems can be used for either 2D or 3D, and in some cases systems combine both images together to improve diagnosis. During 2014, standalone 3D tomosynthesis purchases were often limited to those with higher budgets. Some other barriers for 3D in 2014 were that reimbursement codes and legislation are still uncertain in markets, in addition to uncertainty surrounding studies on the benefits over traditional methods. The market for both 2D and 3D in Europe is forecast to increase by 9% from 2014 to 2019 for unit shipments.

**INTERVENTIONAL X-RAY**
When interventional x-ray was first introduced to the European market, dedicated systems for radiology and cardiology were commonplace, to be used for dedicated procedures. More recently, the market has switched to adopt a 2 in 1 style system, which combines interventional radiology and cardiology. These 2 in 1 systems are commonly being used for procedures such as transcatheter aortic valve implantation (TAVI) and transcatheter aortic valve replacement (TAVR). Combined systems can be used to perform radiology and cardiology procedures, reducing wasted resources with unused rooms. These systems started to penetrate the market in 2013 and continued in 2014, IHS forecast 18% growth from 2013 to 2014 in unit shipments. In Western Europe, combined systems are being purchased as part of consolidation of existing radiology and cardiology rooms. In Eastern Europe, combined IR/IC systems are often being purchased as a first system in many cases to equip hospitals with basic equipment. During 2014, standalone 3D tomosynthesis purchases were often limited to those with higher budgets. Some other barriers for 3D in 2014 were that reimbursement codes and legislation are still uncertain in markets, in addition to uncertainty surrounding studies on the benefits over traditional methods. The market for both 2D and 3D in Europe is forecast to increase by 9% from 2014 to 2019 for unit shipments.
Tips and tricks in paediatric Computed Tomography

In 2010 it was reported that the number of CT examinations for paediatric patients increased approximately 700% worldwide. In the preceding decade CT increasingly became the preferred method in daily practice and emergency departments. The increase of paediatric CT examinations was higher for head and chest imaging procedures. In accordance, CT examinations are considered a primary diagnostic technique to aid diagnosis and patient management. Examples of situations in which CT is used include headache, head injury, evaluation of dysplasia, dental injury, and a child younger than one year old are exposed to the same value of radiation exposure. When an adult is considered a primary diagnosis examination, include headache, head injury trauma, musculoskeletal non-accidental injury evaluation of dysplastic kidney and abdominal trauma.

Increasingly, regulatory bodies and research have focussed efforts on identifying the need for CT examinations to be performed more judiciously due to estimated lifetime cancer mortality risks attributable to radiation exposure. When an adult and a child younger than one year old are exposed to the same value of effective dose, the child has a higher potential of developing a fatal cancer.

Several studies have reported that CT optimisation needs to consider several factors, including the body region, clinical information, the CT scanner technology, and available image processing options. The paediatric CT optimisation processes must follow the phases presented in Figure 1. The equipment quality control must be verified, and the CT dose values must be analysed. According to the International Atomic Energy Agency and the European Society of Radiology recommendations, CT quality control is a multidisciplinary team task that must involve the radiologic technologists, radiographers, medical physicists, and equipment manufacturers. The local DRLs must be established according to the paediatric categorisation. They are particularly useful in areas where considerable individual or collective dose reduction may be achieved. Thus there appears to be a lack of standardisation with respect to age categorisation of paediatric patients for CT protocols across European countries in the published literature to date. These differences are presented but not discussed in detail within existing literature. Some studies use the metric of weight to describe a patient’s size, but this is in most cases not available. The patient diameter is also indicated as a possible method for categorising children for some body regions (chest and abdomen), nevertheless, the measurements must be performed on the topogram to enable the protocol optimisation. Despite the potential size difference within age categorisation metrics, this is the most practical and frequently used method for paediatric categorisation. The obtained local DRLs should be compared with the literature (see Table 1).

In order to analyse the optimisation impact, image quality must be analysed in an objective and subjective mode. To perform objective analyses, image signal and noise must be compared before and after optimisation. Subjective analyses should follow the recommended imaging criteria and must be performed and discussed between radiographers and radiologists.

**Use lower tube voltage and tube current and adapt to paediatric size**

**Avoid multiphase scanning**

**Use thin slices only when necessary**

**Increase the pitch in order to avoid overlapping**

**Use dedicated paediatric curves for tube current and voltage modulation**

**Position the area of interest in CT gantry isocentre**

**Preset protocols according to the paediatric age categorisation**

**Position the area of interest in CT gantry isocentre**

**Use in-plane and out-of-plane shielding**

**Use dedicated paediatric curves for tube current and voltage modulation**

In order to analyse the optimisation impact, image quality must be analysed in an objective and subjective mode. To perform objective analyses, image signal and noise must be compared before and after optimisation. Subjective analyses should follow the recommended imaging criteria and must be performed and discussed between radiographers and radiologists. Optimisation without detriment to image quality is essential for paediatric CT dose reduction and patient safety promotion.

### Table 1: International paediatric head and chest CT DRL values published as CTDIvol and DLP values.

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<td>Head</td>
<td>CTDIvol (mGy)</td>
<td>0 - 28</td>
<td>27</td>
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<td>30</td>
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<td>5 - 43</td>
<td>40</td>
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<td>10 - 51</td>
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<td>DLP (mGy/10cm)</td>
<td>0 - 270</td>
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<td>5 - 430</td>
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<td>10 - 610</td>
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<td>Chest</td>
<td>CTDIvol (mGy)</td>
<td>0 - 12</td>
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<td>DLP (mGy/10cm)</td>
<td>0 - 200</td>
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<td>5 - 220</td>
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**UK (NRPB, 2003); IE-Ireland (Medical Council, 2010); DE-Germany (Galarz et al., 2016); FR-France (Boch et al, 2012); DDM2 (DDM2, 2012); CH-Switzerland (Verdun et al., 2008)**

**Range of ages: <1 year, 1-5 years, 5-10 years and 10-15 years**

**Range of ages: <1 year, 1-5 years, 5-10 years and 10-15 years**

**Know the CT equipment**

**Regularly analyse CT dose values**

**Preset protocols according to the paediatric age categorisation**

**Adapt the protocol to the child’s size**

**Position the area of interest in CT gantry isocentre**

**Use lower tube voltage and tube current and adapt to paediatric categorisation**

**Use dedicated paediatric curves for tube current and voltage modulation**

**Increase the pitch in order to avoid overlapping**

**Use thin slices only when necessary**

**Restrict scan range length to what is necessary**

**Avoid multiphase scanning**

**Use in-plane and out-of-plane shielding**

Joana Santos and Graciano Paulo work at ESTESC – Coimbra Health School in Coimbra, Portugal. Louise Rainford and Shane Foley work at the University College Dublin, Ireland.
EUSOBI meetings see major rise in popularity

Since 2012, the Annual Scientific Meeting of the European Society of Breast Imaging has not been held in Vienna before the ECR, but in different European cities: Barcelona (2012), Rome (2013), and Amsterdam (2014).

The next EUSOBI Meeting will be held in London, October 2-3, 2015. As a result of this change, the number of attendees at meetings, as well as the total number of members of EUSOBI, skyrocketed. This includes members and participants from all over Europe and even countries outside Europe like India, Egypt and countries from the Middle East and South America.

At the last meeting, held in Amsterdam in September 2014, there were almost 500 participants. EUSOBI scientific meetings include state-of-the-art updates on recent developments, scientific insights and discussions on controversies in breast imaging. In Amsterdam, the debate between Prof. Christiane Kuhl from Aachen, Germany and Prof. Monica Morrow, from New York, on preoperative MRI was very lively and one of the most popular parts of the programme. The lecture by Dr. Elizabeth Morris from New York, vice-president of the U.S. Society of Breast Imaging, on background parenchymal enhancement drew attention to the expanding role of breast MRI from diagnosis to prognosis and risk stratification. The final session on screening interval cancers and errors was also greatly appreciated by the attendees.

Young breast radiologists have a special position within EUSOBI. Not only are they highly encouraged to join the Society, but also they are encouraged to submit their scientific work. In Amsterdam, the Carla Boetes Award for outstanding scientific work by younger radiologists was awarded to Dr. Katja Pinker from Vienna. Dr. Pinker is mainly focused on research in breast MRI, and is now the member of the Executive Board responsible for the EUSOBI Young Club, a new initiative dedicated to medical students, residents, and young radiologists highly interested in breast imaging for information contact katja.pinker-dominguez@medizinuniv.at.

Apart from the Annual Scientific Meeting, EUSOBI organises a number of courses on MRI, digital breast tomosynthesis (DBT), and screening mammography. The general breast MRI course is organised twice a year: one preceding the Annual Scientific Meeting and the other during summer, the last one was held in Dubrovnik, Croatia. We are also planning some more focused EUSOBI Breast MRI Courses, which will highlight specific items regarding breast MRI, such as screening, preoperative, MRI and the evaluation of neoadjuvant therapy. The first edition of the EUSOBI DBT Course (in collaboration with five vendors of DBT equipment) was held in Vienna, Austria on the two days preceding ECR 2014. The course will be held again in 2015. A residential one-week breast cancer screening course was held in June 2014 in cooperation the Dutch Reference Centre for Screening (LRCB) in Nijmegen, the Netherlands and will be held again in June 2015.

Position papers on different subjects in breast imaging are published by EUSOBI, aimed at filling the gap regarding information for women. The first of them, dedicated to mammography, was published in 2012 ( Insights Imaging. 2012; doi: 10.1007/s13244-011-0127-y). The second one is dedicated to breast MRI and will be published very soon. It has been written in cooperation with one of the most important European advocacy associations, Europa Donna, which has reviewed the text in order to ensure that is easy to understand for lay readers. EUSOBI is working on similar papers for ultrasound and needle biopsy procedures. In addition to all these activities EUSOBI represents European breast radiologists by interacting with all European societies or groups/sections of breast imaging. A meeting was held in Amsterdam during the Annual Scientific Meeting. The aim of this initiative, guided by Prof. Gabor Forrai from Budapest, EUSOBI vice-president, and Prof. Julia Campa Herrero from Valencia, chairperson of the EUSOBI International Relations Committee, is to maximise uniformity in breast imaging to the benefit of women and patients all over Europe. During this meeting, in Amsterdam, in which 22 European countries were represented, it became clear that the availability of equipment and skills of breast radiologists between countries inside Europe varies substantially. This situation was also explored by a detailed questionnaire sent to all European breast imaging societies, the results of which will be published soon. As a result of this survey and requests from several national breast imaging societies, EUSOBI will offer a number of places for the next screening course at the LRCB free of charge as a first step towards initiating high-quality breast imaging all over Europe and to minimise these differences. Position papers and statements are also in preparation, the first of which are aimed at supporting screening mammography.

Join EUSOBI now and attend the annual scientific meeting in London 2015!

More information about the European Society of Breast Imaging can be found at www.eusobi.org.

The next EUSOBI Meeting will be held in London, United Kingdom, October 2-3, 2015. (©FotoToz – abortiv)
Effective communication is vital for inter-professional discussions

BY ERIC ACHTEN

I started my radiology residency in 1984 and so today, I am a proud radiologist with 30 years on the clock. My first experience in MRI (as it was called back then) was a three-month internship at the Hvidovre Hospital in Denmark, which I secured for myself back in 1984. I remember clearly my first attempt at 31P MR spectroscopy. The coils had to be manually tuned to the resonance frequency, and matched for best coupling. Shimming was done manually in the computer room of the MR system while standing on calibrated paper. The peaks were cut out with scissors and each one was weighted to a precise balance. Metabolite ratios were calculated from the weights and a scientific paper on 31P MRS of brain tumours was actually published.

Today, MRI is a complex science and in order to bring it to the clinic many medical and non-medical professions are involved, and they all have important input. Inter-professional discussions level of understanding depends on common knowledge and a language to understand each other. Societies like the International Society for Magnetic Resonance in Medicine (ISMRM) and the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) have done a great job to accomplish such effective communication.

Looking back at the early days of MRI, I could understand most of what was going on, but that is not possible today. Fortunately, help comes from discussions at conferences with my MRI friends, who have degrees in radiology, physics, engineering, biochemistry, chemistry, pharmacology, or, as they say, related fields. Personally, I am very happy to be part of the large international community that is the ESMRMB, where people help each other and advance MRI science.

The radiological communities across the globe also adopted MRI very early on. In many diseases it has become the imaging modality of choice. Because of its complexity, MRI needs special attention in the education of radiologists and this has resulted in dedicated courses like the School of MRI, a product of the ESMRMB. These schools are very popular with our residents and with good reason; they are of excellent quality, thanks to excellent organisers and teachers.

Teaching does not stop after a lecture. MRI science is evolving very fast, and reading textbooks and science papers and attending conferences with refereed courses is an essential part of keeping up-to-date. The ESMRMB supports the development of science by organising conferences and promoting excellence through awards and scholarships. The ESMRMB also facilitates networking, which is without doubt essential to increasing the vigour in research and promoting the distribution of knowledge.

When I was in my last year of residency, I remember that I had to actually grab a high-level politician by the arm to prevent him from entering the magnet room, which was left open for him so that he could admire the mighty machine. MRI safety has always been an issue because of the immediate danger of the “projectile effect” or side-effects on cardiac pacemakers for example. Nowadays, more and more patients with complex pathology have to be scanned. Such patients often need close function monitoring and are dependent on IV medications. Needless to say, MRI safety and monitoring is a bit more complicated for such procedures. Not only the patients themselves, but also accompanying persons have to be protected. MRI suites are now also equipped with a variety of monitors and breathing equipment which are MRI conditional; meaning, if you can handle them correctly you are in for a nasty surprise. With ever stronger gradients and higher fields, the other two electromagnetic (EM) fields of MRI, heat deposition and electrical stimulation might become problematic if they were not actively monitored by the MRI systems. A good local safety policy is of the utmost importance and it is not surprising that education in MRI safety is an integral part of the ESMRMB’s courses. The new European rules for safety with EM fields could have potentially threatened the field altogether. Fortunately, the Alliance for MRI, with the help of the ESR and ESMRMB, and the support of all involved in the field of MRI in Europe, achieved a dedicated legal exception for our field, and thereby avoided the nightmare of not being able to run MRI systems in hospitals anymore.

Looking back at 30 years in radiology, I realise now how privileged I am to have such a long history in MRI. I can only advise my younger colleagues to dig deep into the science and find out how exciting MRI really is. Join us at ESMRMB, and we will take care of just that.

Want to know more? Visit us at www.esmrmb.org
Hybrid imaging contents to heighten delegates’ interest at ECR 2016

ECR Today spoke with ECR 2016 Congress President Prof. Katrine Åhlström Riklund, deputy head of the department of radiation sciences and director of the medical school at Umeå University, Sweden. By Mélanide Rouger

**Katrine Åhlström Riklund:** It is hard to tell what the specific highlights will be more than one year ahead, due to the rapid development of imaging. The highlights will be the entire congress through its well-developed programme, which covers the whole range of education from student level to advanced subspecialties. I should say the added content of hybrid imaging will be more attractive. Besides the educational and scientific programme, the grand opening ceremony and social activities will also be memorable events.

**ECRT:** What will be the high-lights of ECR 2016? **Katrine Åhlström Riklund:** It is hard to tell what the specific highlights will be more than one year ahead, due to the rapid development of imaging. The highlights will be the entire congress through its well-developed programme, which covers the whole range of education from student level to advanced subspecialties. I should say the added content of hybrid imaging will be more attractive. Besides the educational and scientific programme, the grand opening ceremony and social activities will also be memorable events.

**ECRT:** Will there be any new additions to the programme? **KAR:** As always, there will be innovations at the ECR. The content of hybrid imaging will be spread across several sessions and not in one single session. The new session formats introduced at ECR 2015, with the European Excellence in Education (E3) programme – divided into five levels (The Rising Stars programme, European Diploma Prep Sessions and Beauty Stars programme, European Academies and ECR Master Classes) will be continued. These levels cover the entire span from undergraduate medical education to subspecialised continuing professional development. Getting involved in the sessions is important for retaining knowledge.

**ECRT:** As current 1st Vice-Chairperson of the Congress Committee, you must have a pretty good idea of what is awaiting you next year. What do you think are the necessary qualities for the job? **KAR:** I think a genuine interest in imaging is a rather broad overview of the field and a well-sortied hard disc are good things to start with. Besides that, enthusiasm when working with others and the desire to create a good meeting for all attendees are mandatory. Another prerequisite to be able to fulfill this job is the existence of the excellent staff at the ESR Office, in particular the Scientific Programme department, in the lead-up to the congress.

**ECRT:** Your subspecialty is nuclear medicine. Will it be reflected in the ECR 2016 programme? **KAR:** Nuclear medicine and radiology techniques are part of my daily work and help me to make the correct decisions regarding the patient’s disease or response to treatment. In my position, both specialties are needed for the patient’s benefit, and of course this will influence the ECR programme. There will not be a separate nuclear medicine programme; instead, the sessions, especially the ECR Academies, will include integrated hybrid imaging content. We will also have an ESR meets Nuclear Medicine session at the congress. This session will show the added value of having both radiology and nuclear medicine experts talking about hybrid imaging.

**ECRT:** What is the state of nuclear imaging equipment (PET/CT) in Europe? How far along is PET/CT research on the continent and how many years are we from its integration into clinical practice? **KAR:** Before introducing PET/CT into clinical practice, the added value it provides in comparison to PET/CT remains to be shown. I think the transition of PET/CT into clinical practice will be much more rapid than the transition of PET/CT. When problems with attenuation correction are solved, the method will be used in sites that are already equipped. I am already aware of the clinical demands at my own department, where we recently installed a PET/CT machine. The spread of the technique will take some time due to the tight financial situation and the lack of resources. As promoted by the EuroSafe Imaging campaign, PET/CT is preferred, as it will lower the radiation dose to the patient.

**ECRT:** Is ECR 2016 likely to have a Swedish touch? **KAR:** My guess is yes, but it will not only be Swedish. We will organise activities in which delegates will be able to discover all Nordic countries. ESR President Prof. Lluís Donoso Bach is from Barcelona, so you can also expect a touch of Spanish culture at the congress.

**ECRT:** You are one of the very few women who have been appointed ECR President. Do you think this share reflects women’s presence in high power positions in the society in general? How could we encourage more women physicians to take on official functions? **KAR:** Yes, I think the small number of women in these positions still reflects the situation of women involved in high positions in general. I am happy to say that during the years I have been in charge, the situation has been evolving and more women are being elected and accepting high power positions, so changes are on-going, even if they are slow.
Italian radiologist enjoyed first Albert L. Baert Fellowship

The editorial fellowship was initiated by Prof. Albert L. Baert and the European Radiology Private Foundation. Baert was Editor-in-Chief of European Radiology during the annual European Congress of Radiology. The editorial fellowship programme aims to provide training in editorial skills, such as manuscript evaluation, peer review, editorial office work, and board meetings. The fellowship is open to radiologists in training or under the age of 45 to cover expenses. Candidates are selected each year by the ESR and the EMEA, and the fellowship is a good initiative for younger or less experienced radiologists.

ECRT: You were last year’s winner of the Albert L. Baert Editorial Fellowship. Had you had any previous experience in the editorial process of a scientific journal?
GZ: I had been reviewing for several journals for many years before I received the fellowship, but did not have the insider experience that I gained during my time at the editorial office in Munich and Vienna, so this was something new to me.

ECRT: You are a reviewer for European Radiology: did you find the fellowship helpful for your future work as a reviewer/author?
GZ: Even though I have been a reviewer for many years, I think that the fellowship has given me a different insight on how to perform a review, so this has definitely been a very useful experience not only as a reviewer but also as an author. So yes, I think it was useful on both sides.

ECRT: Do you think this fellowship is a good initiative for younger radiologists who have not yet been able to gather so much experience in the editorial process?
GZ: Yes, I think that someone who is not yet experienced will benefit even more from this type of fellowship and it can help them develop useful skills at a much earlier stage and thus become more experienced both as a reviewer and as an author. I think this would definitely be a very good experience for younger radiologists.

ECRT: Where do you expect to gain a better understanding of how medicines are being used in real clinical practice and how EU regulatory decisions impact clinical practice, as well as how the Agency can best communicate with healthcare professionals to support their role in the safe and rational use of medicines?
GZ: In my opinion, the time I spent in Munich and in Vienna was already very well organised. However, I agree very much with the changes you are making to the structure of the fellowship, like shortening the length of the fellowship a little and taking into account applicant age and work experience as well, and in giving younger and less experienced radiologists a chance to learn about the editorial processes behind a scientific journal.
The LRA is one of the organisers of many international radiology events in other countries in order to exchange experiences in the application of new modern radiological methods. The LRA is cooperating with various international societies including the ESR. Some ESOR courses took place in Lithuania every year, e.g., PET, 3T MRI, perfusion-MRI and MR spectroscopy.

many practical rules, in the United States, Italy and Europe, result from faulty communication, non-communication or inadequate communication. In fact, the impact of poor communication on malpractice litigation is now a factor in up to 40% of all medical malpractice lawsuits. The President of the Italian Society of Medical Radiology (SMR), Prof. Carlo Maucorci, and the SMR Executive Committee encourage Italian (and non-Italian) radiologists to change their ways, and get up from the reading room and away from the work station. Speaking with patients and sometimes giving them a report in person has become a much more common practice. The professional radiologist must communicate first during medical education. This teaching is necessary both in theory and practice but primarily in the latter. It requires the trainee to take and develop effective communication habits from those based on the needs of doctors to those focused on patient rights and needs, as well as learning key elements of effective communication7.

The EHR and Forensic Radiology section of SIRM will promote education programmes in order to help radiologists to cultivate communication skills. Ideally, such programmes would provide a rationale for conversations that will help radiologists to enhance confidence, skills and strategies for approaching challenging conversations with patients and their families in the context of routine workflow.

Radiologists, despite our limited time, must start during medical training how to communicate effectively and, primarily in the latter. It requires a sender, a message, and a intended recipient. The communication process is complete only if the personal staff and with their patients 1.

Good communication is an important professional attribute for radiologists. Depending on the nature of their practice, radiologists have variable degrees of direct contact with patients, but all radiologists must be able to communicate well with other medical and non-medical staff and with their patients. The current state of radiologists’ communication derives from the Latin word ‘communis’, meaning to share. Communication requires a sender, a message, and an intended recipient. The communication process is complete only if the intended recipient has received the message from the sender.

Communication takes different forms. Communication test results as a major issue affects only patient care; increasing the risk of missed or delayed diagnoses. Communicating is not easy and, as Leonard Bernstein underlines, once the receiver has understood the message of the sender.

The calendar of events organised by the LRA is associate professor and head of the department of radiology, nuclear medicine and medical physics at Vilnius University Hospital Santariskis Klinikos, is the webinar of the ESR website.

Interventional angiography procedure performed by radiologist A. Simkevicius. (Provided by Prof. Jurate Dementaviciene).
**Turkish Society continues to work closely with its international counterparts**

The Turkish Society of Radiology (TSR) is a non-governmental organisation and one of the foremost medical specialty organisations in Turkey. Its headquarters are located in Istanbul, in the capital city. It was formed through the recent merger of the two main radiology societies of Turkey, one of them founded as early as 1934 (the latter, the Turkish Society of Medical Imaging and Interventional Radiology, was founded in 1993). It is a member of the Turkish Medical Specialist Board, an official body of the Ministry of Health in Turkey. The main office of the TSR is based in the city of Bursa.

President of the Turkish Society of Radiology, Dr. Abdulhakim Coşkun is the first radiologist in Turkey to take the office of the TSR. He took the presidency in the Imperial Medical School (Istanbul) in 1896. Esad Feyzi, studies started in Turkey on the field of radiology. He took the first radiographs at the Imperial Medical School (Istanbul) in 1896. It was formed through the recent merger of the two main radiology societies of Turkey, one of them founded as early as 1934 (the latter, the Turkish Society of Medical Imaging and Interventional Radiology, was founded in 1993). It is a member of the Turkish Medical Specialist Board, an official body of the Ministry of Health in Turkey. The main office of the TSR is based in the capital city of Ankara.

After the introduction of the x-ray in 1895 by a military doctor named Esad Feyzi, studies started in Turkey on the field of radiology. He took the first radiographs at the Imperial Medical School (Istanbul) in 1896. Esad Feyzi worked in the clinical team led by Professor Salih Effendii, MD, at the Valide Temporary Military Hospital in Istanbul to take radiographs of soldiers wounded at war in cooperation with the German Red Cross medical delegation. This event is most probably one of the earliest examples of the application of x-ray technology in military surgery anywhere in the world. The vision of the TSR is to be a global pioneer in science, contributing to public health, highly regarded professional society and the primary decision-making authority in the field of radiology. Its mission is to enhance the science of radiology in accordance with the public interest and to improve occupational scientific and social relations between its members.

The Turkish Society of Radiology publishes the quarterly peer-reviewed journal Diagnostic and Interventional Radiology Thai journal, which has been published since 1995, has the highest standards of peer-review, editorial content and publication quality, and it is a medium for original articles, reviews, pictorial essays, technical notes and case reports related to all fields of diagnostic and interventional radiology. In 2005, Diagnostic and Interventional Radiology was accepted for indexing in the Science Citation Index Expanded. The Impact Factor of Diagnostic and Interventional Radiology in 2021 was 1.14. The average evaluation period is 20 days, and the article acceptance rate is 19%. The journal is also available free to all readers on the web (www.turkrad.org.tr).

The number of scientific articles by Turkish authors in radiology journals has increased substantially over the last 15 years, and Turkey ranked in the top five to ten among countries submitting articles to the most respected radiology journals such as the American Journal of Roentgenology, Cardiovascular and Interventional Radiology, European Journal of Radiology, American Journal of Neuroradiology, Paediatric Radiology and European Radiology.

The Society continues to run the Winter School programme, through which every resident undergoes a two-week training programme during their residency period with all costs covered by the Turkish Society of Radiology. Every year, approximately 200 to 300 residents are trained in the basics of radiology by distinguished lecturers. Since 2007, the Society’s Education Council has been holding radiology board examinations in an aim to increase the knowledge and competency of Turkish radiologists. The TSR also aims to support our young colleagues who want to work in any field of radiology, at home or abroad. Between 2011 and 2021, a total of thirteen full members were awarded TSR Scholarships; nine were foreign and four were domestic scholarships.

Within the field of radiology, the TSR is a European Society of Radiology and an International Society of Radiology institutional member, which develops infrastructure and human resources rapidly. It also implements high-quality training programmes for residents and young colleagues and makes invaluable scientific contributions at the international level. The TSR also holds a joint meeting (GAST) between the German and Austrian societies, held in Istanbul last May which resulted in the decision to hold the meeting annually and implement academic exchange programmes for residents.

In addition, the 12th Balkan Congress of Radiology was held in Istanbul from October 26 to 29 at the Kaya Barbarus Hotel with participants from Bosnia-Herzegovina, Macedonia, Romania, Serbia, Bulgaria, Greece and, of course, Turkey under the presidency of Okan Akhan and the co-president of Neva Elmas and Mustafa Osman. We also have close relations with the Korean Society of Radiology and the Iranian Society of Radiology as a result of the memorandum of understanding we have signed with them.

The Turkish Society of Radiology has a strong relationship with the European Society of Radiology for the last 30 years. Strengthening and improving the relationship between two societies is of the utmost importance to the TSR. We also participate in the European Congress of Radiology every year in Vienna. It is an honour for me to say that Turkey will be one of the guest countries at the EUR meeting session at ECR 2015. We have prepared a fulfilling programme, both scientifically and socially.

The TSR also regularly holds refresh course and workshops to educate radiologists. Subspecialty groups (breast imaging, abdominal radiology, etc.) and societies (the Turkish Society of Thoracic Imaging, the Society of Ultrasonics, etc.) frequently offer workshops and refresh courses in collaboration with the TSR to support radiologists. The TSR has ten subspecialty groups including: paediatric radiology, head & neck radiology, imaging physics and radiation protection, breast imaging, imaging informatics, musculoskeletal radiology, and abdominal, urogenital system, cardiovascular and a resident committees.

The Society holds its National Congress of Radiology each year, both as symposia and other small-scale meetings. Attendance at the annual congress is in the range of 1,500–2,000 radiologists. An impressive range of world-renewed radiologists from many subspecialties of radiology are invited to these meetings to present lectures. Our 13th Turkish Congress of Radiology, TurkRad 2015, will be held on October 20–23, 2015, at the Kaya Palazzo Golf Resort in Antalya. (© Photos.com – monticelli)
TOP TIPS for trainees and teachers

BY CHRISTIANE NYHSEN

PART 5: Educational resources

IS THE TEXT BOOK DEAD?

If you enjoy the lectures here at the ECR you may be interested to read about some selected topics in more depth. Please find below some valuable information on the educational resources available, particularly those offered by the ESR and their development plans to watch out for! Dr. Sue Barter, apart from many other important roles in the ESR and the U.K., was chair of the Self-Assessment Subcommittee of the ESR until spring 2014, and serves on the Scientific Board of the European Board of Radiology (EBR), responsible for delivering the written content of the European Diploma in Radiology (EDiR) exam. So I trust her to recommend the best educational resources for you.

ECRT: Do you know any good radiology apps out there you would recommend?
SB: I’m afraid I’m rather an app dinosaur; I don’t use any.

Another hint for trainees and students is that they may use such websites for learning.

ECRT: Do you enjoy the lectures here at the ECR or do you personaly recommend, and which level of training would they be suitable for (medical students, radiology trainees, consultants, all levels)?
SB: The ESR’s online resources are really good, and I’m involved in developing the new eLearning platform, which will bring together in one portal access to ESOR courses, composed of videos recorded in 2010–2012; quiz cases, made up of PowerPoint presentations and tests; self-assessment tests with tests and feedback from the ESR Self Assessment tool; and eLearning modules, composed of ESOR and ECR 2014 lectures.

ECRT: What are the advantages or disadvantages of such websites?
SB: The advantage of the ESR’s material is that it offers assessment in the eLearning modules. This is a proven way of consolidating learning. The material is also written by experts in the specialty. Another advantage of this resource is that it will eventually cover the ESR European Training Curriculum for Radiology.

As I mentioned before, some websites are not as rigorously reviewed and monitored, so it is important to bear this in mind when using such websites for learning.

ECRT: Do you have any good radiology anatomy teaching sites for medical students, radiology trainees or experienced radiologists who need to look up specific areas for reporting?
SB: This is not something I use or am familiar with.

ECRT: The internet is a great resource for looking up specific items, but most people will probably still only use Google. Are there any other, or better, search engines for medical facts? How do you search the internet?
SB: I still use Google the most.

ECRT: These sites are suitable for all radiologists, but are probably rather advanced for medical students.
SB: Other online case collections and tutorials I refer to are sites like Radiopaedia. These sites are suitable for all radiologists, but are probably rather advanced for medical students.

ECRT: Make learning fun and use different resources to consolidate your knowledge. eLearning and reading textbooks in depth have useful functions.

Dr. Christiane Nyhsen is consultant radiologist at Sunderland Royal Hospital, U.K., and former chairperson of the ESR Radiology Trainees Forum.
LUDWIG GOES POP

AN EXHIBITION AT THE MUMOK – MUSEUM OF MODERN ART

Roy Lichtenstein, Still Life with Pitcher and Apple, 1972, Museum Ludwig, Köln
© Estate of Roy Lichtenstein / Bildrecht Wien, 2014
From February 2015, mumok is presenting on four levels one of the world’s most significant holdings of Pop Art – the collection of the German industrialists Peter and Irene Ludwig. In this extensive overview, around 120 works from seven different institutions associated with the Ludwigs will be brought together. Exhibits from the Museum Ludwig Cologne, the Ludwig Forum for International Art, Aachen, the Ludwig Museum in the Deutschherrenhaus Koblenz, the Kunstmuseum Basel, the Ludwig Museum in Budapest, the Ludwig Museum for International Art in Beijing, and mumok will be on show in Vienna to September 2015.

Pop Art was quicker than any other art movement of the twentieth century to gain entrance to art markets, and was widely exhibited and enthusiastically received as soon as it began to emerge on the scene in the USA. Peter and Irene Ludwig first discovered American Pop artists in the mid-1960s, when this movement was still largely unknown in Germany. It was only with presentations at the 1964 Biennale di Venezia and documenta 4 (1968) in Kassel that Pop Art became known to a broader European audience. The Ludwigs were interested in those artists who are today seen as the legendary protagonists of Pop Art: Jim Dine, Robert Indiana, Jasper Johns, Roy Lichtenstein, Claes Oldenburg, Robert Rauschenberg, James Rosenquist, Andy Warhol, and Tom Wesselmann. Their early sense for the significance of these works led to the largest Pop Art collection, which includes, among many other things, large groups of works and single key works – artists such as Duane Hanson, Jasper Johns, Roy Lichtenstein, Robert Rauschenberg, Andy Warhol, and Tom Wesselmann. Important British Pop artists will also be included, with works by Peter Blake and Richard Hamilton.

The works of Pop Art mirror the sense of life in the 1960s. This art reacted to the increasing commercialisation of post-war society and the growing presence of mass media such as television, advertising, and print media. Pop Art took an interest in packaging, the outer sheen, the cliché, and quotation. High and trivial culture were not seen as fundamentally different. The presentation of the real art was accompanied by an ambivalent view somewhere between a fascination for the seductive clichés of the world of commodities and advertising and its rejection as the epitome of ‘kitsch’ (Clement Greenberg) and ‘false consciousness’ (Theodor W. Adorno). Pop artists appropriated the aesthetics of contemporary advertising, made use of popular means of production and expression, such as photography, film, or comics, and they lifted them to the status of contemplative objects, while at the same time scornfully parodying the clichés of so-called high art. They were interested in urban experience and the superficialities of the consumer society. The degree of illusion of their figurative images and motifs was taken to extremes, since reality seen through the media and its consumable outer sheen was the key theme of Pop Art. It can now also be seen as an attempt to analyse the sociological effects and ideological implications of commercial forms of communication.

The mumok exhibition will focus on works from the mid-1950s to the mid-1970s. The most important protagonists in American Pop Art will be included with large groups of works and single key works – artists such as Duane Hanson, Jasper Johns, Roy Lichtenstein, Robert Rauschenberg, Andy Warhol, and Tom Wesselmann. Important British Pop artists will also be included, with works by Peter Blake and Richard Hamilton.

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WHAT’S ON TODAY IN VIENNA?

Theatre & Dance

Please note that all performances are in German.

Akademietheater
1030 Vienna, Lieblgasse 1
Phone: +43 1 544 444 2145
www.akademietheater.at

Burgtheater
1010 Vienna, Universitätsring 2
Phone: +43 1 544 444 2145
www.burgtheater.at

Rabenhof
1170 Vienna, Rabengasse 3
Phone: +43 1 712 82 82
www.rabenhoftheater.com

stadttTheater wolkfagasse
1170 Vienna, Wolkfagasse 4
Phone: +43 1 212 12 00
www.stadtttheater.org

Theater in der Josefstadt
1080 Vienna, Josefštchter Straße 26
Phone: +43 1 427 00 300
www.josefstadt.org

Volksoper
1090 Vienna, Währingerstraße 78
Phone: +43 1 544 444 2145
www.volksoper.at

Concerts & Sounds

Konzerthaus (Classical Music)
1030 Vienna, Lothringerstraße 20
www.konzerthaus.at

Mozarteum (Classical Music)
1010 Vienna, Bösendorferstraße 12
www.mozarteum.at

Porgy & Bess (Jazz)
1170 Vienna, Riedererstraße 14
www.porgy.at

Arena (Alternative Music)
1101 Vienna, Haußgasse 26
www.arena.co.at

Szene Wien
1101 Vienna, Haußgasse 26
www.szene-wien.com

Opera & Musical Theatre

Volksoper
1090 Vienna, Währingerstraße 78
www.volksoper.at

Wiener Staatsoper – Vienna State Opera
1010 Vienna, Opernring 2
www.wiener-staatsoper.at

Raimundtheater
1101 Vienna, Wolkfagasse 18-20
www.musicalvienna.at

Ronacher
1110 Vienna, Saletstraße 9
www.musicalvienna.at