De Roos spells out essential ingredients to achieve success in research

The future well-being of radiology hinges not on where the specialty will go, but on what role radiologists will play in the delivery of healthcare and how they can stimulate the research enterprise, according to Honorary Lecturer Prof. Albert de Roos.

“We have to develop new techniques and keep running and explore the technology,” de Roos said in a plenary session on Friday. “We have to start doing research earlier in our careers and not leave it too late, and we have to develop a mentoring programme, as suggested by ESR statements. Find the best mentors in the hospital and learn to write articles from the start, which is not a major thing but rather like riding a bike: when you know the principles, everything is not difficult but rather like riding a bike: you have to sustain the momentum. The dollar being the foremost consideration …”

Prof. Albert de Roos from Leiden, the Netherlands.

“...but the future for radiologists is far less certain.” and “Outsourcing of imaging teaches hospital administrators that relationships don’t matter, and anyone can do it, at any time.”

Summing up, he said he particularly liked the following quote from Indira Gandhi, the Indian politician: “My grandfather once told me that there were two kinds of people: those who do the work and those who take the credit. He told me to try to be in the first group; there was much less competition.”

Facebook quote of the day
“Brilliant presentations! Great organization! It is break at the moment at ECR Live, so if I have a minute to tell thanks a lot.”
Olena Katric

“Leaving the live, lunch time traditional Russian music in the main concourse at ECR2014”
McNulty_J

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“Cooperation, not competition,” say speakers ahead of ESR meets ESC session

“Researchers are recruited rather late in their careers. Develop a structured mentoring programme. Exposure of all residents to research training. Give more guidance for career planning and skills.”

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Ultrasound supplies answers in standardised tumour therapy evaluation

A multicentre study of 500 patients using dynamic contrast-enhanced ultrasound (DCE-US) nudges radiologists further towards standardisation in functional evaluation of tumour perfusion, which until recently was lacking in the toolkit of oncologic imaging specialists, ECR attendees learned on Friday.

The study, outlined by speaker Dr. Nathalie Lassau, head of the laboratory at the renowned Institut Gustave-Roussy in Villejuif, France, was a vital component in a presentation in which DCE-US was compared with CT, MRI and PET at a joint session of the ESR and the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB).

Previously there was little or no consensus about the parameters or the timing for early evaluation of anti-angiogenic drugs. But the French research demonstrated the feasibility of DCE-US and now helped provide an update to good clinical practice recommendations on the best parameters and timing for evaluating response to anti-angiogenic therapies using contrast-enhanced US.

The study found that using raw linear data pertaining to blood volume after bolus injection, a decrease of 50% at one month post-treatment in the area under the Curve (AUC) correlated significantly to progressions-free survival and overall survival. This was welcome news to radiologists seeking standardisation in therapy validation strategies.

"The good news is that all compa- rees routinely provide this raw linear data for performing quantification," she said.

In the panel discussion, delegates were keen to find out how soon tumour response could be evaluated by ultrasound, and queried the choice of one month as the imaging follow-up point.

"Early changes in tumour per- fusion can be seen in the days or weeks after treatment with ultra- sound, and with a vascular disrupt- ing agent, even hours afterwards as demonstrated on MRI. But when we discussed this with the oncologists they said it was not very useful to have this information because they want to compare the toxicity of the drug, how the patient seems to be and imaging," noted Lassau.

She went on to explain that for oncologists, knowing very early response might be interesting, but her colleagues at her hospital were not willing to propose a change in drug for a patient before one month post-treatment had elapsed. Checking up any area of uncer- tainty over the usefulness of volume ultrasound imaging in the clinical setting, Prof. Michel Claudon, pro- fessor of radiology and head of imag- ing at University Hospital of Nancy, France, compared DCE-US to a real-life adult-sized garden tool, and also to a child's beach spade, asking the question tool or toy? Descriptively on the side of the former; he pointed out that advances in probe technol- ogy had led to shorter acquisition times and improved resolution. A series of rapid rhetorical questions followed, answered just as quickly by the expert.

"Why do radiologists like CT and MRI? Clearly because of the advan- tages involved: namely speed of data capture and permanent storage with capacity for peer review or second reading, as well as high resolution, flexible manipulation and analysis features such as measurements, mul- tiplanar reformating (MPR), maxi- mum intensity projection (MIP) and surface-rendering. Patients, on the other hand aren't so keen on the intrusion of these modalities, he explained. He also asked whether or not the same rapid acquisition of volume data with the same high resolution in 3D and with the same flexible manipulation and analysis features could be obtained with the more patient-friendly ultrasound.

Slow acquisition, a relatively lim- ited field-of-view post 2 resolution, and respiration and movement arte- facts were among the impediments to validating electronic probes that were first seen on the market at the beginning of this cen- tury. Electronic probes that appeared in 2004, have largely overcome the problems of mechanical probes.

"You are able to decrease the slice thickness because you are able to focus on the third dimension in the elevation plane," said Claudon, detail- ing the other advantages of the elec- tronic probe: the focused beam can be placed anywhere within the field of the transducer, meaning there is better spatial resolution and image uniformity that can be maintained at depth as well as improved B and C plane resolution in volume ultra- sound MPR. Furthermore, live mul- ti-plane imaging and volume acqui- sitions taking typically less than a second provided a safe and real-time approach to diagnostic imaging.

While using 3D and 4D ultrasound in the past hampered workflow, today's advances in PACS and remote reading and reporting mean that volume imaging could be smoothly integrated in the clinical setting. In the future, integration of volume imaging and fusion would yield high quality dynamic imaging of organs and lesions, he remarked.

"The first ultrasound session showed 'Good results through co-operation', this second through combination," said moderator Prof. Lorenzo Dorchy, from Genoa, Italy. "From different points of view we are working towards a single one which is patient-focused."

BY MÉLISANDE ROUGER

Ultrasound supplies answers in standardised tumour therapy evaluation

Survival guidance to giving evidence in court

Medical imaging professionals need to understand what is at stake when carrying out procedures on children, as they can encounter some sensitive situations, experts said dur- ing a dedicated Refresher Course on Friday at the ECR.

Many questions come to mind when dealing with child protection issues. One of them concerns the role of radiologists and radiographers in cases of suspected abuse of paediatric patients. "As someone who teaches in this area, one thing that often strikes me is that when we think of something like non-accidental injury in child protection and suspected child abuse, we don't often talk about the bigger picture and where we fit with that," said course chairman Jonathan McNulty, head of teaching and training diagnostic imag- ing programmes at the University College Dublin (UCD), and a fellow in teaching & academic development.

The course set out to clear things up by answering key questions like what do you if you do find yourself being called to give evidence. The first thing to do is if you are called upon to provide expertise on forensics or testify as a witness is to avoid going to court; according to Mark Viner, Fellow of the Cranfield Forensic Institute in London, who also spoke during the course.

"You may not have to go to court if you identify the film, using ID markers, subject ID, radiographer and patient ID, and follow reporting procedures and keep a record of the imaging. You can for instance keep a CD of the original data set, burned as a master copy," he said.

Tracing and securing images at all times, and keeping contempor- aneous notes and factual statements signed by witnesses may also help to avoid a court appearance.

Medical imaging professionals should understand that during an investigation into non-accidental injuries, the patient and his or her cor- responding images will be treated as part of the crime scene. "The patient and their story is the evidence. Any examination of physical evidence can be pre- sented as evidence, including images and imaging reports. In order to be admissible, any image, statement or other information to be presented as evidence must be properly authen- ticated and its continuity demonstr- ated," he added. "Medical imaging professionals must understand the importance of continuity of evidence in forensic examinations."

If you can't avoid going to court, review the records before writing your report; organise your report, avoid technical jargon and abbrevi- ations, and commit only on matters within your expertise. Viner recom- mended. "Where there is evidence undermining your opinion, outline that evidence and explain why it is not persuasive," he added.

Radiographers in particular should pay attention to what their patients may say during the examination. "As radiographers, when we're imaging a child and suspect child abuse we're in quite a unique position. When we're in the x-ray room, parents may be outside in another room, so children can often make disclosures of that potential abuse as well. How we manage that information is really important," McNulty said.

It would definitely help if radiog- raphers were given proper education about how they can report abuse, according to Dr. Ciara Fitzpatrick, UCD School of Medicine and Medical Science.

"Education goes beyond continu- ing professional development (CPD), I think it should be present in every undergraduate curriculum across Europe, and it should be in training and education. When child protec- tion training is offered in hospitals, a lot of people usually don't think to include radiographers. And when I ask why, they say it's because radiog- raphers don't work with children. There's a perception of what radiog- raphers do, so I think training should be present in every undergraduate curriculum," she said.

"Working along a multidiscipli- nary approach could also improve understanding, she believes. "We're expected to act in a multidiscipli- nary team. If we communicate to the individuals at a multidisciplinary level, we'll have better knowledge of what the course and physician do, for instance, and that's where we'll start to break down professional barriers."
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Controversy breaks out over how to study cell death in cancer

When Prof. Uwe Haberkorn drew breath after his presentation at yesterday’s New Horizons session on imaging the hallmarks of cancer, he probably didn’t anticipate the lively debate that was to follow.

One view is that ultimately all radiologists and oncologists need to do is look at cell kill and study the dead cells. But it presents no initial specific success stories in the sixties and presented to current TB imaging, one means in, imaging, attention was accomplished in, contributions to, and accomplishments of Russian session that highlighted Russian advances in this area, Tyurin told ECR Today. “Imaging the hallmarks of cancer,” came from the famous article by Douglas Hanahan and Robert Weinberg, called ‘The Hallmarks of Cancer’ (Cell 2000;100:101–10). It is one of the most widely read and cited medical articles of all time, having been downloaded more than 30,000 times.

Cell death can have defects in the control mechanisms that govern how they belong, plus they need a blood supply to grow. “All these mechanisms must be overcome in order to be able to develop into a cancer. Each mechanism is controlled by several proteins,” he said. “These proteins are damaged when the DNA sequence of their gene is damaged through acquired or somatic mutations, i.e., mutations that are not inherited but occur after conception.” This occurs in a series of steps, the outcome of which Hanahan and Weinberg call hallmarks.”

By Frances Rylands-Monk

Russia pursues reform of TB screening system

Incidence and management of tuberculosis (TB) in Russia is much mystified and misunderstood, according to Prof. Igor Tyurin, chief radiologist at Russia’s Medical Academy for Postgraduate Education.

Despite a constant yearly decrease in the number of new cases, the high number of patients infected with the disease means that the country’s screening strategy and follow-up, a legacy from the Communist era, must be radically updated to enable its radiological services to manage these patients effectively. New modalities have already started to modify radiology’s diagnostic approach to the disease and this must be built on to ensure continued improvement in this area, Tyurin told delegates on Friday.

As part of the ESR meets Russia session that highlighted Russian contributions to, and accomplishments in, imaging, attention was drawn to current TB imaging, one of the former Soviet Union’s imaging success stories in the 1960s and 1970s. TB is a potentially curable disease but it presents no initial specific success stories in the sixties and presented to current TB imaging, one means in, imaging, attention was accomplished in, contributions to, and accomplishments of Russian session that highlighted Russian advances in this area, Tyurin told ECR Today. “Imaging the hallmarks of cancer,” came from the famous article by Douglas Hanahan and Robert Weinberg, called ‘The Hallmarks of Cancer’ (Cell 2000;100:101–10). It is one of the most widely read and cited medical articles of all time, having been downloaded more than 30,000 times.

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EuroSafe Imaging poster exhibition officially opens

ESR President, Prof. Guy Frija, officially opened the EuroSafe Imaging poster exhibition yesterday, Friday March 7. Flanked by members of the EuroSafe Steering Committee, Prof. Frija reiterated the ESR’s commitment to a holistic approach to radiation protection and to quality and safety in medical imaging. As such an approach necessitates close collaboration between a variety of stakeholders, Prof. Frija thanked all involved organisations and individuals for their contributions and commitment to the EuroSafe Imaging campaign. The exhibition opening was attended by distinguished representatives from the ESR, IAEA, WHO, European Commission, HERCA, MELODI, EFRS, ESPR, EFOMP, European Patients Forum, COCIR, and many more.

Located in the M building, the exhibition contains more than 40 posters detailing the radiation protection efforts of a variety of organisations across a number of European countries. If you like what you see in the exhibition, why not join the campaign yourself? Organisations and individuals can sign up to become Friends of EuroSafe Imaging at www.eurosafedging.org

Hot Shots from Day 2
Join the Siemens Industry Workshops at ECR 2014

March 6th – 9th, 2014

Siemens is looking forward to welcoming you at ECR 2014. We invite you to join the Siemens Industry Workshops at our Experience Lounge to discover more about innovative applications.

Benefit from experts’ experience and receive an update on state-of-the-art techniques in computed tomography, magnetic resonance, molecular imaging and breast imaging. As a registered attendee for ECR 2014 these workshops are free of charge.

Location for Industry Workshops:
Siemens Experience Lounge, Entrance Level
(next to Exhibitor Registration)

Registration on-site. Please note that seats are available on a first come – first serve basis only.

And don’t forget to visit the Siemens Booth #11 located in Extension Expo A, Entrance Level.
At ECR 2014, the programme includes a visit from undoubtedly the largest medical discipline to take part in the initiative so far: cardiology, represented by one of the biggest medical societies in Europe, the European Society of Cardiology (ESC). Cardiology has much in common with radiology, but this is the first time that the two European societies have come together for an official joint session at a major meeting.

Despite some well-known points of controversy between the two disciplines, concerning professional turf, the exchange of knowledge during this afternoon’s ESR meets ESC session will be one of cooperation and mutual understanding. Prof. Panos Vardas, president of the European Society of Cardiology, who will co-ordinate the session, believes that the blurring of horizons between subspecialties makes this kind of exchange of knowledge a must. “Our societies share so many imaging techniques and modalities that our scientific communities simply have to exchange views and scientific opinions. I cannot imagine that any other medical community shares as many techniques with radiologists as we do; it makes perfect sense for us to try to pool our knowledge. As technology evolves, especially in imaging, the distinctions between specialties are becoming less clear. The most important thing for the patient is that we have well-educated experts who function as a team, are familiar with the requirements of their colleagues, and can learn from them too. The techniques we use in each such diagnosis differ but we apply similar principles, and there is no question that cooperation between both disciplines in these areas can save lives,” said Vardas.

ECR 2014 Congress President Prof. Valentino Sinitsyn, who will co-chair the session, is a cardiac imaging specialist and current president of the European Society of Cardiology (ESCR). Having worked closely with cardiologists for many years, he is glad of this opportunity to promote their work and to demonstrate the importance of their contributions to research in areas of cardiology. “The ESC is a very important society for us to get to know better, as cardiology is so close to radiology in daily practice and there is a lot we can learn from them. In general, I would like there to be better connections and understanding between cardiologists and radiologists doing cardiac imaging and cardiologists. Sometimes the relationship between the disciplines can seem slightly strained, because it is true that in some areas we are sometimes competing for the same work. But I feel it is important for radiologists to be aware of the research that cardiologists are doing in the field of cardiac imaging and to make use of that specialist knowledge in the reporting phase. Working together, the cardiologist and the radiologist have to be able to combine their expertise to best serve the patient.”

With diseases of the heart ranking among some of the biggest causes of death in the world, it is clear that cardiologists need to have both basic knowledge of cardiac diseases and cardiology, and interest in subspecializing in cardiac imaging is apparently rising. As modern imaging techniques have improved, cardiac imaging has gradually moved beyond specialist centres and into general hospitals, stimulating growth beyond specialist centres and into general hospitals, stimulating growth and interest in both knowledge and ability to discuss cases has to be absolutely equal to their colleagues. In the vast majority of cases, it is essential to have both the professional figures present on an even footing during the acquisition of images and during the reporting phase. Working as a team enhances the quality of the outcome. Cooperation, and not competition, is the prerequisite for a good performance,” said Lombardi.

“I think there is no better way for both disciplines to succeed than to be good friends and more forward together,” agreed Sinitsyn. “We have to cooperate because the two societies will continue after this meeting,” he added.

“Cooperation, not competition,” say speakers ahead of ESR meets ESC session

At each ECR since 2007, the ‘ESR meets programme has included a partner discipline along with the three guest countries, as a way to build formal bridges between the European Society of Radiology (ESR) and other branches of medicine, and to give congress participants an opportunity to learn about something a little different.

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ECR 2014 Congress President Prof. Valentino Sinitsyn, who will co-chair the session, is a cardiac imaging specialist and current president of the European Society of Cardiology. Today’s session looks at the role of these techniques, as well as their advantages and potential applications in various clinical settings, including the diagnosis and management of cardiac diseases. The session includes a panel discussion, presentations, and a hands-on workshop to provide congress participants with an in-depth understanding of the latest developments in cardiac imaging.

The session is divided into several segments, each focusing on a different aspect of cardiac imaging. The first segment covers the role of diffusion-weighted imaging (DWI) in the diagnosis of acute myocardial infarction, with presentations from experts in the field. The second segment explores the use of cardiac MRI in the assessment of myocardial viability and the prediction of post-infarction outcomes, with a focus on the latest research findings and clinical applications. The third segment highlights the role of cardiac CT in the evaluation of coronary artery disease, with an emphasis on the integration of CT and MRI techniques in a multi-modality approach. The final segment is dedicated to the emerging field of cardiac PET imaging, with presentations on the use of PET in risk assessment and prognosis of cardiac diseases.

The session is designed to provide a comprehensive overview of the current state of cardiac imaging, with a focus on the latest research findings and clinical applications. The panel discussion provides an opportunity for participants to engage with the experts and to ask questions about the latest developments in the field. The hands-on workshop allows participants to gain hands-on experience with the latest cardiac imaging technologies, facilitating a deeper understanding of the practical aspects of these techniques.

The session is chaired by Prof. Panos Vardas, president of the European Society of Cardiology, who will co-ordinate the session. Prof. Vardas is a leading expert in cardiac imaging and has made significant contributions to the field. The session is supported by ECR 2014, the largest and most comprehensive radiology congress in Europe, providing a platform for the latest developments in the field of radiology.

The session is scheduled for Saturday, March 8, 2014, from 16:00 to 17:30, in Room B of the exhibition hall of the congress. The session is also supported by the European Society of Cardiology (ESC) and the European Society of Radiology (ESR). The session is free of charge for all congress participants and is a must-attend event for anyone interested in the latest developments in cardiac imaging.

Welcome by the ESR President

Professor: P.E. Vardas; Iraklion/GR

Panel discussion

Assessing myocardial viability

M. Lombardi; San Donato Milanese/IT

Assessing acute chest pain

R. Bensebah; Vienna/AUT

Regrettably, Prof. Vardas is unable to attend due to unforeseen circumstances.

Assessing valvular heart disease

S. Massari; Lugano/CH

Assessing interventions

V. Delgado; Leiden/NL

Assessment of post-infarction patients

Prof. Panos Vardas from Iraklion, Greece, who will co-chair at the session, is president of the European Society of Cardiology.

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Renal specialists find new paradigms in characterisation and treatment of tumours

The diagnosis of kidney cancer is no longer the automatic death sentence it used to be. Thanks to advancements in abdominal imaging, more renal carcinomas are being identified when they are small in size. Surgical techniques such as laparoscopic partial nephrectomy have reduced morbidities and life-threatening complications. New therapeutic drugs, such as molecularly targeted inhibitors of protein kinases, are producing better outcomes for select patients.

Negative surgical margins, multivariable analysis has shown that these tend to be no influence on tumour recurrence or survival. Laparoscopic and robotic partial nephrectomy procedures are increasingly being performed, because this procedure has shorter ischemia time, a lower complication rate, and equivalent renal functional outcomes. Because laparoscopic partial nephrectomy is technically demanding, its use tends to be limited to experienced surgeons.

In discussion of discussing laparoscopic and robotic-assisted surgery, Prof. Jean-Jacques Patard, a professor of urology at Hôpital Bicêtre, Le Kremlin-Bicêtre, Paris, will discuss the use of cryoablation and radiofrequency ablation. These minimally invasive treatment trends are being used to treat patients with small cortical tumours 3 cm in size or less, and patients who may not be suitable for surgical excision. A successful cryoablation procedure results in shrinkage of the lesion. Radiofrequency ablation creates radiofrequency waves to heat, delivering temperatures greater than 60°C to the tissue. These result in coagulation and necrosis. For both kinds of treatment, long-term radiographic monitoring is necessary.

The other treatment Patard will discuss is active surveillance. This is increasingly being recommended for patients over 75 years of age in poor health with multiple and severe comorbidities and a renal mass less than 4 cm. Studies suggest that in situations where there is a small risk of cancer progression during the remainder of a patient’s lifetime, active surveillance may provide a better quality of life at considerably less expense to all concerned. The ability to characterise phenotypes of tumours using multiple parameters that include morphologic parameters, functional imaging, and multi-criteria characterisation of a tumour that provides more detailed diagnostic information and predictive response to therapy is leading to the increased use of targeted therapies.

Prof. Nicolas Grenier from Bordeaux, France, chairs today’s multidisciplinary session.

The management of renal tumours has changed, and this is the focus of today’s session’s characterisation and treatment of renal tumours, presented from the perspective of a radiologist, a urologist, and an oncologist. This speaker mix is representative of the multidisciplinary teams who join together to treat patients presenting with renal masses.

Kidney cancer is the seventh most diagnosed cancer of patients living in developed economies and the fifth in less developed countries, according to statistics published by the World Cancer Research Fund. In 2008, approximately 274,000 cases of kidney cancer were reported. While less than half of the patients diagnosed with stage 1 tumours.

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Diffusion MRI: everything you always wanted to know but never dared to ask

Radiologists who know how to use diffusion-weighted imaging (DWI) within their area of expertise now need to gain a comprehensive overview of new indications that promise much but have yet to become established.

That’s the view of speakers at today’s joint session of the ESR and the European Society of MR in Medicine and Biology (ESMRMB), which aims to boost MR knowledge of neuro and body DWI for the general radiologist working predominantly within that field.

Besides the commonly used clinical applications of non-nuro DWI, today’s session will highlight a technique not yet used much in the clinic.

Whole body (WB) MRI with WB DWI from the upper thighs to neck can cover potentially dangerous dose when repeated follow-up inves- tigations are needed in low-malignant tumours, and in tumour surveil- lance especially within the paediatric population.

“In cancers that can metastasise to any tissue in the body, it is valuable to have an overview of suspected areas by analysing a maximum-inten- sity-projection (MIP) WB DW image before scrutinising the original DW images and those that show mor- phology,” said Prof. Håkan Ahlström, professor of radiology and chairman of the Department of Radiology, Oncology, and Radiation Sciences (RO) at Uppsala University Hospital, Sweden, in a pre-congress interview with ECR Today.

In non-neuro body MRI of selected organs, DWI is routinely used as an adjacent to other MR sequences for the detection and characterisation of tumours, for the detection and localisation of prostate cancer and for the detection of peritoneal carcino- noma. It is also useful for looking for infection first, and shows great potential in early tumour therapy evaluation, tumour diffusion increase being detectable in Apparent Diffusion Coefficient (ADC) maps even hours after the start of treatment.

When combined with other data, DWI can differentiate an old benign compression fracture of a vertebra with low signal intensity on DWI from a malign compression fracture which shows high signal intensity. DWI images alongside ADC maps can also differentiate metasta- ses in bone from benign lesions such as haemangiomatosis and detect additional metastases when DWI is combined with PET.

Because the signal in DWI depends on T2 relaxation time and diffusion, attention must be given to potentially false positive findings resulting from normal tissue that may occur with long T2 relaxation times, according to Ahlström. An area with a long T2 relaxation time may remain high signal during DWI and be mistaken for an area with restricted diffusion, such as a malignant lesion.

“This misinterpretation can be avoided by analysing images with a very high b-factor in which a benign lesion should be dark and the cor- responding ADC map in which the lesion should appear white,” noted Ahlström, who will focus on interpretation of DW images in his talk.

DWI should be added to any rou- tine MRI protocol of both WB-MRI and of selected organs, because it provides additional information to the conventional MR-sequences, according to Ahlström. However, DWI images should be interpreted together with all MR-sequences in an investigation, he added.

Because emergency and smaller hospitals now tend to have MRI systems for neuro and spinal imaging, Prof. Elina-Marie Larsson, professor of neuroradiology and director of MRI at Uppsala Uni- versity Hospital, Sweden, believes DWI should be routinely included – and promoted – in brain imaging.

“Using DWI to detect and differenti- ate brain lesions in only a selection of patients is not effective. Beyond diagnosis of acute stroke and in the differentiation of necrotic malignant tumour and abscess, it is hoped the session will increase awareness of the other diseases where DWI can be use- fully employed,” she said.

Diffusion neuroimaging is highly sensitive, depicting lesions that can’t be seen in other sequences. Animal studies have shown detection of acute ischaemia ten minutes after the onset of symptoms. In the clinical setting, a small ischaemia in a com- promised angle procedure could, for example, be seen quickly using DWI, according to Larsson.

During the session, examples will be given of unexpected findings in DWI that are useful for a diagnos- is. In rare cases, such as sporadic Creutzfeld-Jakob disease (CJD), lesions picked up on DWI appear very bright and are not found in typical vascular territories. For other more common pathologies such as ischaemia, diagnosis would result from combining the suspicious diffusion pattern seen on DWI data with that of conventional sequences, such as a routine T2 fluid attenuated inversion recovery (FLAIR) sequence. DWI is also proving itself useful in the characterisation of tumours. While a tumour may be detected on conventional sequences, DWI may be helpful to distinguish whether it is benign or malignant. High cellu- larity indicates malignancy, and low cellularity indicates the opposite. In addition, conventional sequences may show what appears to be either a malignant tumour with necrosis at its centre or alternatively an abscess containing pus.

“The problem with brain abscesses is that patients can present with no fever or other symptoms of infection. Before the advent of DWI, patients needed lengthy spectroscopy to dif- ferentiate between the two patholo- gies, but diffusion imaging has made diagnosis simpler and faster, which is crucial when doctors are faced with an imminent life-threatening condition,” said Larsson.

In DWI, abscesses in the brain have restricted water movement and on a scan appears very bright, like a stroke, while a malignant tumour with necrosis has less restricted water movement and appears dark.

“The malignant tumour is less urgent in the here and now when compared to the patient with the abscess who will die without swift access to antibiotics,” she explained.

Other indications include diag- nosis of multiple sclerosis, in which restricted diffusion in acute lesions is not caused by ischaemia or abscess but due to a swelling of the mye- lin, and in the detection of trau- matic injury resulting from traffic accidents.

“Traffic accident patients always undergo a skull CT. If a patient is in the intensive care unit with unex- plained cerebral symptoms even after a CT, DWI may detect more lesions due to trauma and swelling of such traumatic diffuse axonal injury (DAI) resulting from a head on collision depicts sheering injuries in the white matter brain parenchyma extremely well,” Larsson said.

DWI must be combined with other sequences and clinical data for a timely and accurate diagnosis, important both for treatment decisions and as a means to avoid unnecessary diag- nostic exams. Increasing the routine use of DWI in neuroimaging hinges on radiologists speaking the word about its usefulness.

“DWI only takes one or two min- utes, so why not routinely include it in brain imaging?” she noted. “It can be helpful in lots of different situations, particularly in acute stroke when it should always be performed if there is a question.”

With increasing numbers of MRI units now located close to emergency rooms, Larsson believes there is a strong argument for using MRI on the first day to diagnose or rule out acute ischaemic stroke and guide treatment decisions, even though CT is still the most widely used diag- nostic imaging technique because it is readily available and can rule out haemorrhage prior to starting thrombo- lytic therapy.

“A CT simply excludes haemor- rhage. Patients may undergo unnec- essary thrombolysis when they haven’t had a stroke, with this medication potentially causing haemorrhage,” Larsson said. “With DWI, doctors can specifically diagnose acute stroke,” Larsson said.

»  Clinical applications of diffusion MRI (body)
»  Clinical applications of diffusion MRI (neuro)
»  Processing and analysing diffusion MRI data
»  Diffusion MRI: the bare basics
»  Panel discussion

Acute stroke in a 46-year-old man (embolus from vertebral artery dissection). A. DWI shows high signal intensity in the left cerebellar hemisphere. B. ADC (apparent diffusion coefficient) map shows low signal intensity in the same region, verifying that this is restricted diffusion. (Provided by Prof. Elina-Marie Larsson)

Whole-body diffusion-weighted of malignant melanoma. A patient with malignant melanoma and widespread metastases. Maximum intensity projection (MIP) image of DWI shows the disease distribution in a valuable overview of the entire body. (Provided by Prof. Håkan Ahlström)}
Imaging provides answers in cranial nerve examinations in head and neck

In order to optimise cranial nerve imaging, radiologists need to maximise their level of knowledge and understanding of the relevant pathology, as well as MR techniques and the anatomy of the XII cranial nerves, according to Prof. Jan W. Casselman, from Hospital AZ Sint-Jan AV-Bruges in Belgium. It’s also essential to obtain as much information as possible from the referring clinician.

To launch the Categorical Course on Head and Neck Imaging, Casselman will discuss ‘Cranial nerve examinations made easy’ in today’s session about ‘How to perform and read a head and neck study’. In an interview with ECR Today he emphasised the importance of having an in-depth understanding of the cranial nerves because they are often the first warning sign of an intracranial event, adding that imaging provides clinicians with indispensable information that they need before making the right treatment choice.

“Only MR imaging is able to confirm if a lesion is present, which lesions it is and on which nerve segment it is located,” he said. “Radiologists can provide this crucial information if they know the cranial nerve anatomy, know which MR sequences to use, and are familiar with the most frequent pathology involving the different cranial nerves.”

MRI is the best modality with which to study the cranial nerves, because it is the only technique that can visualise the nerves with sufficient sensitivity to detect tumoural lesions, for example, nerve sheath tumours, and non-tumoural lesions, for example, neuritis. “Intravenous gadolinium is often required to detect the pathology, and it is the excellent contrast resolution of MR that makes it the imaging modality of choice to study the cranial nerves,” added Casselman.

He highlighted which cranial nerve segments are most essential to distinguish and evaluate: these are the cranial nerve nuclei and the course of the nerves inside the brainstem; the cisternal segments of the cranial nerves; their paraspinal course and course through the temporal bone and skull base foramina, and their extracranial course.

Different sequences are needed to see the different nerve segments. Casselman pointed out. Cranial nerves I–VI run in an anteroposterior direction and are therefore best studied in the coronal plane. Cranial nerves VII–XII have a more predominant mediolateral course and are best studied in the axial plane. Different sequences must be used to visualise these different nerve segments, and the cisternal segment can, for instance, best be seen on heavily T2-weighted images on which the cerebral spinal fluid is white and the nerves are black while the brainstem nuclei and the facio-ocular segment of the nerves are best studied on TSE T2 proton density or multi-echo gradient echo images.”

He added that nerves were easy to visualise at sites where they are surrounded by fat – for example, the parapharyngeal fossa, superior orbital fissure, and mandibular foramen – and highlighted that these sites should routinely be checked. Intravenous gadolinium injection is mandatory in the study of cranial nerves as otherwise many subtle lesions can be overlooked. Images with fat saturation can help to visualise subtle cranial nerve lesions.”

In today’s Categorical Course, Casselman will also discuss the most common pathology that causes cranial nerve deficits and requirements to look for in these cases: are nerve sheath tumours, e.g., schwannoma, perineural tumour spread caused by head and neck tumours growing along and follow the cranial nerve, metastases, neuritis, multiple sclerosis involving the brainstem nuclei and faciculat segment, neurovascular conflicts and post-traumatic involvement of the cranial nerves. “The most frequent lesion of the VIIth nerve is a schwannoma, the most frequent pathology involving the VIIIth nerve is neuritis. This illustrates that different nerves have different most frequent pathology,” he said.

Also speaking on the topic of head and neck imaging, specifically part 1 of the session on ‘How to perform and read a head and neck study’ will be Dr. Harriette C. Thoeny from the Ruim University Hospital in Switzerland, who will discuss diffusion-weighted imaging (DWI) should form part of any head and neck MRI.

“DWI is a noninvasive MRI technique that doesn’t need any contrast medium administration,” she noted. “It also allows detection of pathologies and differentiation of recurrence from post-therapeutic changes in the treated neck, provided that image interpretation is performed carefully.”

Describing the mechanism by which DWI works, Thoeny said it provides information on the Brownian motion in the extracellular, extranuclear space without any contrast medium administration and is therefore a functional MRI method that provides information beyond morphology. However, she added that for image interpretation of DWI, so-called high-b-value images and corresponding Apparent Diffusion Coefficient (ADC) maps have to be analysed, together with morphological images.

Thoeny will highlight the differences between recurrences, post-therapeutic changes, cystic, and necrotic features of images. “Recurrences in the treated neck, or solid tumours in the untreated neck, show typically a high signal intensity lesion on the high-b-value images corresponding to a low signal intensity lesion on the ADC map,” she explained. “On the other hand, post-therapeutic changes are typically detected as high signal intensity lesions on both the high-b-value image and the corresponding ADC map. This therefore allows differentiation of the two entities in a high percentage of patients.”
Multidisciplinary team meetings produce impressive results in breast cancer patients

Multidisciplinary team meetings are coming for you – or at least you can expect them to be more common in the future, according to Italian researchers. In a Saturday session, a radiologist, surgeon, pathologist, and others, will come together to answer questions about what it’s like to work as a team and to explain why they think multidisciplinary team meetings are the wave of the future.

In an interview with ECR Today, the researchers from Milan said considering the clinical and even the medicolegal climate, they think multidisciplinary team meetings will definitely become more commonplace, and probably of “trivial importance” in patient management. Their session, “Multidisciplinary team meeting from Milan, Italy,” offers a perspective on what it’s like to work within a multidisciplinary team model specifically for breast imaging. All of the researchers come from different departments – Dr. Pietro Panizza comes from the radiology department at the San Raffaele Scientific Institute, as does radiology resident Dr. Sara Viganò and Dr. Laura Lozza come from the Institute Nazionale dei Tumori, along with Dr. Biagio Paolini (pathology department) and Giulia Bianchi (nuclear department) at the same institution – but they work together to treat breast cancer patients.

Their multidisciplinary team has to provide all the services related to breast cancer, including genetics and prevention, treatment of the primary tumor, care of advanced disease, palliation, and follow-up of previously treated patients. The radiology unit is made up of a group of dedicated breast cancer specialists, including a radiologist, radiographer, surgeon, reconstructive surgeon, pathologist, medical oncologist, radiation oncologist, and breast care nurse.

The specialists involved in breast cancer units have access to all the facilities required for high-quality care and spend most of their working time dealing with breast cancer. They organize weekly meetings to evaluate and plan patient case at any step of the diagnostic and therapeutic process. Each year, they treat about 1,000 newly diagnosed patients with primary breast cancer and about 1,000 patients follow-up.

According to the researchers, the necessity of a multidisciplinary consensus in decision making has always been perceived by clinicians, even in the field of breast care. The importance of a general consensus on treatment decision and cooperation was strongly perceived when conservative treatment has been introduced. This is now established as a standard of care but it wouldn’t have been possible without the support of a multidisciplinary team.

Multidisciplinary work has become important not only in breast imaging but also in all radiology subspecialties. For instance, cancer treatment has become more complex, requiring a wide range of different expertise and including “non-cancer issues” with a growing number of specialists and health professionals involved. As a consequence, a multidisciplinary approach cannot be disregarded any more. In fact, the European Partnership Against Action Cancer (EPAC) consensus group stated: “Multidisciplinary teams emerge as a practical necessity for optimal coordination among health professionals and for clear communication with patients.”

In the face of this increasingly complex case scenario, radiologists, what ever subspecialty they are involved in, cannot ignore the necessity of multidisciplinary team work any longer, the researchers insist. “It’s not just about ‘breast patients,’ it’s about every patient in order to deliver high quality care throughout the care pathway and shift towards a patient-centred approach,” they said.

HOW MULTIDISCIPLINARY TEAMS ARE DIFFERENT

Functioning as a team affects an individual’s workload and patient management. Coordination of different health professionals involved in patient care may improve patients’ short- and long-term outcomes by influencing various aspects of care, for instance, primary breast surgery, management of the axilla, whether and when patients should receive chemio oncology radiotherapy, and which kind, the researchers said. A multidisciplinary approach can also

- deliver a level of care that conforms to agreed standards and reflects national guidelines
- allow better adherence to evidence-based decisions
- create more coordinated patient care that can improve clinical decisions and reduce inappropriate planning of the care pathway concerning primary and reconstructive surgery, chemotherapy, radiotherapy and radiological assessments
- nurture shared decisions on clinical approved approaches as well as get a consensus on newly innovative techniques or treatments
- define and coordinate follow-up strategies in a post-operative period, using neoadjuvant chemotherapy, or for patients not surgically treated
- boost time management due to cooperation and clearly defined pathway and guidelines
- improve patient involvement in treatment decisions
- help in problem-solving about organization and patient management.

“As radiologists, working in a multidisciplinary team leads to a better comprehension of the whole treatment strategy; we can, for example, compare imaging with pathological results and discordant cases can be easily identified and opportunely conveniently followed-up,” they said. “We can be more involved in the care pathway not only as a diagnostic service, but also in the follow-up of neoadjuvant therapy establishing together with clinician the best imaging technique for every patient.”

On the flip side, because the radiologist knows which therapy or treatment the patient has received, he or she can achieve a better interpretation of the imaging findings.

Nonetheless, working in a multidisciplinary team is not always straightforward. It requires cooperation and comparing different point of views that can lead to “complex and straggling discussions,” they added. Also, the involvement of different disciplines within the same discipline, implies different perspectives and interpretations that can diverge and should be taken into account.

Working together as a team requires the capability to come face to face with “our own limits and accept others’ advice, not as a critique on its own,” but as possible constructive criticism. Moreover, organizing the whole multidisciplinary work may require a huge amount of time, everyone involved should shift from an individual way of thought to a shared one, which can’t be taken for granted, they added.

All things considered, working as a team may make everyone more reassured with regard to patient management because there is cooperation, strategy sharing, and coordination. Clinicians can boost their confidence in decision-making as the decision is strengthened by a general consensus. “Improvements in the breast multidisciplinary model are required and this work in progress, but we hope that our experience might be a useful look through the benefit and the criticisms involved in multidisciplinary team work,” the researchers conclude.

ECR TODAY, SATURDAY, MARCH 8, 2014

Multidisciplinary team meetings produce impressive results in breast cancer patients

A 65-year-old patient presented with a recent history of a new lump in the left axilla. Clinical examination confirmed a discrete hard palpable mass in the left axilla, in keeping with suspicious finding without clinical breast abnormalities. Mammography and ultrasound were required. Corresponding to the palpable lump, on left mammogram is a rounded mass without any breast lesions and on ultrasound an hypoechoic lesion, with no hilum in keeping with malignant metastatic lymph node. (Provided by Dr. Pietro Panizza)

A second look ultrasound was performed demonstrating an ill-defined, irregular lesion corresponding to the enhancing lesion on MRI. It was biopsied. At histology, it was an invasive ductal carcinoma, and the patient underwent conservative surgery. Chemotherapy was discussed and agreed upon in the multidisciplinary meeting. (Provided by Dr. Pietro Panizza)
ESR initiatives highly valued in Iceland

Despite its small size, Iceland is an island of diverse medical culture. The Radiological Society of Iceland, founded in 1914, is perhaps the smallest radiological society in Europe with an active membership. Radiologists do their specialty training in Europe, mostly in Scandinavia, but also in the United States. The quality of medical care has always been of the highest standard, since most Icelandic radiologists have had the good fortune to train at top institutions on both sides of the Atlantic. Due to Iceland’s location in the middle of the Atlantic, far from large hospitals, with the shortest flying time to the European mainland being two hours, the Icelandic health system has to be independent and able to offer Icelandic patients the best medical care at any time. We have had the luxury of being able to perform most medical procedures and offer complex surgery to our patients.

RADIOLOGICAL EQUIPMENT AND STRATEGIC PLANNING

But Iceland faces difficulties just like many other European countries. The replacement of radiological equipment has suffered over the last few years as expected, but the introduction of what is currently considered standard equipment in the countries surrounding us, like PET, has not happened in Iceland. Currently, there is no PET machine in Iceland, making the diagnostic options for Icelandic patients fewer, and possibly causing them to get sub-standard treatment. As PET/CT is an established imaging modality that has been extensively validated in routine clinical practice. Presently, around 50 patients travel abroad to get PET/CT, but around 1,000 to 2,000 patients should be examined every year for lung cancer alone, based on population numbers. As support for strategic planning, ESR guidelines, white papers and publications in European Radiology and Insights into Imaging are very important. They are also beneficial for helping participating societies advise governments on strategic planning.

SHORTAGE OF RADIOLOGISTS IS AN INTERNATIONAL PROBLEM

Currently, there is a shortage of radiologists at the Landspitali University Hospital, the largest hospital in the nation’s capital, where radiologists are now a third fewer than in 2008. Due to this shortage, there has been talk of establishing telemedicine for the reading of examination reports, especially at night. For this reason, the support and guidance of the ESR regarding telemedicine and eHealth is important. Even though Iceland is presently not a part of the European Union, observing and following developments there is important.

THE IMPORTANCE OF LOCAL EDUCATION AND TRAINING

The education of new radiologists in Iceland is highly important. Residents are allowed to start their specialty training in Iceland, but it is mandatory to do the majority of their specialist training abroad. In this matter, the European Training Curriculum of Radiology is of highest importance as a guiding document in planning and implementing the first one or two years of radiological training and to use as a guide for quality control for training centres. For this purpose, European Training Assessment Programme (ETAP) assessments are also very useful for the member societies. Due to the small size of the medical community, there are not many local courses held in Iceland. The Icelandic Medical Association holds an annual congress every January, where the Radiological Society of Iceland takes an active part. The International Day of Radiology has also become important to our society and is very important in introducing the imaging profession to the public and to the medical community as well.

ACADEMIC RADIOLOGY SUFERS

Due to the shortage of radiologists in Iceland, academic radiology is bound to suffer to some degree. Unfortunately, there is less time to do research, and funding is limited. Primary radiological research has suffered in particular, but clinical research with radiological involvement less so. This is unfortunate, as there are great research opportunities in Iceland, with large databases and excellent conditions for population studies. The Icelandic Heart Association and the Icelandic Cancer Society with its breast imaging department are examples of institutions where radiological research has been successful.

CELEBRATING 100 YEARS OF RADIOLOGY IN ICELAND

This month, the Radiological Society of Iceland will be celebrating 100 years of radiology in Iceland. In March 1914, Professor Gunnlaugur Clausen started the first radiological practice in Iceland, in cooperation with the Medical Faculty of the University of Iceland. The practice was situated in a private house in downtown Reykjavik, then a city of 13,800 inhabitants. It had 10 kW generator which could generate 120 kV. The electricity supply in Iceland was not very stable at this time. The electricity was generated at a nearby carpentry workshop, Völsundur Carpentry and Prof. Clausen occasionally needed to telephone the carpenters and ask them to turn off their machines momentarily, as he needed to do an examination that required extra high energy. It is indeed a day to celebrate, and it will be interesting to see what the next 100 years will bring to Icelandic radiology.

Musculoskeletal Diseases

June 28 – 30, 2014
Hong Kong, China

Course on Diagnostic Imaging and Interventional Techniques
www.idkd.org

Diseases of the Abdomen and Pelvis
March 30 – April 4, 2014
Davos, Switzerland

Satellite Courses
Nuclear Medicine: March 29 – 30, 2014
Breast Imaging: March 29, 2014
Pediatric Radiology: March 29, 2014

Course on Diagnostic Imaging and Interventional Techniques
www.idkd.org

Musculoskeletal Diseases
September 25 – 28, 2014
Athens, Greece

Course on Diagnostic Imaging and Interventional Techniques
www.idkd.org
Russian radiographers prove their worth in diagnostic decision-making process

Expert speakers intend to spell out how Russian radiographers fulfill this valuable role and gain a deep sense of professional satisfaction. A particular challenge is to outline the challenges they face in their work.

For instance, in polytrauma patients who cannot raise their arms above their heads, interpreting multidetector CT (MDCT) scans becomes problematical due to artefacts from upper extremities in the chest cavity. Delays in interpretation hamper patient flow, having a negative impact on patient management when injuries are significant and life-threatening, and when polytrauma patient numbers are high.

Laying unsanitised and vented polytrauma patients in optimal positions for emergency MDCT scanning is described in the quest for artefact-free images, according to Aleksandra Tarasenko, radiographer at the regional hospital of Krasnodar. A recent study in the radiology department at a hospital involving 495 unconscious patients on artificial lung ventilation placed in various positions before undergoing MDCT scanning yielded interesting results that are now influencing routine work.

"Analysis using archived data from 2011 included 157 patients scanned with hands under the buttocks, 135 with hands under the buttocks, 135 with hands above the head, and 157 patients with arms to each side of the body. The lowest number of artefacts was identified in patients laid on the table with hands under the buttocks," noted Tarasenko.

Possible variations in hand placement and the problems associated with each position will undergo further research in Krasnodar.

"Patient position is crucial for obtaining quality images when humeral joint and clavicle injuries prevent hands being raised above the head. The decision of the radiographer is therefore of great value," said Tarasenko, who will also be addressing the role of the technologist in CT post-processing, a task that has until recently always been carried out by the radiologist.

In her recent study, technologists are trained to do the more simple 3D and 4D reconstructions of pathologies such as ribs, skull, and pelvic fractures, sagittal and coronal reconstructions of spine fractures, and under the supervision of the radiologist, reconstruction of the aorta. In particular, radiographers must be aware of motion artefacts that can interfere with evaluation of the coronaries’ patency and pathological changes, according to Tarasenko.

"The most important factor for getting good images is proper preparation and choosing the right protocols in line with the final beats per minute (BPM)," said Elena Hichina, a radiographer in the department of radiology at the Centre of Treatment and Rehabilitation, Moscow. "Radiologists must understand their importance and have an input in the final diagnosis, and take responsibility for the conclusions radiologists will draw based on images they perform. A little mistake in our daily work could impact a patient's centre life."

Aiming her presentation at radiographers and general radiologists at the beginning of their training, Hichina said she would describe her daily work in cardiac imaging and address the contribution of the radiographer to the success of coronary MDCT.

"Compared with other CT techniques such as the abdomen, and chest investigations, cardiac CT requires in-depth knowledge and constant mindfulness of many important points for obtaining high quality images. It’s also important to strive for lower dose exposure with significant impact on the image quality," she pointed out.

The remit of radiographers in Russia is wide-ranging and includes the many techniques needed for investigations undertaken with each modality such as x-ray, mammography, CT and MRI, partly because Russian radiology departments are not divided by body part or system, according to Hichina. The main benefit of this for radiographers is the opportunity to improve routine work using the wide experience gained from performing tests using different modalities.

"In typical hospitals in Moscow and other large cities, standard modalities include ultrasound, x-ray, angiography CT and MRI. The radiology department in the on-bed Centre of Treatment and Rehabilitation includes three MDCT scanners, four MRI systems, x-ray, dental CT, ultrasound and mammography.

"Our CT scanners work a 24/7 schedule. Therefore all radiographers who work on CT must know all techniques for typical emergencies," said Hichina, adding that the department’s radiographers can read main urgent findings like free air and fluid, pneumothorax and cerebrovascular haematomas and sometimes help point out other findings.

Given the development of modern Russian cardiac surgery, the need for increasingly less invasive and high quality diagnostic methods has also grown. Presenting a lecture on imaging children with congenital heart disease (CHD), Vladimir Bereznitsky, radiologist at Bakoulev Scientific Center for Cardiovascular Surgery at the Russian Academy of Medical Sciences in Moscow, will underline the necessity for the imaging team to take an individual approach to each patient.

In terms of procedure numbers, Bakoulev is Europe’s biggest centre for surgery on children with CHD. Correct and timely surgical treatment depends on specific knowledge of the heart defect. For over 14 years, the centre has used contrast-enhanced CT to diagnose CHD in children at an early age, with results confirmed intraoperatively.

"Use of contrast-enhanced CT has meant that catheter angiography is obsolete in 80% of cases," said Bereznitsky, noting that successful studies require tailored management of every patient.

At Bakoulev each case is discussed by the doctor, anaesthetist, radiologist and radiographer. The radiographer and radiologist will have a further detailed discussion about scan protocol and the volume and flow rates of contrast agent, according to Bereznitsky. For a new born baby who is only 9 hours old, for example, KV and mA will depend on the size and weight of the subject and on the type of CT scanner.

After the radiographer performs the study, post-processing duties depend on the objectives of the test. These might include reconstruction of the raw data with different filters and slice thickness, multiplanar reconstruction, 3D and 4D reconstruction, and also functional analysis and determination of volumes.

Specialised training for radiographers in Russia tends to occur in the workplace, resulting in varying skill levels between radiographers and across hospitals that have different standards of technical equipment and expertise. To counter this problem, the country’s first ever school for radiographers’ course was held last year. The course included lectures and workplace training and was open to all Russian-speaking radiographers. It is widely hoped that the school will take place again this year in Bakoulev.

By Frances Rylands-Monk

BY FRANCES RYLANDS-MONK

Russian radiographers prove their worth in diagnostic decision-making process

Radiographers are a key part of the imaging team, and making efficient and timely diagnoses depends crucially on the quality of the images they obtain. ECR delegates will learn at today’s European Federation of Radiographer Societies (EFRS) meets Russia session.

Expert speakers intend to spell out how Russian radiographers fulfill this valuable role and gain a deep sense of professional satisfaction. A particular challenge is to outline the challenges they face in their work.

For instance, in polytrauma patients who cannot raise their arms above their heads, interpreting multidetector CT (MDCT) scans becomes problematical due to artefacts from upper extremities in the chest cavity. Delays in interpretation hamper patient flow, having a negative impact on patient management when injuries are significant and life-threatening, and when polytrauma patient numbers are high.

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Germany introduces new law and launches major study

**CLINICAL CORNER**

**EDUCATING PATIENTS: NEW LAW REGARDING PATIENTS’ RIGHTS APPROVED**

In 2014, the German Federal Ministry of Health passed a new law concerning patient rights. It concerns instructing patients before radiological examinations, and it has sparked much discussion among patients and physicians. The law imposes an obligation on the radiologic physician to instruct the patient and give the patient a copy of the documented instructions after the examination. German radiologists see a disadvantage in this new law as it will mean that they can serve fewer cases in future. “However, radiologists now have a unique chance to really tell their patients what their disease is, what it means for their environment, and how it is to be treated,” states Professor Norbert Hosten, president of the German Society of Radiology. “Accordingly, the radiologist will be more likely perceived as a physician.”

**NATIONAL COHORT AND RADIOLOGY LONG-TERM STUDY INITIATED IN GERMANY**

In 2014, a network of German research institutions encompassing the Helmholtz Association, the Leibniz Association, numerous universities, and other research departments will launch a nationwide study that is supposed to last 20 to 30 years. The National Cohort will randomly choose 500,000 people aged between 20 and 69 from across Germany for medical examinations. Radiology is a crucial part of the National Cohort: 3000 prevalent patients will be examined with magnetic resonance imaging (MRI) with one of the newly acquired 3-Tesla MRI machines. Dr. Fabian Bamborg (Munich) is the manager of the MRI part of this long-term study, which radiologists and epidemiologists will carry out together at up to six study centres in Germany.

“With the National Cohort, we will strengthen the scientific and academic side of radiology in Germany,” says Professor Norbert Hosten. “Until now outcome research has been rather difficult to realise in the field of radiology – yet sponsors demand it. Normally it is only possible to receive funding for innovative treatments in Germany if an additional benefit for patients can be predicted. Since it is very difficult to calculate this benefit, outcome research is hard to implement – as seen in the example of PEOT CT refunding which, in Germany, is only approved for pre-operative lung cancer staging. Missing outcome data and the lack of funding led to the installation of only one PET/CT machine in Germany in the last two years. So we’re glad to be able to contribute to and eventually profit from the National Cohort’s results and planned central hub,” the president explains.

The Federal Ministry of Education and Research, a federal state of Germany, and the Helmholtz Association are financing the National Cohort with €200 million, of which €21 million has been allocated to radiological research. Nevertheless, the amount does not yet include the costs for continuous research projects. Such ventures will probably require more funding,” adds Professor Hosten.

Further information www.nationale-kohorte.de/index_en

More information about the German Society of Radiology can be found at www.drg.de
CT developers line up to demonstrate advances in technical exhibition

Lowering the radiation dose experienced by patients undergoing a CT examination is an enduring challenge for equipment manufacturers, but that is not the only route that the companies are following in their quest to provide safer methods for radiologists to use when patients are referred for a CT scan.

In the ECR 2014 exhibition, Siemens is demonstrating how its new scanner, Somatom Force, can carry out contrast-enhanced procedures using significantly smaller volumes of iodine-based agents. This could bring significant benefits for up to 20% of patients showing some level of renal insufficiency.

There is no practical alternative to using iodine-based agents in perfusion studies, so normally those patients considered at risk, such as diabetics or those with identified renal problems would be blood-tested before scanning. Any patients found to have elevated creatinine levels would need special measures, such as hydration before or after the procedure, to help their kidneys to cope with the extra burden placed on them by the contrast medium.

Peter Sauter, vice-president for marketing in the company’s CT business unit, noted: “The lower contrast agent dose would be particularly beneficial in procedures such as transcatheter aortic valve implant surgery.”

“Those is a high incidence of renal insufficiency in patients undergoing this increasingly common procedure. Usually, they would receive around 100 to 150 ml of contrast, both for the planning stage and the actual procedure. That’s why for some of these patients the procedure would be postponed for a few days to allow for their kidneys to recover,” he said. “But with the smaller doses of around 50 ml used with the Somatom Force, the second procedure can be carried out the following day, which will have advantages in terms of workflow.”

Somatom Force is the third generation in the company’s line of dual-source scanners, and it features two VCT-type x-ray tubes capable of carrying out routine examinations at tube voltages as low as 70 to 100 kilovolts. As the contrast-to-noise ratio rises, the amount of contrast medium needed can be lowered accordingly.

The technology has been tested at partner institutions and should be commercially available from the middle of 2014. Reports from those centres suggest that the new scanner has considerable promise in the early diagnosis of oncology patients. Perfusion imaging studies in patients with suspected liver tumours would normally require a high radiation dose, typically more than 50 millisievert (mSv), but the new technology allows those studies to be performed at considerably lower dose levels.

Sauter pointed out that safer imaging will encourage the use of CT in monitoring response to chemotherapy. Making accurate 3-D measurements of the blood supply to a tumour will allow more precise use of extremely expensive therapies and improve patient care by enabling earlier decisions on which treatments will be most effective, he said.

Philips is another company pushing back the barriers to what can be achieved using advanced imaging techniques in cancer patients, and is promoting the results achieved with its latest PET/CT scanner called Vereos. To date, this fusion modality has been mainly used for research studies at academic centres, but Duncan Porter, head of imaging systems field marketing for the company, believes it has potential for future use as a front-line diagnostic option.

“I think it is possible, because with PET/CT you are introducing diagnostic capabilities that we have not seen before. We can make more quantitative decisions about the anatomy when seeing images that have twice the resolution of existing approaches, so I can see this modality moving in directions that have not been possible before. Our clinical reference sites are using the technology in areas which weren’t part of our original plan – brain and cardiac imaging, for example. The images they have been getting are mind-blowing,” he said.

Philips is also exhibiting a more conventional CT-based scanning technology called IQon Spectral CT. As with previous spectral CT scanners, this builds up images based on data from two parallel sets of detectors that capture either low or high energy photons. But while normally the technician must decide in advance whether to use the spectral function or carry out a conventional imaging procedure, with IQon both sets of readings are available automatically. This means the radiologist can examine the conventional greyscale image before consulting with the colour spectral CT data for additional information acquired with the same scan. As the additional image would have no negative impact on workflow, then spectral CT can be used for all routine imaging, Porter said.

Toshiba staff in the exhibition hall are keen to demonstrate the additional capabilities available for its Aquilion ONE scanners. These include a full suite of applications in what the company is calling its Adaptive Diagnostics range, notably the SURESubtraction function, which can subtract bone and calcium from data sets, allowing clinicians to better visualise tumours or arteries at risk. Another highlight is the SURECardio Prospective function with arrhythmia detection. This is a unique application that dramatically lowers patient dose during coronary CT angiography exams using a helical prospective acquisition. It automatically detects and adjusts to patients with irregular heartbeats, providing quicker and more consistent exam results, according to a company statement.

The vendor is also addressing one of the biggest challenges in CT units: that of interpreting scans from patients with metallic implants. Its SEMAR (single energy metal artefact reduction)technology uses a sophisticated reconstruction algorithm to eliminate artefacts caused by metal, while still improving visualisation of the implant. SEMAR can be used in routine low-dose volume acquisitions, and when combined with another piece of Toshiba software, AIDR 3D (adaptive iterative dose reduction), it is said to provide excellent image quality.

“Today’s healthcare environment is changing and there are new clinical needs,” commented Porter.

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Three new EIBR projects launched in 2013

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French hospital adapts paediatric CT protocols

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Dutch Paediatric CT Study to provide new insights into CT radiation risks

Low dose for challenging patient – 50 cm acquired with Turbo Flash mode in only 12.5 s at 80 kV and pitch 2.4, with 1.9 mSv. The image quality is excellent although the patient’s left arm had to be kept in the scan field of view.

(Copyright: Department of Clinical Radiology and Nuclear Medicine, University Medical Centre Mannheim, Medical Faculty Mannheim, Heidelberg University)

High resolution, 3D imaging – coronary CTA images acquired with Turbo Flash mode in only 0.5 s at 70 kV and pitch 2.4, with 45 mSv. The contrast-to-noise ratio was increased by 20%.

(Copyright: Department of Clinical Radiology and Nuclear Medicine, University Medical Centre Mannheim, Medical Faculty Mannheim, Heidelberg University)

Dynamic CTA – 64 cm acquired with special 47 mode at 80 kV, 110 mAs, with 62 mSv contrast. The vascular structures of the complete trunk are clearly demonstrated, and the suspected leaking from the aortic stent could be confidently ruled out.

(Copyright: Department of Clinical Radiology and Nuclear Medicine, University Medical Centre Mannheim, Medical Faculty Mannheim, Heidelberg University)

Dual energy lung PBV – 35 cm acquired in only 4 s with 55 mSv contrast, at 90 / Sn 150 kV. A wedge shaped perfusion defect area is depicted in the left upper lobe, although no pulmonary embolus are present. The image quality is excellent due to greater spectrum separation.

(Copyright: Department of Clinical Radiology and Nuclear Medicine, University Medical Centre Mannheim, Medical Faculty Mannheim, Heidelberg University)
Many cooperative ventures on the horizon for Serbian radiologists

The Radiological Society of Serbia (RSS) is Serbia’s national association of radiologists. Its core aim is to be a professional and educational platform for diagnostic and interventional radiologists, radiologists in training, and other professionals working in the field of diagnostic and interventional radiology, as well as diagnostic medical and functional-molecular imaging.

Our Society has been using the name Radiological Society of Serbia since 2003, it is a successor to the Radiological Association of Yugoslavia and the Radiological Association of Serbia and Montenegro.

The goals of the RSS are to promote professional, scientific and educational activities in the field of radiology and diagnostic imaging, coordinate work in all fields of radiology through standardising the work in national radiology and medical imaging sectors, and guide the work of radiologists and other specialists in scientific and professional collaboration. It also seeks to develop educational activities in all fields of radiology, monitor new technologies in order to create, enforce and implement legal rules and norms related to radiology and medical imaging, represent radiologists in terms of their professional and status interests, and additionally, develop institutional cooperation with other societies in associated medical fields and international associations of radiologists.

Currently, the RSS is an institutional member of the European Society of Radiology (ESR) and the International Society of Radiology (ISR).

The successful and eventful year that passed has brought new standards and expectations for the RSS’s efforts in the years ahead.

Cooperative production between the RSS and the Section for Radiological Diagnostics of the Serbian Medical Doctors Society resulted in the highly successful Serbian Congress of Radiology in Nis, in October 2013. The Congress welcomed many national experts in diagnostic imaging and interventional radiology as well as their counterparts from Europe. The 15th traditional meeting dedicated to interventional neuro-radiological procedures, Neuronterventiti, was held by the Clinical Center of Nis and the recently founded Serbian Society of Interventional Radiologists, as an integral part of the Congress, which yielded a great contribution to understanding, preventing and solving the complications which can occur while performing neuro-interventional procedures.

This year to our great pleasure, the RSS has been invited by the ESR to be a guest of honour in the ‘ESR meets’ programme during the European Congress of Radiology in Nis, today and at 10:30, in a session called A guided tour of radiology in Serbia, leading Serbian radiology experts will give a virtual tour of radiology in Serbia, pointing out the cutting-edge technologies and procedures, advantages and pitfalls of the everyday work routines, and the achievements made. The topics will include interventional treatment of varicoceles, MRI in non-ischaemic cardiomypathy, and the role of prenatal MRI in fetal central nervous system.

Following a strongly established trend of recognising and emphasising the need for high-quality education and communication, the RSS and the Section for Radiological Diagnostics of the Serbian Medical Doctors Society has held a substantial number of section meetings, which covered a wide range of radiology topics and issues, facilitating high-quality discussions and exchanges of experiences between colleagues from the leading institutions and those from rural parts of the country, who do not have the access to the latest technologies and state-of-the-art diagnostic information.

Moreover, high-quality education is provided for radiologists in training, not only through revised and improved training curricula, but also through a large number of educational courses, such as traditional CT schools, MRI schools, and breast imaging educational courses, to name just a few of the courses that attract residents and young radiologists from the whole region, and have excellent lecturers both from Serbia and abroad.

For the first time a joint project of the radiological societies of Serbia, Bosnia and Herzegovina, Slovenia, Croatia and Macedonia resulted in a regional MRI School with the participation from regional and international experts in the field of MRI, which was expertly organised by Dr. Zulejha Merhemic in Sarajevo, the capital of Bosnia and Herzegovina.

The guiding idea of this project is to gather all of the radiologists in training from the above mentioned countries to create a core educational basis in the field of MRI.

In September 2013, the 7th Annual Meeting of the Society of Gastro-intestinal Radiologists of Serbia was held in Novi Sad, presenting the interdisciplinary approach to contemporary imaging of colon disorders.

This year, the Serbian national delegate in the Radiology Trainees Forum (RTF) Dr. Marija Basta Nikolic has been elected as Public Relations Officer of the RTF Board, which will help further promote ESR activities, especially the European Diploma in Radiology, and implement ESR policies throughout Serbia.

**TECHNOLOGY FOCUS**

**Lung subtraction on Toshiba’s Aquilion ONE can be used for highlighting lung perfusion defects in CT pulmonary angiograms.**

**BY MARILA BASTA NIKOLIC, VESNA NJAGULJ & MILOS A. LUČIĆ**

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Three new EIBIR projects launched in 2013

After a highly competitive selection process for the last health call under the EU's Seventh Framework Programme, MITIGATE was favourably evaluated and began in October 2013. Two additional projects under the Virtual Physiological Human theme also began in 2013. VPH-PRISM and VPH-DARE@IT show great promise for advancing the treatment of breast cancer and dementia.

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French hospital adapts paediatric CT protocols

The Hôpital Femme Mère Enfant is a French public children’s hospital belonging to the Hospices Civils de Lyon (HCL). Its CT scanner (Philips Brilliance 40, without iterative reconstruction) scans 4,200 patients each year, 83% percent of whom are children under 15 years of age. Upon its opening in 2008, dedicated paediatric protocols were created by a task group including radiologists, technologists and field application engineers.

The medical physics department got involved in radiology in 2010. While 80% of the average medical effective dose in France was coming from CT scans (data from 2011), it appeared obvious, due to the risks associated with ionizing radiation, that radiology involvement should focus first on CT scans, especially in paediatrics.

We first made an inventory of the CT scan protocols and made an independent copy of them. Some anatomical regions had many dedicated protocols relating to patient weight (body) or age (head). But these protocols were not correlated with one another (different protocols for the same age, mAs different for two identical protocol, etc.). These protocols had varying origins: changes by several people, mistakes, or no replacement of initial protocols following maintenance. Without dose delivery follow-up, with 30 technologists and 12 radiologists, these mistakes were difficult to identify.

The first step was to homogenise and match patient weight (or age) with the delivered doses for all protocols.

In the second step, we wanted to compare the doses delivered by our CT scanner with the Société Française d’Imagerie Pédiatrique et Prénatale (SFIPP) 2008 recommendations. As data recovery was extremely time consuming, we decided to create software (CTDOT) that would allow us to automatically acquire parameters and dose delivered, as no commercial dose archiving and communication system (IMeC) was available.

The first CTDOT release appeared in November, 2010, and allowed us to access acquisition parameters (protocol name, kV planned mA, collimation, automatic exposure control, couch height, rotation time, and pitch) and dose parameters (CTDI and DLP). Thus, we have been able to evaluate our practices and measure delivered doses in order to compare them with recommendations. The data were analysed by medical physicists, radiologists and radiologists to understand the problems and find solutions.

As an example, we decided to increase the number of protocols, whose parameters were strongly related to child morphology, instead of creating only one protocol with a lookup table according to child size. Indeed, this CT machine is used 24/7 by technologists, who are not all specialised in CT (the night staff operates all imaging machines). We made this decision in order to facilitate their job in emergency cases, despite the loss of readability (73 paediatric protocols available).

Patient weight (and height since 2013) has been saved to refined protocols operating ranges.

As the CT machine does not provide BMI (height and weight) automatically, we made an interfacing application (DACS) was available.

We still optimise our CT scans, essentially working on mA and acquisition time much. On this machine, overrange can increase the radiation dose by up to 65%. Technologists were made aware of the best way to image: both sufficient patient coverage and good vertical centring on lasers (effectively the estimated patient size and the automatic exposure control on delivered dose).

Comparison of our data with French and international recommendations has been done in terms of CTDI and DLP. However, we had to take into account the ranges in these recommendations: were not the same and usually larger than ours. Our CTDI (overrange can increase the radiation dose by up to 65% Technologists were made aware of the best way to image: both sufficient patient coverage and good vertical centring on lasers (effectively the estimated patient size and the automatic exposure control on delivered dose).

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We should still work on technologist training concerning protocols choices and planned scan length. Sometimes, despite a known weight (or age), they still choose the wrong protocol, presuming wrongly that the adapted protocol does not suit to the patient.

We still optimise our CT scans, essentially working on mA. The mA are regularly decreased with the radiologists’ approval, because we do not have any tool allowing image quality degradation that would permit a priori optimisation.

Didier Defez is a medical physicist at Centre Hospitalier Lyon Sud in Lyon, France.

DLP follow-up for a 0-1-year-old head examination patient.

Same phantom, different table height: effect on AEC.
UNSCEAR launches new global medical exposure survey in 2014

Interview with the scientific officer of UNSCEAR
Dr. Ferid Shannoun

What is the mandate of UNSCEAR?
The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was established by the United Nations General Assembly in 1955 to collect and evaluate information on the levels and effects of ionizing radiation from natural and artificial sources. From the very beginning, UNSCEAR has systematically reviewed and evaluated the global and regional levels of medical exposure in order to determine trends in frequencies and doses. UNSCEAR also has a mandate to evaluate the evidence for radiation-induced health effects.

How does UNSCEAR collect the information needed for their evaluations?
Information on the use of radiation in medicine and the associated exposures is obtained through population-based surveys sent to national regulatory authorities and more recently through ministries of health in cooperation with the World Health Organization. The objective of the surveys is to estimate the global frequencies of radiological procedures and levels of radiation exposure, with a breakdown by procedure, age, sex, level of healthcare, and country.

Why does UNSCEAR conduct medical exposure surveys?
These surveys are used to identify the trends in exposure and thus serve as an early warning sign for potential safety issues that might require attention, i.e., procedures requiring further consideration by those concerned with radiation safety by virtue of dose or frequency. They can also be used to identify gaps in treatment capabilities and possible unwarranted dose variations within the same procedure. The surveys provide evidence to underpin advocacy messages and to develop and implement evidence-based radiation protection policies.

How long has UNSCEAR been collecting information on medical exposure?
As early as its initial report in 1955, UNSCEAR recognised that exposure from medical diagnostic and therapeutic procedures was a major component of the total exposure due to artificial sources of radiation worldwide, a fact that remains true today. Later, in the 1970s, UNSCEAR provided more detailed information on medical exposure and presented comprehensive evaluations. In 1982, the first survey was carried out in cooperation with the World Health Organization to obtain additional information on diagnostic radiology equipment. Since the UNSCEAR 2000 evaluation, the collective effective dose – in man Saverit – is used to express population dose estimates. The latest UNSCEAR evaluation was completed in 2008.

What are the most important results from the last survey?
According to the UNSCEAR 2008 survey, approximately 3.6 billion diagnostic and 0.5 billion dental procedures were performed annually worldwide. Two thirds of diagnostic radiological procedures, over 95% of all nuclear medicine procedures, and 70% of radiation therapy treatments were performed in the industrialised countries. This imbalance is also reflected in the availability of radiological equipment and practitioners. The global collective effective dose from diagnostic radiological procedures has doubled in 20 years from 1.8 to 4.0 million man Saverit.

How does UNSCEAR estimate the global level of exposure?
Most of the UNSCEAR survey data comes from industrialised countries. A method was therefore developed to extrapolate the existing data and to estimate the availability and frequency of medical radiation use in countries where data are unavailable. Based on a good correlation between the physician-to-population ratio and the annual frequency of diagnostic radiological procedures, the UNSCEAR model enables medical radiation exposure to be estimated on a worldwide basis. UNSCEAR's latest estimate of the global annual effective dose per head is 0.62 mSv.

How high is the estimated risk from such a dose?
At such low levels of radiation the uncertainty in estimating a cancer risk is very high. It increases when extrapolating the probability of incidents due to high or moderate doses to low and very low doses. Therefore, it is not surprising to note that a statistically significant increase in radiation-induced cancer is seen only when the exposure is 100 mSv or above. For this reason, UNSCEAR has recommended that when estimating radiation-induced health effects in a population exposed at levels equivalent to or below natural background, the very low doses should not simply be applied to a large number of individuals. The collective effective dose should therefore be used in this context for comparison purposes only.

What are the main challenges for UNSCEAR in collecting data?
The UNSCEAR surveys revealed a range of issues relating to participation, data quality and analysis. For example, limited resources and infrastructure to conduct national surveys and evaluation are the most limiting factors for data collection.

How does UNSCEAR plan to improve the data collection?
UNSCEAR aims to address deficiencies in data quality and collection, and to improve participation in its surveys by changing the questionnaire structure and standardising its taxonomy and terminology. The questionnaire instructions are provided in other UN languages besides English. But the most important improvement is the development of an online data collection system that allows respondents to upload their completed questionnaires to a dedicated UNSCEAR website.

In addition, UNSCEAR will further cooperate with international and professional organisations, such as the ESR, to obtain relevant data from reliable sources.

What is UNSCEAR's impact on radiation safety?
UNSCEAR has no direct mandate in radiation protection, but it is more focused on the collection, collation, analysis and publication of medical radiation exposure data, covering the issues, levels, impact and trends. The information provided by UNSCEAR is of importance to others, such as the International Atomic Energy Agency, the World Health Organization and the International Labor Organization, who all have responsibility for the preparation of radiation safety and protection recommendations and guidance.

Any final comment with regard to medical exposure?
We should not forget that although medical exposure remains by far the largest artificial source of exposure and continues to grow significantly, radiation – if used appropriately – benefits patients enormously by improving detection, diagnosis and treatment of disease.
KNOWING MATTERS.

The use of CT has increased enormously during the past 10 to 20 years, by more than 50% since 2001 in the Netherlands alone, where approximately 1.2 million scans were performed in 2009. The steepest increase has been seen in non-academic hospitals. CT scans deliver substantially higher radiation doses than most other diagnostic imaging modalities.

A single chest CT scan delivers a radiation dose to the chest more than 100 times greater than that of a conventional chest x-ray, 10 vs. 0.1–0.1 mSv. After many years of discussion about radiation protection in CT scanning, the first two large empirical studies on the issue have recently been published, while several others are in progress, including several European studies within the EPI-CT consortium, as well as studies in Canada and Israel. The UK cohort by Pearce et al. included almost 180,000 patients who underwent one electronically archived CT scan in the Netherlands. Data on more than 100,000 patients who received on average about 1.5 to two scans have already been collected. The earliest scans date back to 1980. Information on all archived CT scans of these children is being obtained, including the date of examination, scanned body part, radiologist’s report, and the technical parameters for organ dose estimation. Although the study is smaller than the previously published ones, it will have additional information in order to address issues such as confounders and uncertainty in exposure assessment.

Among the several ongoing studies, which are also focusing on radiation sensitivity and long life expectancy in the The Dutch Pediatric CT Study, a nationwide retrospective record-linkage cohort study of children who have received at least one electronically archived CT scan in the Netherlands. Data on more than 100,000 patients who received on average about 1.5 to two scans have already been collected. The earliest scans date back to 1980. Information on all archived CT scans of these children is being obtained, including the date of examination, scanned body part, radiologist’s report, and the technical parameters for organ dose estimation. Although the study is smaller than the previously published ones, it will have additional information in order to address issues such as confounders and uncertainty in exposure assessment.

Both studies are major contributions to the field of low-dose radiation risks and provide evidence that radiation doses received by a moderate number of CT scans lead to significantly increased cancer risk. However, both studies were criticized because of a lack of information on potential confounders such as indications for the scans, congenital syndromes, radiation exposure from other diagnostic imaging, etc., as well as substantial uncertainty in organ dose estimation.

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Information on congenital disorders, familial cancer syndromes and leukemogenesis conditioning preceding bone marrow transplantation for non-malignant conditions will be obtained by evaluating radiology reports, as well as linkage with EUROCAT, a population-based registry of congenital anomalies, and the European Bone Marrow Transplant Registry (EBMT). Uncertainty in dose estimation is reduced by the study’s almost nationwide coverage in the Netherlands, a negligible number of paediatric CT scans are performed outside hospitals since multiple scans of the same patient in different hospitals can be linked to the individual patient. Furthermore, detailed data on the settings of the CT scans from RIS and PACS systems will be used in calculating organ doses based on a joint protocol for all EPI-CT studies.

The Dutch Pediatric CT Study, together with the other epidemiologic studies scheduled to report results during the coming several years, will provide additional empirical evidence to inform not only the radiation protection experts but also doctors, patients and their parents whenever a CT scan is considered. Moreover, the studies will uniquely contribute to low-dose radiation risks and associated mechanisms.

Michael Hauptmann is a bio-statistician at the Netherlands Cancer Institute.
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ECR Today: What are the Research Committee’s objectives? HUK: Research Committee’s tasks are to periodically survey the needs of the research community as well as to develop recommendations for radiologists to engage with different fields of research and innovation. We also work to assess the current status and develop recommendations on how to improve education in research and to provide strategic recommendations for the research field to the executive council. Last but not least, we aim to leverage cooperation between research disciplines and foster networking and linking with scientific biomedical European societies.

ECRT: Why is it important to have a dedicated ESR subcommittee for imaging biomarkers? HUK: The Research Committee on Imaging Biomarkers was established to address the issues concerning the future development of image-derived quantitative biomarkers, its assessment, validation and standardization.

The development of imaging biomarkers has become an integral part of modern medicine with a huge potential to advance the development of personalised medicine. Different types of imaging biomarkers (anatomical, functional, and molecular) are used for the detection, assessment, and treatment of major diseases including cancer, cardiovascular diseases, neurological and psychiatric diseases, musculoskeletal disorders, metabolic diseases, as well as inflammatory and autoimmune-related diseases. In contrast to other biomarkers, imaging biomarkers have the advantage of remaining non-invasive. They are also spatially and temporally resolved, non-destructive and repeatable over a long period, and have the potential for broad application. But before imaging biomarkers can be widely adopted, measures for standardization and quality assurance must be implemented.

ECRT: Can you please tell us more about your collaboration with QIBA and the Imaging Group of the EORTC? How important is it to work closely with these organisations? HUK: The collaboration with the European Organisation for Research and Treatment of Cancer (EORTC) and its Imaging Group, as well as the Quantitative Imaging Biomarkers Alliance (QIBA) is extremely relevant.

Medical imaging, in particular radiology, has not until now played an important role within the EORTC. The whole concept of having standardised, quality-controlled quantified imaging biomarkers, which might be used as surrogate endpoints, has not been implemented within the framework of the EORTC. The EORTC imaging group provides a great opportunity to achieve this and introduce standardised quality-controlled imaging and imaging biomarkers into international trials by radiologists. Among other topics, the implementation of data protection rules, such as the anonymisation of image data transferred from study sites to the EORTC, and the absence of a budget for local reviewers, as well as the imaging group, are among the main concerns of this group.

The Quantitative Imaging Biomarkers Alliance was founded by the RINA in order to advance quantitative imaging and the use of imaging biomarkers in clinical trials and clinical practice, by engaging researchers, healthcare professionals and the industry. Daniel C. Sullivan, QIBA Chair, and the RINA have expressed their interest in working together closely with the ESR on the stepwise development of imaging biomarkers. A memorandum of understanding between the ESR and the EINA has been signed, among other things, in order to better integrate the relevant US and European activities, e.g. for the development and introduction of the Uniform Protocol for Imaging in Clinical Trials (UPICIT), Protocol developed by QIBA.

ECRT: Why was the ESR Workgroup on Research in Education and Training founded? HUK: The WG Personalised Medicine (PM) was established to develop a strategy to outline the crucial role medical imaging plays in the field of PM and improve awareness among radiologists, policy makers and patients.

Personalised medicine (PM) is increasingly becoming a hot topic among all areas related to medical research and has the potential to become the paradigm for clinical practice.

The future of medicine lies in early diagnosis and individually tailored treatment, a concept that has been designated ‘personalised medicine’, i.e. delivering the right treatment to the right patient at the right time. However, the value of medical imaging in PM is frequently underestimated, as many policy makers forget the all-important right location in the PM paradigm. Medical imaging has always been personalised as it provides individual assessment of the location and extent of an abnormality, and in the future it will prove fundamental to almost all aspects of PM. It is very important that imaging is duly represented in personalised medicine in order to inform radiologists, patients and policy makers of the crucial role played by medical imaging in PM.

ECRT: What did the working group set out to achieve? HUK: The working group is planning to develop a general ESR policy on personalised medicine, and publish an opinion paper on radiology in personalised medicine and on the role of radiology in linking imaging datasets, biomarkers and other knowledge repositories, including population-based imaging. Another goal for the working group is to identify hot topics for the ESR in the field of PM, develop a strategy to make radiology an important key player in the field of radiogenomics and systems medical imaging. Finally, the working group is committed to offering input and advice in the field of PM to the ESR as a stakeholder in EAPM, EFPM, and CCOR.

ECRT: Why was the ESR Working Group on Research in Education and Training founded? HUK: Research on the future of radiology as it provides visibility in the academic community, attracts good residents, and industry and research funds. Research is the basis of the development of improved imaging methods, and it provides data for discussions in turf battles and healthcare financing. The working group was founded to address the current situation. Many European radiologists are active in research only after their radiology board examinations while dedicating all efforts towards clinical work during residency. Compared to other researchers, clinicians tend to be older before receiving academic promotions. Academic institutions tend to lose bright radiologists before they are financially trained and endowed, and impose requirements on how to improve education in research.

ECRT: What did it set out to achieve? HUK: The working group is planning to develop a general strategy for the ESR on the implementation of research in education and training. The publication of an opinion paper on research in education and training, and the establishment of MD/PhD programmes in radiology are also on the agenda. The tasks of the working group are also to regularly update the European Training Curriculum with research results, provide input and advice to ESOR and the ECR Programme Planning Committee (PPC) in order to have research issues adequately represented, and contribute to the e-learning programme of the ESR.

ECRT: Do you think there is enough importance (discussions, education, financial resources, time, etc.) put on research in imaging in Europe nowadays? What would be your suggestions to improve the situation? HUK: Clinical workload, shortage of academic radiologists, training of young radiologists and financial resources for basic research are the important issues imaging research is facing today. These challenges are difficult to overcome, and not enough importance is put on these issues to ensure the future of radiology for radiologists. To improve the situation, it is vital to raise awareness and change the academic mindset on research carried out by radiologists in radiology as well as in the areas of clinical service and private practice.

Different issues must be addressed at the same time to improve the situation, e.g. appropriate infrastructure, funding, time dedicated to research, general research training for residents, research fellowships and mentoring programmes. Moreover, visionary leadership that understands and communicates research efforts and a culture that respects and rewards research and researchers are important prerequisites for the success of research.
The French Society of Radiology (SFR) has more than 8,000 members. The SFR contributes to the development of research programmes, graduate education and postgraduate training for all French-speaking professionals working in the field of medical imaging. Educational programmes include the Journées Françaises de Radiologie (JFR), the SFR's well-known annual meeting held in Paris each October. The congress attracts a large national and international audience each year.

At the national level, the role of the SFR is to promote healthcare policies which ensure patients have access to the best care and innovations throughout the country. Telemedicine, including teleradiology, is now part of healthcare, and the SFR supports the development of new medical organizations for teleradiology, quality control and radiation exposure guidelines in order to improve patient care. For teleradiology the French Council of Radiology (Ga, presided by the SFR and including all four representatives of French radiologists, has noticed lower levels of patient care within telemedicine income hospitals. Such teleradiology programmes just do readings of CT and x-rays images with no validation of the requested examination, no support to the radiographer, no management of the radiological department, questionable organisation, and doubtful credentials from the remote radiologists. With the French National Council of Physicians (Conseil National de l'Ordre des Médecins, CNOM) and the Ga, the SFR promotes a teleradiology charter (see boxed text) which lists several key duties of the radiologist, along with ethics, and consideration for patients. This charter also refers to several other teleradiology guidelines on medical convention, the role of radiographer, etc., which are available online: www.g4-radiologie.com

**Telemedicine Charter summarizes the main principles of teleradiology**

1. **Teleradiology should be controlled and supervised by radiologist-physicians, in collaboration with other physicians and healthcare professionals involved in patient care.** Teleradiology is part of the local medical organization of radiology at the applicant site.

2. **Teleradiology is a medical act subject to professional ethics.** It includes both medical diagnosis and expertise. Remote image transmission for technical purposes or remote interpretation is only an individual step in teleradiology.

3. **Teleradiology must not undermine the human relationship between the patient, the clinician, the radiographer and the radiologist.** Teleradiology must take into account all technical and managerial requirements for optimal healthcare.

4. **The use of teleradiology must comply with the general healthcare organisation, in the best interests of the patient:**
   - Teleradiology must enable the patient's physician to offer high-quality radiological medicine via a teleradiologist.
   - Teleradiology should promote exchanges of knowledge and know-how among the radiologists who use this modality (tele-expertise).
   - Teleradiology must not be used to justify the acquisition or renewal of imaging facilities unless the necessary radiologists are available on site to operate them, in accordance with the medical project.

5. **The development of teleradiology in France is based on:**
   - District and regional development of teleradiology, promoting networking among clinicians and radiologists.
   - The search for the best possible human radiological expertise, beyond that locally available, for tele-expertise.

6. **The French Radiological Society is committed to refining its national guidelines, together with the French National Authority for Health (Haute Autorité de Santé, HAS), concerned medical societies, the National Council of the College of Physicians (Conseil National de l'Ordre des Médecins, CNOM), the French Ministry of Health and, with respect to technical and ethical aspects, the institutional players involved in image transmission networks.**

7. **Radiologists:**
   - The two aspects of teleradiology, telediagnosis and tele-expertise are complementary to the usual local practice of radiologists.
   - Teleradiology must respect all the quality criteria and medical and radiological steps of patient management, as follows:
     - Initial physical examination
     - Validation and justification of the examination
     - Radioprotection of the patient and staff
     - Image acquisition performed by a radiographer under the responsibility of a radiologist-physician
     - Image analysis and interpretation by the radiologist
     - Interview with the patient and dialogue with the patient's clinician(s)
     - Organization of the radiological staff
   - The radiologist must hold all the permits required to practice in France.

8. **The use of teleradiology as a medical act must be validated by the onsite radiologist(s), the Regional Council of the College of Physicians (Conseil Départemental de l'Ordre des Médecins, CDOM), and the Regional Board of Radiologists, based on a written medical convention.**

9. **Communication:**
   - The radiologist must be able to communicate directly with the clinician at the site from which the images are transmitted, and the medical convention should clearly state his or her obligations in case of an emergency, or the need to visit the site.

10. **The contractual document must include:**
    - A medical contract signed individually by all radiologists and clinicians, based on the national guidelines of the French Society of Radiologists and validated by the National Council of the College of Physicians (CNOM). This contract must describe in detail how the patient is managed by telemedicine, from technical aspects, to ethical and technical requirements for the medical practice, to patient safety and quality assurance policy.
    - A technical contract signed by the applicant site(s), radiologists and the industrial or institutional facility ensuring technical support for remote image transmission. This contract must describe in detail the technical requirements for the equipment and data management network, including archiving and communication systems, as well as maintenance and breakdown services. Separate criteria must be provided for the quality and safety control procedures (quality assurance policy).
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**Ethics and Safety:**
- The patient must be informed of and approve his/her medical teleradiological management procedures.
- The security system for patient identification, confidentiality, and identification of the physician and radiologist must comply with medical ethical standards and relevant French legislation.
Accomplished neuroradiologist delivers Röntgen lecture at ECR 2014

In recognition of his exceptional contributions to medical research, particularly in the field of neuroradiology, the European Society of Radiology has invited Professor Paul M. Parizel from Antwerp, Belgium, to present the Wilhelm Conrad Röntgen Honorary Lecture at ECR 2014.

By Florian Demuth

Free trade between the two largest markets in the world – an idea that had been floated for decades, but never quite got off the ground, is currently becoming a reality as the EU and the USA negotiate the ‘biggest bilateral trade deal ever’.

Fuelled by the economic crisis that started in 2008, the joint High Level Vellinga Group on Growth and Jobs recommended the start of negotiations in early 2013. Following a comprehensive study of the potential benefits of a trade deal, in July, the European Commission, which negotiates all trade deals on behalf of the EU member states, and the Office of the US Trade Representative started negotiations on the Transatlantic Trade and Investment Partnership (TTIP). If successfully concluded, it would create a trade area covering 40 percent of the world’s GDP and would add up to 0.5 percent to the EU’s annual economic output.

Generally welcomed on both sides of the Atlantic, especially by business groups and governments desperate for growth, the negotiations have also drawn criticism, particularly from consumer and environmental groups, but also stakeholders in the health sector who fear that profit-driven liberalisation could lead to detrimental outcomes for patients. Third countries, particularly those in geographic proximity, have also voiced concerns about the potential impact on income from exports towards the EU and the US. It is unclear how the TTIP will affect multinational trade negotiations, while one camp argues that it could kickstart the Doha talks that have been going nowhere for five years, others believe that the TTIP will be the last nail in the coffin of a global trade deal.

After these largely predictable reactions to a free trade agreement of this magnitude, let us turn to the more immediately relevant questions for the ESR: what is the TTIP’s content, what is it for in the health sector, and what does it have in store for radiology?

Apart from a few exceptions, tariffs are virtually non-existent between the EU and the US; this means that the TTIP will focus on non-tariff barriers and regulatory convergence. The TTIP will comprise three pillars: market access, regulatory areas and trade rules. While there will not be a dedicated health chapter in the agreement, partly due to the EU’s lack of competence in this area, the health sector will be affected in a number of ways. Negotiators will have to agree on common regulations and industry standards for pharmaceutically and medical devices or the recognition of scientific tests in authorisation procedures.

Indirectly, a variety of horizontal provisions, i.e. rules applicable to all sectors, will also apply to healthcare. This includes rules for public procurement, services and products, and, controversially, investor-state dispute resolution mechanisms – clauses that can enable foreign investors to sue governments for affecting future profits. This could potentially occur if governments legislate for public policy goals in areas such as health. The EU began to counter such criticisms in late 2013, and argued that the TTIP will include an explicit guarantee that governments’ decisions for ‘legitimate’ public policy goals cannot be over-ridden. However, in the past, even explicit opt-outs have not shielded governments from being sued by foreign investors.

Finally, a brief mention of something that will not be in the TTIP: data protection. In the wake of the revelations about NSA surveillance in Europe, the EU declared that data protection, as a fundamental right and not a ‘product’ to be traded, would not be part of the negotiations. Some high-ranking EU politicians, among them European Parliament president Martin Schulz, even called for a suspension of talks until trust has been restored; but neither the spying scandal nor the US government shutdown have slowed down the negotiations. However, whether the ambitious timetable for an agreement by the end of 2015 will be met remains to be seen.

BY MICHAEL CREAM

The Transatlantic Trade and Investment Partnership

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Rising Stars presenter gives advice to new participants

ECR Today spoke with Fatih Seker, a resident from Heidelberg, Germany, who will be a presenter during the student session.

ECR Today: You have been involved in the organisation of the programme, notably in discussions with Alexander Sachs, the Rising Stars representative on the ESR’s Undergraduate Education Subcommitte. What do you enjoy about the programme?

Fatih Seker: People like Alexander Sachs who are involved in the planning are fully committed to education. That’s what makes it fun to work with Alexander and contribute to the programme. The Rising Stars programme, therefore, provides highly interesting topics for medical students, with or without radiological experience.

ECRT: You will deliver a presentation during the student sessions for the second time. What motivates you?

FS: I’m actually looking forward to participating as a student to improve my sonography skills. Alexander Sachs has built a highly professional programme, which covers a variety of ultrasound examinations. It’s definitely worth taking a look at this programme.

ECRT: What is your favourite area of radiology?

FS: In my opinion neuroradiology is the most fascinating aspect of radiology. Even the smallest leeks in the brain can have a tremendous influence on the patient’s health.

ECRT: You recently graduated. What topics do you write about?

FS: My first scientific work: investigating the mystery of stroke. Since I was a student myself until recently, I wrote articles that may interest other medical students, such as reviews about radiological congresses, including the ECR (e.g. http://www.hellste-koepfe.de/site/fachart/store/rising-stars-ecr-2012), interviews with radiologists, etc.

ECRT: What are your plans for the future?

FS: First of all, I want to focus on my clinical training and research. But besides that, I also want to contribute to both the German Roentgen Society and the European Society of Radiology, which provide very interesting programmes for medical students.

ECRT: You contribute to the online magazine hellste-koepfe.de, a German website for young radiologists. What topics do you write about?

FS: Hellste-koepfe is not only for young radiologists; it’s also for medical students who are interested in radiology. Since I was a student myself until recently, I wrote articles that may interest other medical students, such as reviews about radiological congresses, including the ECR (e.g. http://www.hellste-koepfe.de/site/fachart/store/rising-stars-ecr-2012), interviews with radiologists, etc.

ECRT: Will you also take part in the ultrasound workshops?

FS: First of all, don’t worry about the presentation; secondly, enjoy the congress; and thirdly, enjoy Vienna.

ECRT: What will your presentation focus on?

FS: I will talk about my experimental studies on cerebral vasospasm, a disease that occurs after aneurysmal subarachnoid haemorrhage. I will focus on how we built an ex vivo model of cerebral vasospasm and analysed the effects of nimodipine. Nimodipine is a calcium channel blocker and is currently used in interventional neuroradiology for the treatment of cerebral vasospasm.

ECRT: Do you have any tips for your fellow student presenters?

FS: Firstly, don’t worry about the presentation; secondly, enjoy the congress; and thirdly, enjoy Vienna.

ECRT: You will also present on the ultrasound workshops. What topics do you present on?

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FS: First of all, I want to focus on my clinical training and research. But besides that, I also want to contribute to both the German Roentgen Society and the European Society of Radiology, which provide very interesting programmes for medical students.
Top tips for trainees and teachers
Part 3: Career and CVs

Seeking advice on CVs and job interviews? Who better to ask than Prof. Adrian K. Dixon, long serving Cambridge professor and dedicated teacher, researcher and mentor, as well as former editor-in-chief of European Radiology. And guess what? Even he didn’t get every job that he applied for in his early career. But you can see where enthusiasm, hard work, integrity and staying true to yourself can lead you.

ECRT: Could you describe some of the most common mistakes you have seen in CVs during your career?
AKD: A long list of publications but all only submitted; put these under ‘work in progress’. Unexplained gaps; a missing year in general practice, may be relevant and beneficial and better than a year in prison! Grades at school, college or university are important.

ECRT: How can trainees find opportunities abroad and why is it important to have experience training in another country?
AKD: If you are getting increasingly difficult for medical students to do electives abroad, which is a pity as electives are often the way in which young doctors discover their career choice. During radiological training it is always beneficial to see radiology practised in different cultures, and a spell at a centre of excellence in another country is especially useful when doing subspecialty training. In this regard, the ESOI Scholarships scheme has been a spectacular success for high-flyers. However, there are a lot of other scholarships (national, industry-funded, etc.) for short (<3 months) projects or experience abroad, some of which only require a modest number of applications.

ECRT: What kind of audit projects do you think will impress a potential employer?
AKD: A long list of publications but all only submitted; put these under ‘work in progress’. Unexplained gaps; a missing year in general practice, may be relevant and beneficial and better than a year in prison! Grades at school, college or university are important.

ECRT: What other career advice could you give trainees?
AKD: Re-read your CV, find out about interesting cases happening in the department and watch them – even if out of hours. You will never know as much about radiology as when you pass your final exams. It is easier to learn when you are young. So invest at that stage – every expert professional needs to put in 10000 flying hours. As Gary Player (the famous golfer) put it: ‘the more you practise the luckier you get’. As we look to the future, how can we ensure our subspecialties continue to grow, and how can the European Society of Oncologic Imaging facilitate this? By targeting clinical practice, research, and education, the European Society of Oncologic Imaging will be taking the right steps to ensure that we will be able to practice with excellence across Europe. The Network of Clinical Excellence will be launched in 2011, which will link together institutions across Europe, and aim to facilitate dissemination of good practice and provide a support network for education and research. Close involve-ment in the ESR European Training Curriculum and focused teaching workshops will hopefully provide the next generation of cancer imagers with the tools to face the new challenges that technological advances will bring.

More information about the ESOI can be found at www.esoi-society.org

Professor Vicky Goh from London, UK, is the ESR President.
Gustav Klimt, Beethoven Frieze, 1901–1902, Detail (Gnawing Grief)
Photo: Oliver Ottenschläger
The Association of Visual Artists Vienna Secession was founded in 1897 and presented its first exhibition in 1898, the same year the new Secession building was completed according to the designs of Joseph M. Olbrich. Today, the Secession is the world’s oldest independent gallery devoted entirely to exhibitions of contemporary art. One of the basic objectives of the Association is the presentation of current developments in Austrian and international art, as well as to cultivate openness for experimentation.

The Vienna Secession was adapted and renovated several times in the course of its hundred year history. The entrance hall was already being altered in 1901. In 1908, part of the ornamentation and the slogan ‘Der Zeit ihre Kunst. Der Kunst ihre Freiheit (For every time its art. For art its freedom)’ were removed. The building was damaged by bombings during World War II and set on fire by the retreating German army. During the reconstruction in 1963 the original décor was renewed and a second floor inserted in the entrance hall.

A total of about 20 exhibitions take place in the Vienna Secession (in the Main Hall, Gallery, Graphic Cabinet and Ver Sacrum Room) each year. All of the exhibitions are accompanied by a publication and often by parallel events, lectures, symposia, art discussions, etc. The world famous Beethoven Frieze by Gustav Klimt is permanently on show.

In spring 1902 the acclaimed XIVth exhibition at the Secession presented the magnificent Beethoven Frieze for the first time. A total of 21 artists collaborated on the exhibition under the direction of Josef Hoffmann. The exhibition centred on Max Klinger’s Beethoven statue placed in the main hall. In addition to Klimt’s Beethoven Frieze, wall paintings and decorations by Alfred Roller, Adolf Böhm, Ferdinand Andri and numerous other artists were presented. The declared aim of the exhibition was to reunite the separate arts – architecture, painting, sculpture and music – under a common theme: the ‘work of art’ was to emerge from the interplay of the design of the rooms, the wall paintings and sculpture. Klimt’s monumental wall cycle was located in the left-hand aisle, which visitors to the exhibition entered first. An opening in the wall offered a view of Max Klinger’s Beethoven statue, indicating the interplay of architecture, painting (Klimt’s Beethoven Frieze) and sculpture (Klinger’s Beethoven) as soon as the visitor entered.

The XIVth exhibition drew nearly 60,000 visitors, thus becoming one of the Secession’s greatest public successes. It also proved fundamentally important to Klimt’s further development, as well as that of numerous other participating artists: the ideal of the interplay and aesthetic integration of all artistic disciplines and the collaboration tested in the Beethoven exhibition was successfully continued by the Wiener Werkstätte, among others.

Today the Beethoven Frieze is considered one of Klimt’s key works and one of the high points of Viennese Art Nouveau. The theme of the Frieze is based on Richard Wagner’s interpretation of the 5th Symphony by Ludwig van Beethoven.

“Three important innovations can be observed in the Beethoven Frieze by Gustav Klimt: the two-dimensional depiction and the monumental isolation of the human figure, the expressive use of line and the dominating role of ornament. Klimt’s participation in the Beethoven experiment marks the beginning of his famous ‘golden period’. Today, the monumental allegory is seen as one of the key works in the artist’s development,” stated Marian Bisanz-Prakken in the essay ‘The Beethoven Frieze by Gustav Klimt and the Vienna Secession’, which was published in ‘Gustav Klimt – Beethoven Frieze’ (Secession 2002).

Secession
Friedrichstrasse 12
1010 Vienna
Opening hours:
Tuesday–Sunday 10 am–6 pm
www.secession.at

Gustav Klimt, Beethoven Frieze, 1901–1902, Detail (Poetry)
Photo: Oliver Ottenschläger
WHAT’S ON TODAY IN VIENNA?

Theatre & Dance

Please note that all performances, except at Vienna’s English Theatre, are in German.

Akademietheater
1030 Vienna, Luitzstraße 1
Phone: +43 1 5444 5455
www.burgtheater.at
19:30 Onkel Wianja by Anton Chekhov

Burgtheater
1010 Vienna, Dr. Karl-Lueger-Ring 2
Phone: +43 1 5444 4445
www.burgtheater.at
20:00 Der Alpenkönig und der Menschenfeind by Ferdinand Raimund

Museumsquartier – Halle E+G
1070 Vienna, Museumsplatz 1
www.halleeg.at
20:00 Red Bull – Flying Bach Unique performance combining Johann Sebastian Bach and Breakdance, interpreted by the Breakdance world champions Flying Steps and opera director Christoph Hagel

Schauspielhaus
1070 Vienna, Porzellangasse 19
Phone: +43 1 581 35 91
www.stadtheater.at
20:30 Encore Eugénie Rebetez (Switzerland)

stadtTheater walfischgasse
1010 Vienna, Walfischgasse 4
Phone: +43 1 522 42 00
www.stattheater.org
20:00 Drei Mal Leben by Yasmina Reza

Tanzquartier Wien
1070 Vienna, Museumsplatz 1
Phone: +43 1 581 35 91
www.tqw.at
20:30 Joseph und seine Brüder – Die Berührte by Thomas Mann

Vienna’s English Theatre
1080 Vienna, Josefsgasse 12
Phone: +43 1 402 12 60 0
www.englishtheatre.at
19:30 Maria Stuart by Friedrich Schiller

Concerts & Sounds

Konzerthaus (Classical Music)
1030 Vienna, Lothringerstraße 20
www.konzerthaus.at
19:30 Wiener Singakademie, chorus; conductor Heinz Fersleb
Pier Damiano Peretti, organ
C. Tournemire, T.D. Schlee, C.-M. Widor, M. Duruflé

Musicverein (Classical Music)
1010 Vienna, Bösendorferstraße 12
www.musikverein.at
19:30 Sächsische Staatskapelle Dresden, conductor Christian Thielemann
Rafa López, piano
F. Liszt, L. van Beethoven, R. Strauss

Porgy & Bess (Jazz)
1010 Vienna, Riemergasse 11
www.porgyat.at
20:30 Brein’s Café (Austria/Bulgaria)

Arena (Alternative Music)
1017 Vienna, Baumgasse 8
www.arena.co.at
18:00 V-Titty (Germany)

Gasometer (Alternative Music)
1120 Vienna, Guglgasse 8
www.gasometer.at
20:00 Casper

Opera & Musical Theatre

Theater an der Wien
1010 Vienna, Linke Wienzeile 6
www.theater-wien.at
19:00 La Nozze di Figaro by Wolfgang Amadeus Mozart (opera in concert)
Conducted by Nikolaus Harnoncourt
With Christian Gerhaher, Christine Schäfer, Mari Enkemaen, André Schuen, Elisabeth Kulman, Ildiko Raimondi, Mauro Peter

Volksoper
1070 Vienna, Währingerstraße 78
www.volksoper.at
19:00 Turandot by Giacomo Puccini

Wiener Staatsoper – Vienna State Opera
1010 Vienna, Operngasse 4
www.wiener-staatsoper.at
19:00 Adriana Lecouvreur by Francesco Cilea, conducted by Evelino Pidò
With Elena Zhukova, Massimo Giordano, Angela Gheorghiu, Roberto Frontali

Ronacher
1010 Vienna, Selleristrasse 9
www.musicalvienna.at
19:30 Der Besuch der alten Dame by Michael Reed, Moritz Schnieder