Russia: Scanners plentiful but radiologists too scant

However, investments in equipment and advanced training are attracting medical students, John Brosky reports

‘Going back 20 years we had problems with access to high-end technologies for radiology. CT, MRI and PET scanners were quite rare,’ sighed Valentin Sinitsyn MD. Then, he laughed. ‘Now suddenly we have the opposite problem with more and more new technologies and a shortage of radiologists qualified to operate all this equipment.’

Over the past decade, he explained, the Russian Ministry of Health has invested heavily in the acquisition of high-end radiology platforms, significantly including information systems to process, store and share images. ‘In absolute numbers, we can claim to have between 14,000 or 15,000 radiologists, but most have been trained in basic examinations for X-ray or else specialised in just CT or MRI. There simply wasn’t a need for more advanced training,’ he said.

As a result, the Russian Society of Radiology has endorsed the European Training Curriculum for Radiology developed by the European Society of Radiology (ESR) as a basis for a national training programme. Chief of Radiology at the Federal Centre of Medicine and Rehabilitation, Dr Sinitsyn is also a member of the ESR Executive Council and, over the past year, served as the Chairman of the Congress Committee responsible for the scientific and educational programme. He has given special attention to organising a special session at the Congress ‘Concerning Russia’, that will feature some of his country’s most prominent radiologists, two cultural interludes and a panel discussion on the theme, Future developments in Russian radiology: which path to take?

‘I would not want to predict what the panelists will decide, but my own greatest hope is that we will encourage and support this great interest that young people are showing in radiology,’ said Dr Sinitsyn, who is also a professor and the Head of the Radiology Course at Moscow State University. ‘Radiology has become very attractive for Russian medical students. They find it exciting with all the high technologies, computerised processes, information technologies, 3-D imaging and functional imaging. It is a field that is developing very fast, which also appeals to them.’

‘Most of these students speak a high level of English, which is essential as so much data and information is available for them everywhere in English-language journals and, of course, on the internet. To the point where increasingly we can offer radiology courses for Russian students in English,’ Prof. Sinitsyn explained.

Among the students and residents he teaches he said he is impressed by their drive and enthusiasm to be successful, well-trained and knowledgeable professionals. Attending international congresses has convinced them they also need to demonstrate an expertise by presenting results from their work.

I am very pleased that we have seen an increase this year of more than 60% in papers and posters submitted to the European Congress from Russia. My country is now among the leading contributors of scientific work this year and I believe it is a general trend and that we can expect it will be sustained with future congresses.

There remain significant challenges for Russia with its uneven expansion of capabilities in radiology, he added. ‘While we have seen an acceleration in the development of digital networks and PACS, many hospitals have boldly gone ahead purchasing these expensive systems without building the required infrastructure or assuring they have a sufficient number of workstations. Often they cannot see further than acquiring stand-alone systems. On the other hand, we have quite successful programmes at hospitals that are fully equipped and fully-digital with regional radiology networks and teleradiology. It becomes a question of cultural change, of finding the appropriate approach for creating these services.’

‘Service for the new equipment is another, quite complicated issue,’ he continued. ‘It is not unusual to have one scanner working and another scanner standing idle for months, which will stop a scanner operation, of course, but repair or replacement takes place only when the companies themselves are very complex regulations and customs requirements in Russia. The required registration of tenders can be quite long. Even where a hospital has the funding there are very lengthy delays.

On the other hand, we continue to have challenges for maintaining operations with the manufacturers themselves. These are very big, international companies, but I regularly find myself telling them they need to improve service and support. They have a shortage of technicians, of spare parts, even for minor parts, and this takes time.’

These obstacles can be disturbing, frustrating the smooth operation of a radiology group by leaving a scanner standing idle for months, a waste of resources, especially human resources,’ he pointed out.

Nevertheless, Prof. Sinitsyn believes that Russian radiology is now moving in a positive direction and that current challenges will be resolved with continued progress and improvements.
A time to celebrate greater child protection

The Image Gently campaign enters 7th year

By Cynthia E. Keen

The words ‘Image Gently’ are synonymous with protecting children from unnecessary or excessive exposure to X-rays. A grass-roots campaign started by a handful of US paediatric radiologists and medical physicists who were deeply concerned about the radiation doses paediatric patients were receiving from CT scans has become a highly effective, on-going worldwide message and movement to make diagnostic imaging safer for children.

The Alliance for Radiation Safety in Paediatric Imaging consists of over 80 member societies representing more than 800,000 medical imaging professionals. On 1st January 2014, 28,298 medical professionals had taken the Image Gently pledge to ‘child size’ radiation doses, keep radiation dose levels as low as reasonably achievable (ALARA) to obtain a diagnostic-quality image, and to substitute non- ionising exams, such as ultrasound and MRI, whenever possible.

The Image Gently campaign promotes radiation protection for children through an all-volunteer social networking campaign that just keeps gathering momentum, according to the Alliance’s chairperson, Dr Marilyn Goske, a paediatric radiologist at the Cincinnati Children’s Hospital Medical Centre, Ohio, USA.

Dr Goske attributes Image Gently’s success to global agreement by medical professionals, allied health groups, regulatory and advisory organisations, government agencies and medical device manufacturers because this is the right thing to do. Its messages are also directed to parents, whom it works hard to educate. Its authoritative directed to parents, whom it works hard to educate. Its authoritative

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In Radiology

MIR

in Barcelona, will explain the ESR initiatives on radiation protec-

Session 2

The two sides of the radiology coin are individualising treatment, i.e. a

ACR initiatives on radiation protec-

Professor Peter Mildenberger from Mainz is the current head of Management

Subcommittee of the POC explain the results of a European survey on the economic situation, while Dr Manmooz Fahriz (Iran) will report on challenges experienced in ‘special situations’, providing a real example of economic impact on radiology practice at national level. Better understanding and appropriate acting by radiologists can only be achieved with better knowledge of basic economic rules, to be explained by economics expert Professor Giuseppe Turchetti (Italy).

Improvements in patient-centred radiology involve a better cul-
ture of safety and communication. Dr Catherine Mandel will reveal experience with a Radiology Event Register® in Australia and New Zealand, while radiologist Charles Kahn (USA), chair of the ISNAs reporting templates committee will discuss communication and the need for a ‘visible radiologist’.

Winding up the session, Dr Eric Briere will present the patient’s perspective.

Both sessions include discussion time and audience participation.

ECR DIARY DATE

Saturday, 8th March 2014, Satellite Symposium session

13:00–17:30, Room M-B.

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Healthcare IT must adopt new security measures

While acknowledging that some healthcare establishments have implemented measures to ensure eavesdroppers cannot access their systems, Torbjörn Kronander is concerned that others are still exposed to intrusion from outsiders. As head of the Swedish firm Sectra, which develops and sells products and services for medical imaging IT and security, Kronander has been concerned that hospitals often do not realise how easy it is to eavesdrop into secure computer or archival systems and how common it is. However, he is sensing a change of attitude among healthcare organisations and an increased demand for his company’s knowledge and expertise in data security in a medical IT setting, coupled with greater awareness of the risks of data breach and the importance of a security component for hospital archives. Challenges still remain, he notes, in implementing the need for security into daily practice and ensuring that the community understands the need for effective data security. Another issue for Europe’s health sector is the lack of uniformity in secure systems adoption in hospitals. The risk of data breach and eavesdropping, he explained, was vividly highlighted by the case of American computer specialist Edward Snowden, where the former NSA contractor revealed details of global surveillance by the NSA.

Torbjörn Kronander maintains that it is not difficult to keep internal and opportunist hackers out of hospital systems but stressed that many need to take practical steps if they want to remain IT secure. ‘They need an awareness and knowledge of data security at IT level and also understand how to make the system secure so that no one can go into the system and change data,’ Kronander said. ‘Changing data is the worst thing you can do in a hospital, it’s worse than losing data or eavesdropping on the data.’

He cited an example of a case a decade ago in a European country: a doctor who had made a clinical error went into an image archive and changed the picture he had used for the procedure. ‘Security comes at different levels and you can do a lot with software but in the initial phase it is a systems approach, how you look at security in hospital, support it, and then how you enforce it. No chain is stronger than its weakest link, so all systems must be secured,’ he added. ‘For a hospital, the first need is to understand that there is a problem and then adopt a symptomatic specification on a hospital level on how this should be tackled, so that you don’t lose security in different ways in different places.’

Security that pays off

While secure systems cost money and take up some staff and time commitment, the cost is not always as high as hospitals fear. ‘Security costs money but a breach of security costs even more money. It is like insurance; insurance costs money but if you do not have insurance and something happens it will be even more expensive.’

‘Sectra, which has evolved over the past 35 years into an international company with more than 500 employees across 12 countries, is now seeing interest in securing the medical imaging infrastructure and PACS the Company sells in its other division. The company underpins its success with long-term and close collaboration with customers, standing their daily life and routines and combining this with leading-edge technology.

Security awareness, he pointed out, remains generally low in standardisation bodies such as DICOM, and there is no consistent way of solving security issues within them. He also advises hospitals to demand better terms.

Gabriel Krestin believes are essential to advance diagnosis in the brave new world of omic-medicine that is emerging. Thus, during the Sunday session on Imaging in Precision Medicine, he will develop the subject during an ECR 2014 presentation ‘Radiogenomics and personalised (precision) medicine’. Ahead of the congress, Professor Krestin spoke with European Hospital about the potential of linking genomic mutations with imaging phenotypes, the quantification of reporting it will require, and his views on changes necessary in both radiology and society.

This is no longer a dream but a reality. These types of studies have been exponentially increasing in recent years since the start of the Human Genome project. Now that we can increasingly sequence the whole genome in large numbers of cases and controls, people try to determine whether there is anything changed within a gene that is associated with a certain disease or a certain phenotype. Multiple cases have been found where such genes correlate or are associated with people who develop Alzheimer’s disease, or diabetes, Crohn’s disease or specific types of cancer or other chronic diseases.

The same techniques have been applied in large population studies. One of the first that we published, for instance, was the discovery that a genetic mutation associated with white matter lesions in the brain. These lesions are a predictor for the development of cerebral vascular disease or Alzheimer’s disease. The question was whether there is a gene that predicts or is associated with white matter lesions. There is a potential for a lot more.

Where does radiology play a determining role in the universe of omics? A very exciting area that is not based on the overall genetic profile of the patient is leading to the genetic signature of a malignant lesion. This can become significant.

First, we can identify a certain number of patients with a certain type of cancer, biopsy that cancer, sequence the active genes that are expressed within that cancer type, and then correlate the genetic signature, the gene expression sequence, with hundreds of different imaging signs, like size, contours, the enhancement pattern, signal intensity on MR images and many other features that can be identified and characterised in a binomial way. Are the margins sharp or not sharp? You give it a 1 or a 0. Applying statistics, people have found very strong correlations between imaging features and the genetic signature of those tumours.

It seems these imaging features may very well be a product of a certain genetic expression in that specific tumour – aggressiveness, for example. It seems there are certain genes that contribute to hypoxia in some tumours. We can find a correlation between that expressed gene and the enhancement pattern of that tumour. This will tell us if the tumour is hypoxic, or not. These are very relevant findings that have an implication on the possibilities to treat that tumour, because we know that tumours that are hypoxic will not respond to certain chemotherapies or radiotherapies.

Radiology has a 100-year tradition of interpreting images and reporting findings. Will this change that?

Absolutely. We are moving towards applying precision medicine in imaging. I’m absolutely convinced this is the way forward, and if we don’t want to be completely sidelined and made obsolete as radiologists, we have to move toward precision medicine. People are measuring, structuring and standardising. I can understand that sometimes measuring and using these tools can seem quite boring. It’s much more rewarding to apply knowledge as an art instead of applying it as a science. I know how much resistance there is because it limits the freedom of professionals who are very much used to use their own words, to give descriptive findings.

Some radiologists also resist computer assistance for readings. Do you think that will change?

There is no way we can do this manually or even only based on visual interaction. Instead we develop imaging algorithms that do this work fully automatically. Processing image data with tools gives us the numbers without any interaction between the reader and the images. We get brain volumes, the thickness

Two things that radiologists resist – structured reporting and (computer-assisted) quantification – are the very things that Gabriel Krestin believes are essential to advance diagnosis in the brave new world of omic-medicine that is emerging. Thus, during the Sunday session on Imaging in Precision Medicine, he will develop the subject during an ECR 2014 presentation ‘Radiogenomics and personalised (precision) medicine’. Ahead of the congress, Professor Krestin spoke with European Hospital about the potential of linking genomic mutations with imaging phenotypes, the quantification of reporting it will require, and his views on changes necessary in both radiology and society.
Siemens is looking forward to welcoming you at ECR 2014. We will proudly present innovations created with your daily challenges in mind. Innovations offering new possibilities for more accurate diagnoses and more targeted therapies that support you to focus on your patients.

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Answers for life.
Dual energy brings more to the eye

Spectral imaging offers morphological plus functional and molecular data

How does spectral – or dual energy – imaging work? Very similar to red and green in black-and-white photography. A black-and-white camera provides information on intensity for each of the photographed objects; an object that is black under red light is actually green. Different photon energies generate differently coloured light. Spectral imaging applies the same knowledge to X-rays in order to increase the information content in the images, says Professor Thorsten Johnson who until recently headed the radiology department of the University of the Hospital Munich at Grosshadern. With his team he shaped the development and the clinical application of dual energy imaging.

While in spectral imaging the X-ray image is created in conventional greyscale, but using different photon energies, the system manufacturers follow different approaches to achieve their results.

**Dual energy: More information but same radiation dose**

Siemens places two CTs with two X-ray tubes in one device. These radiations are generated at the same time and then are operated at different kV levels; they fire from different angles but from the same position on the axis simultaneously on two detectors. We reconstruct images from both projections; Prof. Johnson explains, and in a second step we analyse the images as to their spectral characteristics. In the data set we can identify different substances, particularly heavy elements such as iodine, xenon or calcium. Most – the most successful – applications use contrast agents.

Top: X-ray ventillation shows a defect in the right upper lobe.
Centre: Spectral imaging confirms the kidney stone (in red) better than a black-and-white scan. Bottom: Iodine image of the lung shows a triangular defect indicating a small embolism

Applications

Spectral imaging is suited for a wide range of applications. In angiography the specific and quantitative detection of iodine contrast agent allows the complete removal of the background, including bone structures. This provides a much better overview of the region of interest and significantly facilitates diagnosis. In peripheral artery occlusive disease the vascular structure is much easier to see and evaluate. Bone marrow oedema, for example, might be visualised with enhanced spectral imaging. The same holds true for tendons, ligaments and cartilage – which are all difficult to image because of the weak signal. How can such potential be explored? Clinically indicated exams, the professor suggests, could simply be performed using conventional dose and spectral imaging.

Summing up

‘Conventional CT can only visualise morphology. It is the physician who must draw conclusions regarding functional aspects,’ Prof. Johnson points out. Dual energy introduces functional imaging to CT. It shows perfusion defects, or whether a kidney stone is composed of uric acid and can therefore be dissolved with drugs, or whether a haemorrhagic renal cyst does not take up contrast agent, which means it’s not a tumour. The additional information that functional and molecular CT imaging provides allows a much more specific diagnosis without higher radiation dose. I’m proud that today this method, which I was fortunate to co-develop, delivers on its promise in clinical practice and in research worldwide.’

Aiding maxillofacial, small joints, cervicals and ENT diagnoses

NewTom is at ECR: Booth 515, Expo E.

* A precursor in Cone-Beam Computed Tomography (CBCT) imaging, NewTom is the unrivalled benchmark in radiology thanks to highly effective research standards, flawlessly reproducible and sheer quality; the manufacturer reports. These ingredients make 5G the best way to explore new fields of application. NewTom 5G is recommended for medical radiology specialties with a focus on maxillofacial, small joints, cervicals and ENT diagnosis. Users can explore several clinical applications, thanks to the open pathway through style gantry and the motorised patient table.

* NewTom 5G couples a revolutionary flat panel X-ray detector technology with a very small focal spot (0,5mm), so to produce the clearest, sharpest images possible. The size of the FOV available on the device can vary from the smallest one to the biggest 18x16 cm.

* New protocol saves dose and time

  * The EcoScan is the novelty among the various scan protocols available on 5G. This protocol reduces scan time and X-ray emission time, as well as dosage, without affecting the high quality of the image.
  * The device features the proprietary NNT software, that creates different kinds of 3D images, compatible with all major software on the market.
  * Finally, the firm points out, NewTom optimises the use of radiation via its SafeBeam technology so ‘the actually absorbed dose is less than a rather standard exam using a conventional MSCT’.

Details: www.newtom.it
Virtual anatomy

Software sustains a link between anatomy and imaging procedures

In 2007, Sara Doll (Institute for Anatomy and Cell Biology, Heidelberg University) and Dr. Frederik Giesel (Clinical Director, Radiology Clinic, Department of Nuclear Medicine at Heidelberg University Hospital) initiated the development of virtual anatomy for a seminar aimed at students in the pre-clinical phase of their medical degree course. For the seminar, Roland Unterhinninghofen, Dr. ing., at the Karlsruhe Institute of Technology, developed an interactive educational software package.

The objective was, and continues to be, the creation of a link between radiological image data collated in clinical routine and anatomical content for educational purposes. These image data are then shown in 2-D and 3-D so that students can, for instance, carry out virtual dissections.

Due to high demand for the clinical study phase, Dr. Giesel also introduced a seminar entitled ‘Virtual Radiology, Nuclear Medicine and Radiotherapy’ to cover pathological and hybrid imaging and the use of image-guided radiotherapy. These links between pre-clinical and clinical subjects (anatomy and radiology) happened against a background of rapid technological change in computer-aided teaching concepts. The introduction of particularly the touch screen made it possible to offer students more post-processing software for images data. Therefore, the software environment in Heidelberg was also adapted for tablet computers. The teaching and learning environment already facilitates an interactive surf-by 3-D anatomy teaching and learning function. The software facilitates 3-D viewing and virtual dissection as well as 2-D viewing with axial, coronary and sagittal visualisation in real time.

This new technological concept facilitates individual and intuitive work with radiological-anatomical image data and can help to improve spatial imagination. At this year’s ECR, the software developer Dr. Unterhinninghofen will introduce, for the first time, this technological implementation and new potential.

Most recently, the teaching and learning concept at Heidelberg has also been supported by a CT-scanner in the anatomy department. This makes it possible to digitise preparations prior to macroscopic anatomy with high-resolution procedures and to explore and analyse them alongside the dissection, almost as in real medical routine.

Figure 1a-b: Virtual anatomy and virtual dissection of the heart and the thoracic vessels, where the heart and vessels are hidden by the chest. In order to make the topographical relations and anatomical structures more graspable, the chest is removed using the sculpting tool (Fig. 1b).

The thoracic aorta and its major branches, the pulmonary trunk, pulmonary veins, superior vena cava and ventricles can be clearly depicted.
Should CTA become a screening procedure?

With low tube voltage, reduced radiation and contrast agent dose, the system delivers sufficient and meaningful data.

CT angiography (CTA), an objective method to visually assess cardiovascular risk, provides reliable data that can help save treatment costs. As CTA is becoming less invasive due to reduced radiation and contrast agent dose, low tube voltage and new technologies, the technique’s popularity among physicians is increasing. In view of these facts, could CTA become a screening tool for disease prevention? Radiologist Professor Uwe Joseph Schöpf, specialist in cardiology and paediatrics, and Director of the Division of Cardiovascular Imaging at the Medical University of South Carolina in Charleston, is carefully optimistic: ‘At least we are now in a position to collect sufficient and meaningful data on this issue.’

A selective procedure

A CTA frequently shows that an alleged high-risk patient is not at such a high risk after all – a fact that has obvious implications for treatment costs. For example, a patient with a high lipid level undergoes a CTA but the scan shows no arteriosclerosis whatsoever. Imaging thus indicates that a long-term diet adjustment or rigorously decrease lipid levels might not be necessary. In short: Imaging shows which patients really need therapy and prevention. This is an important contribution to cost efficiency – made by an imaging procedure. Quite a surprise in the view of the fact that imaging is often considered expensive and a prime candidate for cost reduction initiatives,’ the cardiologist points out.

Prospective triggering supports dose reduction

High risk or not, and is there a stenosis in the coronary arteries and, if so, how severe is it? These are important questions for cardiac patients – 80 to 90 percent of whom can be examined using a prospectively triggered CTA protocol (approx. 1 to 3 mSv), which provides reliable and precise diagnostic information. A major advantage: Heart rate does not affect this procedure; 80 to 110 bpm are no problem and do not result in artefacts as long as the heart rate is not too irregular. It is important to trigger during systole, not diastole – a fact not every CT operator is aware of, Prof. Schöpf points out. Contrast agents are applied when stenoses need to be detected or when artefacts require additional information. Unclear: insufficient coronary plaque, need to be visualised. 'With normally built patients, imaging for preventive screening,' the expert suggests. Whether in the end cardiac CTA will really be a suitable procedure to risk stratify patients and to determine medication remains to be seen – currently the available data do not allow a final conclusion. Since there are low invasive techniques and procedures, Prof. Schöpf sums up: ‘It’s our task to do further research on cardiac CTA and to provide meaningful data to assess the suitability of the procedure.’

CT development can excel those for CT.
Although some clinicians say computed tomography is dead…

...a Compudric Annual Growth Rate (CAGR) of 7%.

The new report states that just four companies – GE Healthcare, Siemens Healthcare, Toshiba Medical Systems Corporation and Philips Healthcare – accounted for more than 75% of the CT market in 2012, with a market share of 22.5%, 22.1%, 17.9% and 15%, respectively.

To further increase revenue, these top firms are also establishing manufacturing facilities in developing countries such as India and China. Companies such as Siemens Healthcare and GE Healthcare have set up manufacturing facilities not only to meet domestic demand, but also to export CT equipment to developed countries,’ explained Rashmi Nishtala, GBI Research’s Analyst covering Medical Devices.

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* The industry report ‘Computed Tomography Systems Market to 2019’ is available at http://www.gbiresearch.com

**'Dental Radiology Systems Market to 2019’ is available at http://www.gbiresearch.com

EHR @ ECR

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Indorsed by the French Society of Radiology, this year’s symposium was jointly organised by Dr Blum and Marc Zins MD, who leads the radiology group at Saint Joseph Hospital in Paris.

Innovations affecting diagnostic strategies and practice will be a focus for discussions with presentations on dual-energy image acquisition, spectral imaging, perfusion, iterative reconstruction and metal artefact reduction (MAR). Additionally, back-end operation for image processing, structured reporting, or archiving and storage will be highlighted.

Managing radiation and dose will fill a whole session, as 2014 sees hospitals across France deploying new software for tracking and monitoring patient and staff exposure.

In Manufacturer’s Corner every CT-scan vendor will present products and the symposium will close with its signature final session featuring a face-off of consoles in a head-to-head competition, with its signature final session featuring a face-off of consoles in a head-to-head competition.

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Interventional therapies for damaged intervertebral discs

Report: Michael Krassnitzer

No large incision, no scalpel and no sutures: Radiologically guided, minimally invasive procedures can help many patients with chronic pain when conservative procedures don’t work,” said Professor Siegfried Thurnher, head of the Department of Radiology and Nuclear Medicine at Vienna’s Hospital of St John of God. The main focal area is the spine. ‘Interventional radiology can precisely access the area where the pain originates and can, for example, administer ozone to the intervertebral discs or inject bone cement into the vertebral repair fractures, or fix metal or plastic sleeves in the dorsal area of the spine.’

Interventional Radiological Obert Symposium (IROS)

At the recent congress of the German, Austrian and Swiss (DeGIR, OGIR, SSCVIR) Associations for Interventional Radiology (IROS 2014) held in Salzburg this January, various sessions focused on pain therapy.

Florian Streitparth MD, from the Radiology Institute at the University Clinic Charité in Berlin, Germany, spoke on the treatment of pain caused by herniated discs and disc degeneration with so-called intradiscal procedures. The basic principle: Removal and cauterisation of the discal tissue to reduce pressure and relieve painful nerve compression. Some of these procedures must still be considered as experimental, the radiologist explains. Initially the entire range of conservative procedures, i.e. medicinal treatment as well as physiotherapy, heat therapy and electrotherapy should be exhausted before one of these new procedures is used. Dr Streitparth emphasised, concluding: At the moment, the evidence of success for these intradiscal procedures is not yet that promising. However, with good patient selection the procedures will become a good option.’

The intradiscal procedures must be on a par with well-established and very effective therapies. There is much evidence regarding the effectiveness of medicinal therapy, he points out. There is also periradicular therapy (PRT), i.e. percutaneous infiltration of the nerve roots with pain medication and similar procedures. ‘PRT and other, similar procedures are of low impact and strain and effective at reducing pain in around two thirds of patients,’ explained Dr Bernhard Oder, Head of the Department of Nuclear Medicine at the Vienna’s Hospital St John of God. In Austria, crystalline corticosteroids are also being used for treatment, he added. However, in Germany crystalline corticosteroids have not been licensed for infiltrations to the spine. German radiologists are therefore hoping for support from their Austrian colleagues to back up their argument. Oder Dr Streitparth can refer to a study carried out at his hospital involving 700 patients who suffered no retrospective complications after percutaneous infiltration with crystalline corticosteroids.

Most important intradiscal procedures:

Percutaneous laser-disc compression (PLCD): The nucleus of a herniated disc is shrunk using a laser beam

Intradiscal Electrothermal Therapy (IDET): An electrothermal probe is guided into the disc and heated to 700 Celsius

Automated percutaneous lumbar discectomy (APLD): The disc nucleus is extracted via aspiration

Percutaneous laser discoscopy: Water in the disc nucleus is evaporated by laser, which reaches temperatures of up to 6000 Celsius

Chemonucleolysis: The disc nucleus is liquefied with the help of an enzyme (chymopapain) and then aspirated.

Angiography: ozone injection in the vertebral disc

© hospital St. John of God, Vienna
The new RadiForce RX650 completes the EIZO multi-modality monitor series. The 30-inch 6 megapixel widescreen LCD displays all image applications simultaneously and saves space and costs in comparison with standard multi-screen solutions.

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Pieter Paul Vuylsteke MSc PhD, who graduated in electronics engineering at Leuven’s Catholic University, is Agfa Healthcare’s senior scientist and expert in medical image processing, currently leading an R&D team of six experts in this field. He is the principal developer of the Musica image contrast enhancement software for digital radiography and inventor of the underlying concept of multi-scale contrast enhancement.

Dr Vuylsteke has also filed 40 patents relating to medical image processing. In 1994 he received the Otto Bayer Medal for honouring scientific research achievements.

Better visualization of subtle details in the abdomen
PET/CT-specific radiopharmaceuticals for diagnosis and therapy

The multiple benefits of PET/CT are undisputed – one being the fact that radiopharmaceuticals, which are used at pico and nano levels – are not toxic. Newly developed radiopharmaceuticals are highly specific and thus allow precise molecular characterisation of the tumour in question. However, not only pharmaceutical companies but also academic research institutions produce these substances. Professor Peter Alexander Bartenstein, Director of the LMU in Munich has operated its own radiopharmaceutical production line since August 2013.

PET/CT study using Ga-68 PSMA in a patient with metastasised prostate carcinoma

The advantages of advanced radio-pharmaceuticals are clear: Diagnosis is highly specific, a precondition for a targeted therapy tailored to an individual patient. With prostate cancer, for example, the diagnosis goes far beyond confirming enlarged lymph nodes: The antigens/radiopharmaceutical couple identifies the metastases of the prostate cancer cell. The patient's situation surgery is scheduled, or a personal radiation plan can be designed.

Targeted therapy

PET/CT-specific radiopharmaceuticals for diagnosis and therapy

PET/CT has the resources to operate a production line since August 2013. The professor explains: ‘It goes without saying that we do apply the same high level of safety standards as any pharmaceutical company.’ However, not every clinic has the resources to operate a production lab for radiopharmaceuticals and, since the substances are not known to focus their research on new drugs.

Prof. Waterton explains. ‘It goes without saying that we do apply the same high level of safety standards as any pharmaceutical company.’

Report: Mark Nicholas

New imaging biomarkers are helping radiology to play a greater role in drug development.

Prof. Peter A. Bartenstein has directed the Nuclear Medicine Department at Johannes Gutenberg University in Mainz before his return to Bavaria. He is Board Member of the German Society of Nuclear Medicine (DGN) and a member of the steering committee of the Biotech Cluster “m4” of the German Federal Ministry of Education and Research (BMBF).

With projects underway to validate imaging biomarkers and make them as trusted as pathology, John Waterton, Professor of Translational Imaging at the University of Manchester in England, believes they are set to be increasingly important tools in the development of new targeted cancer therapies. He will outline their rising role in the session ‘Imaging biomarkers in cancer drug development’ on 7th March at ECR 2014.

‘The success that radiologic structural imaging remains a mainstay to assess objective response or progression-free survival, he noted that the success of pathology having ‘eclipsed’ pharmacodynamic imaging to a degree during that period. One of the reasons for that is that our measurements - the imaging biomarkers - can be difficult to interpret. What this talk will cover is how we can build radiologic imaging biomarkers that are trusted tools for drug developers so radiologists can play an even bigger part in cancer drug development alongside the pathologists.’

Validating imaging biomark
Setting new clinical values in X-ray imaging

Shimadzu, specialist in diagnostic imaging equipment, is presenting its latest technologies and clinical application solutions at ECR 2014. Among these is the Opescope Acteno, a surgical C-arm system that merges high image quality with ease of use, the company reports.

For use in operating theatres and emergency rooms, the C-arm is fully counter-balanced and provides extra-light movements and positioning, Shimadzu explains. ‘The exclusive manual vertical C-arm movements enable much quicker height adjustments in routine operations.

Other devices on display will include: The Trinias angiography series – multipurpose systems for cardiovascular and angiographic procedures equipped with a 30 x 30 cm FPD supporting a wide range of vascular interventions from head-to-toe, or with a 20 x 20 cm FPD supporting specialist cardiovascular interventions, the firm explains. ‘Innovative designs applying the Score, Smart and Smile philosophy set Shimadzu apart.‘

Sonialvision G4 multi-functional R/F system

The new Sonialvision G4 is a high-performance R/F table providing numerous best-in-class features significantly improving functionality and operability, the manufacturer reports. ‘Sonialvision G4 covers the widest possible range of examinations, including tomosynthesis for general radiographic imaging and slot scanning. It is equipped with the largest available FPD at 43 x 43 cm and Shimadzu’s next generation digital imaging platform. The SUReEngine technology contributes to creating excellent image quality and enables the natural enhancement of the entire image for clearer revelation of all examination areas, including small, faint targets.‘

Evolving technology with high flexibility

MobileArt  Evolution’s highly developed functions improve the clinical workflow in mobile DR. Different FPDs with fields of view of 43 x 43 cm, 35 x 43 cm, and 27 x 35 cm are available. The choice of different detectors allows very high flexibility, the firm explains. ‘Like running two different detectors to enhance the range of applications, retrofitting the analogue MobileArt series, or even sharing the detectors with compatible digital X-ray rooms.‘

Details: www.shimadzu.eu/ and/or medical@shimadzu.eu

Sonialvision G4 – a multifunctional R/F system

Shimadzu is at the ECR: Expo C. Stand 312.
Positron emission mammography (PEM) improves breast cancer management

US-American researchers have shown that positron emission tomography (PET), a tried procedure, is a helpful modality to detect breast cancer. Dr Frank Müller and his team of radiologists and nuclear medicine specialists in Ludwigshafen, Germany, are the first office-based physicians in Europe to use positron emission mammography (PEM) to offer breast cancer diagnosis.

The medical and psychosocial aspects of breast cancer detection have long been a major focus of Frank Müller's work as he particularly aims to offer a definite diagnosis quickly and transparently in order to spare his patients superfluous examinations and therapies.

The better of two imaging worlds

PEM is a highly innovative specialist application of PET to visualise tiny breast tissue changes. The technique is based on the same principles as its ‘big sister’ PET: it analyses increased glucose metabolism in the cancer cells via an injected radionuclide – usually FDG, an analogue of glucose incorporating F18, which has a very short half-life.

A special detector head identifies PET uptake and the data are converted into high-resolution images of the breast tissue. The examination procedure itself is very similar to conventional mammography: the breasts are individually placed between two plates and compressed but, while in a conventional mammography a pressure of about 20 kg is applied, PEM requires only 7 kg.

Benefits in early detection, therapy planning, monitoring and follow-up

‘PEM can detect tumours of a mere 1.6 mm – about the width of a rice grain,’ Dr Müller explains. ‘The most important advantage: at this early stage breast-conserving surgery is still possible. Moreover, all suspicious lesions in the breast and the axilla can be identified in one session and surgery can be planned precisely.’ Which means that superfluous interventions can be avoided.

‘If a biopsy is needed to histologically confirm cancerous breast tissue, which limits 2-D mammography, PEM can be performed within eight minutes with a device attached to the imaging system. The tissue sample is immediately tested and the radiologist checks whether the sample is sufficient or whether further biopsies are required.’

The more tissue samples are analysed, the more precise the histological results. PEM offers a further major advantage: therapy response can be evaluated reliably after only two weeks. While other modalities allow assessment of therapy response only after about three months, PEM can indicate a necessary change of therapy much earlier. Thus patients are spared ineffective therapies with their negative side effects and they are informed early about therapy successes. This strengthens motivation and confidence in the physician’s work,’ Dr Müller points out.

In addition, because its performance is not affected by scar tissue, PEM is well suited for follow-up and relapse detection.

High specificity and sensitivity

Müller’s own research supports study results by US-American researchers: PEM detects breast tumours with a sensitivity and specificity of more than 90 percent. In a comparative study of PEM and breast MRI in 68 women with suspicious lesions Dr Müller found PEM to show sensitivity of 100 percent and a specificity of 94 percent with tumours of 9 mm. He convinced: ‘PEM offers superior precision at high resolution compared to other modalities, such as mammography, breast ultrasound or breast MRI. It thus offers many advantages for the patient with suspected and confirmed breast cancers.’

Overcoming the technical challenge

Digital breast tomosynthesis

Digital breast tomosynthesis offers a number of benefits over other modalities but challenges remain in its optimum clinical application.

A major obstacle is reading time at digital breast tomosynthesis generating extensive image data sets.

That is the view of Dr Pontus Timberg, from Lund University in Sweden, who will outline a number of the technical challenges in using digital breast tomosynthesis (DBT) at a Satellite Symposium scheduled for ECR 2014 in Vienna on 6 March.

Dr Timberg, who has conducted extensive research in the area of digital breast tomosynthesis in recent years, will highlight some of the issues facing radiologists involved in the implementation of DBT in a screening situation.

‘In my European Hospital paper ahead of his ECR session – ‘Technical optimisation of digital breast tomosynthesis for future breast screening’ – Dr Timberg said: ‘Technical optimisation generally aims to improve cancer diagnostics with DBT, but a major challenge is the reading time, which is one of the major obstacles when interpreting 3-D image volumes.’ During the session he will present different approaches to reduce reading time and also cover limitations with current breast compressions. However, he points out that DBT does have advantages over other modalities. ‘It has the ability to reduce the effect of superimposed tissue, which limits 2-D mammography; digital breast tomosynthesis is also a relatively cheap technology that utilises similar technology as used in 2-D mammography,’ he added.

Dr Timberg is hopeful that ECR delegates will take away a number of learning points from the session. ‘There seem to be optimal conditions that are dependent on the type of lesion and diagnostic task,’ he said. ‘Delegates will hopefully consider methods to reduce reading time and viewing conditions in their own optimisation.’

However, there are clear advantages from DBT for patients in respect of improved lesion visibility, which ultimately leads to better cancer diagnosis. He is also optimistic that clinicians will see benefits in terms of reduced interpretation times and improved image quality.

The Satellite Symposium has been organised by Siemens Healthcare Digital and focuses on breast tomosynthesis and low dose mammography, looking at how innovations complement clinical routine.

Along with Dr Timberg’s contribution, the session will also look at digital breast tomosynthesis from an initial concept to clinical routine and high image quality with lower dose mammography, and will pose questions on whether DBT is the new standard in the diagnostic breast imaging and how to implement DBT as a method in specialist training.
Medicor Germany celebrates 21 successful years

Report Daniela Zimmermann

Medicor’s story and laudable commitment. Companies, stand for a unique success story and laudable commitment.

Heinz Gerhards, CEO of MMS Medicor Medical Supplies GmbH, Kerpen/Germany

100 analogue devices and the first position emission mammography in Europe, he explains. This managing director is out to win. A passionate football trainer, in his spare time he trains the female A-Juniors of the VfL Grevenbruch Pannenscheide e.V team, aiming for their promotion to the German Football League. Heinz Gerhards' dedication to Medicor is just as whole-hearted and his enthusiasm does not stop at national borders. With the founding of Medicor Austria and Medicor Switzerland he launched two further, prospering companies hoping to repeat the success achieved by the German company by becoming the respective market leaders in breast diagnostics and X-ray and MRI-guided biopsies.

In his private life, apart from soccer coaching, he is on the board of the German Cameroon-Help Organisation, which aims to improve living conditions for people in Africa and the provision of cultural exchange. He repeatedly succeeds in combining his passions, such as with the first Hologic-Cup held at the beginning of February in Herzogenrath, or the sale of soft toy giraffes at the ECR in aid of Cameroon-Help.

Heinz Gerhards and Medicor, like many medium-size German companies, stand for a unique success story and laudable commitment.

A new era began at Medicor, which to this date continues to be characterised by a focus on diagnostic and interventional breast imaging. Perhaps it was a fortunate coincidence that mammography screening was introduced in Germany around the same time that Medicor realigned itself. This resulted in an increase in business of 25-35% per year, and the service and maintenance range also had to be significantly expanded. Medicor fully utilised this opportunity and now has the biggest service network in Europe's German-speaking areas, with more than 40 technicians based between the Baltic Sea to south of the Alps.

Thanks to this large network the medium-size company, based in Kerpen, North Rhine-Westphalia, is now an attractive business partner for firms wanting to enter the German market with service-intensive products.

Even Samsung, the giant Far-East player, trusts the competence of Medicor, by entering into a sales partnership with the firm two years ago. The range of services is rounded off with the bone densitometry programme from Hologic, goods from the microwave ablation devices manufacturer AMICA and products from a large, Chinese HIFU manufacturer, Chongqing Haifu Medical Technology Co., Ltd.

Medicor offers hardware as well as software: partnering Visus, Medicor was the first supplier and service provider to offer and sufficiently service the two information systems used for screening in Germany.

Heinz Gerhards attributes the company's current market leadership in breast diagnostics not least to this unique selling point. More than 55% of newly installed systems in Germany are from Medicor, followed, with a slight gap, by Siemens and then a large gap by all other providers. We have more than 350 digital mammography and tomosynthesis scanning systems on the market, along with just under 100 analogue devices and the first position emission mammography in Europe, he explains. This managing director is out to win. A passionate football trainer, in his spare time he trains the female A-Juniors of the VfL Grevenbruch Pannenscheide e.V team, aiming for their promotion to the German Football League. Heinz Gerhards' dedication to Medicor is just as whole-hearted and his enthusiasm does not stop at national borders. With the founding of Medicor Austria and Medicor Switzerland he launched two further, prospering companies hoping to repeat the success achieved by the German company by becoming the respective market leaders in breast diagnostics and X-ray and MRI-guided biopsies.

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Heinz Gerhards and Medicor, like many medium-size German companies, stand for a unique success story and laudable commitment.
Liver fibrosis emerges as a breakthrough for elastography

Clinicians agree elastography is an essential functionality in ultrasound, though they are divided on how to use it. "Elastography is in a position much like Doppler 20 years ago," according to David Cosgrove, BMBS, MA, FRCP, FRCP, Professor of Clinical Ultrasound at Imperial College School of Medicine in London. Back then Doppler was new and people were excited about it. They wouldn't buy a high-end machine without the capability. Yet they didn't know what they would do with it. That's now the situation with elastography.

A renowned expert in ultrasound, Prof. Cosgrove has authored numerous publications and is a key contributor to the 'Guidelines and Recommendations on the Clinical Use of Ultrasound Elastography' from the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) that spells out the basic principles and technology as well as the clinical applications of ultrasound elastography. In a similar effort, he helped compile guidelines for the World Federation for Ultrasound in Medicine and Biology (WFUMB), with publication expected later this year.

"The guidelines have been effective in getting people launched in the right direction, suggesting where to put their efforts, as well as helping to standardise what it means to be a found wanting," he explained, adding that they also provide a good meta-analysis, with the writers of each section summarising the available literature and adding their own experience.

According to the professor, the reason for the uneven adoption of elastography is that its quality is extremely variable: "There are so many technologies, some good, some very good, whilst in others the results seem random, in some cases regrettably rather poor."

The turning point in the wide adoption of colour Doppler came with deep vein thrombosis (DVT) when it became clear that it was a much easier diagnostic technique and gave greater confidence. Once clinicians found it indispensable for this application, they were more assured in applying it elsewhere, Prof. Cosgrove pointed out.

He believes the breakthrough for greater adoption of elastography will come with investigations on liver fibrosis. 'Classifying this disease is difficult,' he said. 'Biopsies are not nearly as easy as in the breast, and take just a tiny sample of a rather large organ, whereas elastography can sample much, much more. There are a lot of reasons why liver elastography is probably going to be the most important and widely used application.'

The United Kingdom's National Health Service Technology Adoption Centre (NTAC) found ultrasound elastography, using the shear-wave speed technique, 'enables a non-invasive, and therefore safer, diagnosis and subsequent monitoring of liver fibrosis when compared to the traditional gold standard procedure of liver biopsy.'

NTAC concluded: "The findings suggest that for a cohort of 27,620 patients, the estimated number of patients diagnosed with liver disease in England and Wales, implementing ultrasound elastography is predicted to save a total of £14 million, or £520 per patient'.

"Benefits to patients included a positive effect on the user's budget, and an outpatient exam of 15 minutes against a hospital stay of up to three days for biopsy procedures. 'It is a small study with three centres, not as thorough as NICE (National Institute for Health and Clinical Excellence) would have done, but it is quite a strong recommendation,' Prof. Cosgrove notes.

For the ultrasound component of the Quantitative Imaging Biomarkers Alliance (QIBA) project sponsored by the Radiological Society of North America (RSNA), the work group also narrowed its focus to liver fibrosis, and also selected the shear wave speed elastography technique.

The flexible 6-megapixel 30-inch LED backlight display

Recently launched, Totoku's new six megapixel colour display CCL6502 has a 30-inch screen and brightness of 800cd/m², making it highly suitable for all diagnostic conventional X-ray applications, the manufacturer reports, adding that the model is equipped with a new LED backlight. The successor of the CCEL technology is based on semiconductors and is known from a variety of consumer products. The benefits are both ecological as well as financial and qualitative nature," said Marcel Herrmann, Totoku Medical's Marketing Manager for displays. 'Compared to CCFL monitors, LED displays save up to 20 percent of electricity and have a longer life span of about 50 percent – a positive effect on the user's budget. Furthermore, the CO2 emission decreases due to reduced energy production. Specifically, those displays will use 15 percent less power than their predecessor.' He also mentioned environmental benefits because LEDs 'do not contain critical elements such as mercury'.

Additionally, the standby power consumption has been reduced by 80% due to a newly developed power supply.

The CCL6502 also offers a new developed flexible input concept, with a dual DVI and Dual DisplayPort Input. 'In this way users can decide to connect two signals from one workstation or to connect two workstations,' Totoku adds. 'With DisplayPort, all recent AMD or NVIDIA cards can be connected. For older Matrox MED or RAD cards the CCL6502 support a SMP simulation mode, this ensures full compatibility here [in Europe].'
Three tiny grills deliver high contrast X-rays

Mammography scans with lower dose and higher contrast – that’s the declared goal of Dr Nik Hauser, Medical Director of the Women’s Clinic and Director of the Interdisciplinary Breast Centre at Kantonsspital Baden, Switzerland, and Professor Marco Stampanoni of Paul Scherrer Institute in Villigen, Switzerland.

By building upon a procedure used in materials research to cull more information from X-rays, the added significant value to mammography for breast cancer diagnosis. When passing through tissue, X-rays are not only absorbed but also refracted and scattered. The researchers used this additional information to generate breast scans with more detail and higher contrast that show even minute tissue changes.

‘While this principle is theoretically suited for any anatomy, it presented itself for breast scans, because of the high proportion of soft tissue in the breast, which means the effects are particularly well visible,’ Dr Hauser explained.

Core components of this innovative procedure are three tiny grills, one being placed directly behind the X-ray source, the two others behind the tissue sample. ‘By slightly moving these grills we can see which X-rays pass through the tissue and which are attenuated. Since these effects happen at the molecular level, the grills have to be of nano dimensions to be able to register the minute angle scattering of the X-rays,’ the Director of the breast centre explained. The detector records this information, which is transferred onto separate images.

In a next step the conventional absorption image of the mammography and the new scatter images are fused. Alternatively, the grills can be used to generate the usual image quality at lower dose. The fusion image allows a better evaluation of breast tissue. Minute structures are visualised in enhanced sharpness, which enables more precise evaluation of microcalcifications and tissue changes. Even the fine extensions of the growth are distinctly recognisable. ‘The fusion images themselves can be presented in different ways, e.g. with colour codes. However, the radiologists who evaluated the images in the Hauser/Stampanoni study stuck to familiarity – black and white.’

Whilst Dr Hauser is sure this technique can also be used in 3D, in vivo studies come next. He hopes to present data next year. So far, the researchers have performed their tests on mastectomy samples. To be able to use the technique for human patients the mammography systems will have to be equipped with the grills. ‘Currently,’ he explained, ‘we are working with a prototype that is not suitable for clinical routine use. Right now, we are fitting the grills and make sure that the system remains stable and precise and that the results are reproducible. The foundation has been laid.’

The research project aims to achieve enhanced quality, resolution and diagnosis using the same radiation dose as conventional digital mammography to be able to detect and treat tumours earlier. ‘If this method turns out to improve tumour detection and delineation and thus pre-surgery evaluation, Dr Hauser confirms, “I’m sure it will prevail.”

Innovation shows up and sharpens breast images

X-ray images of breast tissue generated with conventional mammography and with the new mammography procedure. The latter show a significant improvement in image sharpness and visibility of the tumour extensions (right). Image: Paul Scherrer Institute/Kantonsspital Baden

Thanks to increased sharpness cancer could be detected at a very early pre-stage.

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In the era of Big Data, radiology is left behind

Reports are little more than a Tweet, while hundreds of data points from an exam are irretrievably lost, John Brosky reports

There is a wealth of information in every radiology exam, but even a phalanx of super-computers at the National Security Agency (NSA) could not extract it. Referring physicians, and even other radiologists, have a hard time figuring out if a given report is positive or negative. ‘If all a radiologist did at the end of the report was to say if it was positive or negative for the reason it was done in the first place, that would be a major advance in radiology archives,’ said Eliot Siegel MD, Chief of Imaging at Veterans Affairs Maryland Healthcare and Director of the Maryland Imaging Research and Technologies Lab.

Every time we do an examination, for example for CT pulmonary angiography, when we issue a report saying we did not see any pulmonary embol, we are not including hundreds of different types of data that we could include. Computer algorithms to be able to discover in the future, he told French radiologists at the Sixth Computed Tomography Symposium (Nancy, France).

During a single-shot thoracic scan that takes a few seconds, the CT captures images that can be converted to quantifiable data for lung nodules, breast masses and calcifications, cardiac chamber size, aortic size, coronary artery calcifications, rib fractures, liver texture, lung texture, bone mineral density, loss of height of vertebral bodies, renal function and renal volume.

In an ideal world, the raw data set from this scan would be stored with meta tags and automated mark-up language, making it discoverable for current health policy information or future research. This data could also be shared locally among other support systems in a hospital for treating patients. Instead, once the radiology report is issued, the data is irretrievably lost, ironically the very moment it is sent to cloud storage.

“We radiologists need to re-invent ourselves,” Dr. Siegel emphasised. “If radiology is going to be important, then just as with lab and genomic data, we need to make our data discoverable, indexed and tagged.”

Much is at stake, starting with incomes earned by radiologists or approvals of capital equipment expenditures for new equipment. In the United States, he suggested, as the concept of Meaningful Use becomes more sophisticated, health-care administrators are going to impose reimbursement for a radiology exam based on providing to the healthcare system basic, discoverable types of information.

“In the era of Big Data, people are looking for benefits and outcomes they can prove with data,” he pointed out. “If we can’t give answers to basic questions, we cannot demonstrate the value of the data in radiology. It’s going to become increasingly difficult for radiologists to get reimbursement and funding if people cannot find the data that’s hidden inside our scans, and even inside our reports.

“What we issue are reports that are analogue in a digital age. It is essentially a tweet that responds to a specific question; but, unlike a tweet, it is not in a form that can be read by a computer.”

If loss of income from hospital administrators is not a sufficient driver to move radiologists to structured reporting, then perhaps armies of liability lawyers can help.

Currently, radiologists often make recommendations, such as a follow-up exam. Yet there is no way of knowing if the referring physician read the report or acted on the findings. ‘Radiologists make recommendations all the time but practically no one in radiology follows up to see if the recommendations have been carried out,’ Dr. Siegel explained. ‘Legally, the radiologist is held accountable for the recommendations where there are untoward consequences or adverse events, such as a tumour that grows. Courts have an expectation that recommendations have been carried out.’

Closing the communications loop with capital information input to automated systems would improve the ability to track liability associated with an error and could accelerate the movement to structured reporting. Eliot Siegel has been out on the leading edge of radiology for 30 years, advocating change for a generation. ‘I was thinking about how could I buy $450,000 of storage capacity I can buy today at any Best Buy? For $800,000, the same terabyte of images. In the 1980s he created the world’s first, digital radiology archive for the VA system in Maryland. ‘The entire storage capacity I had then was one terabyte and it cost us $800,000, the same terabyte capacity I can buy today at any Best Buy.’

He was responsible for the National Cancer Institute’s (NCI) Cancer Image Archive and served as Workspace Lead for the caBIG in Vivo Imaging Workspace.

At radiology events, such as the one in Nancy, he pushes for adoption of the Annotation and Image Markup (AIM) developed by NCI that creates a single standard format to store computer-discoverable image annotations.

He also preaches a vision that speaks to the potential of radiology information joining the full power of Big Data. ‘A first advance would be receiving responses to queries in seconds, not days, he said.

Increasingly, pixel interpretation of structures could be compared and matched with other biomedical information, leading to a definition of imaging biomarkers for disease and its progression.

Yet, he sees the true potential in fulfilling the greater promise of personalised medicine, where a patient’s imaging can be assigned, cross-referenced and correlated with genomic or histological data, and compared to similar cases to make predictions on treatment and outcomes.

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When it comes to storing images PACS remains king across the industry, but increasingly vendor-neutral archives (VNAs), particularly cloud-based examples, are gaining market share fast due to their ability to bring significant financial, productivity and clinical quality benefits.

When Spire Healthcare, the UK’s second largest provider of private healthcare in the UK, wanted to provide their clinicians with access to patient images from any location and PACS environment, it was to Carestream’s cloud-based services that they turned. The seven-year agreement was a natural progression as an upgrade to their existing Carestream PACS. As a result, their Healthcare IT Services will transition from a managed service-based model to a Software-as-a-Service (SaaS) model, an innovative approach to managing imaging information on a predictable, pay-as-you-go basis. Carestream will host the new services in their first independent UK Data Centre.

Spire Healthcare was created in 2007 with the privatisation of British United Provident Association (BUPA) Hospitals and the expansion of its footprint viewer that unifies clinical and disaster recovery, the company relies on guaranteed performance and uptime without fear of the system, back up and redundancy of the system, back up and recovery solutions.

Stephen Hayward, IT Director of Spire Healthcare, said that having access to care records and reports on a mobile device at the clinician’s finger tips will be a great boon going forward. ‘In private health-care the consultant largely decides where he takes his patients. ‘To grow Spire’s business we need to differentiate our services from those of our competitors so that our consultants want to bring their patients to us and consequently grow our revenues.’

Quaiser Malik MD, a consultant radiologist with Spire Healthcare, took part in the pilot implementation and discovered the benefits of being able to work remotely. ‘I no longer have to physically go to the hospital to log in at one of the workstations in the private sector because they want a prompt service and, using this new technology, we can provide that.’

‘The fact that it works across different platforms is a great advantage,’ he said. ‘Some of our consultants work at multi sites and the Vue Motion system allows them to access images from any Spire hospital. That means greater flexibility for them and greater flexibility for the patients if they are seen at, for example, another Spire hospital in the region.’

Saskia Groeneveld, Worldwide Marketing Manager for Healthcare Information Solutions believes that the cloud solution is a liberating technology for Spire giving users and administrators peace of mind that they can concentrate on health-care. ‘It also gives them scalability,’ she added. ‘They are a fast-growing organisation and using cloud services allows them flexibility to adapt the service to their changing needs.’

Pay as you-use
Carestream’s Managed Print Solutions (MPS), which combines the image quality of its Dryview laser imagers and medical films with a comprehensive, all-inclusive programme, has been used since February last year by Dr Pascal Haquet and Christian Luneel in their busy radiology practice in Paris, France, prior to its commercial release. They report that the solution corresponded exactly to what they wanted - to digitise everything; images, results, reports, management of remote equipment and to make the information accessible via the internet. Dr Haquet: ‘The Carestream solution also means we don’t need to invest capital in equipment, a great advantage. Being billed only on our consumption also fits well with our business model.’

Under the programme, Carestream maintains its laser imagers at the healthcare provider’s location and remotely monitors operations. Now, there is very little printer down-time, according to Dr Haquet. Regular quality control checks are mandatory for mammography exams, so monitoring the machines via the internet before those checks is a definite advantage. I receive alerts before a printer fails, which is essential, particularly when a patient is waiting for their results. When there is a potential lapse in quality, Carestream technicians can detect a failure before it happens.’

He firmly believes the biggest benefits of the MPS solution include streamlining inventory management, consumption monitoring, orders, regulations, and supervising equipment operation. Everything is now simple and accessible for the staff, and having data on the website helps customer relations. Conclusion: ‘It’s better for them and for us.’

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High-field and Hybrid

7 Tesla MRI is a platform for clinically-oriented research, but not yet a medical product

MR imaging systems at 7T magnetic field strength or above are by now an established platform for clinically-oriented research. According to Quick, there are currently about 50 such systems installed worldwide. They were built to enable highfield MR imaging of the entire human body. “7T MRI technology is “the carrot stick”, explains Quick, “which can be used to obtain more details than at 1.5T or 3.0T due to its inherent high signal-to-noise-ratio”. However, Quick reckons that “7T is still about two or three years away from becoming a medical product, as issues such as safety and standardisation of the technology have not yet been sufficiently addressed”.

The inherent advantage of this technology lies in its excellent soft-tissue contrast, and high spatial resolution which permits to better determine “the anatomical structure down to the finest details”, summarises Quick, who also points out that “7T enables to further characterize the structure of lesions in multiple sclerosis rather than just cooking them down”. He claps his hands and says “7T also does this, in particular for the head area to be investigated. As RF coils for the head are already commercially available, the clinical research into the use of 7T technology focuses mainly on imaging the brain. However, imaging the rest of the body is currently a piecemeal attempt with different institutes concentrating on designing RF coils for specific body parts, such as heart, spine or extremities. Institutes do this in collaboration with MR system producers and clinicians.”

EHU in Essen, Quick reveals, “has been devoted to a holistic approach, aiming at depicting each part of the body with specifically designed RF coils. Our group is internationally positioned to develop high-frequent RF transmitter and receiver coils plus multi-channel systems”. In the field of 7T highfield MRI Quick’s team focuses on:

- imaging the heart, prostate and mammography
- designing RF coils and RF technology for whole-body imaging
- ensuring the safety of those RF coils
- adapting sequences for clinical highfield MR imaging

PET/MR is closer to the clinical side than MRI at 7 Tesla. Having worked closely with Siemens Healthcare on the introduction and advancement of PET/MR hybrid imaging during his tenure as professor at the Institute of Medical Physics at the Friedrich-Alexander-University in Erlangen-Nuremberg, Quick brings to his new job a wealth of experience in the PET/MR realm along with excellent contacts to the industrial partners as well as the PET/MR imaging community.

Status of PET/MR

Quick estimates that currently there are about 50 installed PET/MR systems. Unlike 7T highfield MRI, PET/MR systems are already labeled as medical products and possess more extensive clinical experience. However, reimbursement and refinancing are still unresolved, as is their use case, which still needs to be defined.

PET/MI is a platform for interdisciplinary PET/MR research, joining the efforts of clinicians, manufacturers, physicists and other scientists. Asked about his immediate research priorities, Quick comes up with a long laundry list of projects. He is particularly keen to investigate the potential for reducing radiotracers due to the high sensitivity of the PET detectors in the context of PET/MR, explore “motion correction technologies to correct for breathing and cardiac motion in view of the relatively long PET data acquisition times”, work on attenuation correction (AC) and to develop MR sequences, which will help to provide bone information for MR-based AC. Furthermore, Quick wants to optimise the hybrid imaging workflow in such a way that “maximizes diagnostic information while minimizing acquisition time”.

It is certainly an ambitious list, but Quick is optimistic: “There is a lot of research waiting for us, but the team is enthusiastic and with ‘7T highfield MR and hybrid PET/MR we have two of the latest and greatest tools for MR imaging research available here in Essen’.”

Figure 1: (A) Custom-built 16-channel radiofrequency (RF) transmit/receive body coil for body-MRI at 7 Tesla. Images (B-F) show current examples for 7 Tesla highfield body-MRI, employing different body regions: (B) cine-TrueFISP of the heart, (C-F) gradient-echo images of the kidneys (C), the upper body stem (D), the pelvis (E), and of the spine (F) featuring a two-step examination. All images courtesy of Erwin L. Hahn Institute for MRI, University of Duisburg-Essen, Essen, Germany.

Figure 2: PET/MR hybrid whole-body imaging of a female patient with known squamous cell carcinoma of the lung. While MR imaging (A) provides high spatial resolution and excellent soft tissue contrast for anatomical reference, simultaneously acquired PET imaging (C) reveals radiotracer accumulation in tumors and metastasis with high sensitivity. The image in the middle (B) shows the fusion of MR and PET data, in this patient further metastasis have been located in the brain, the pancreas, and in the rectum.

PET/MI is currently used in the context of PET/MR with a few scattered reports: “There is a lot of research waiting for us, but the team is enthusiastic and with ‘7T highfield MR and hybrid PET/MR we have two of the latest and greatest tools for MR imaging research available here in Essen’.”

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Toshiba’s new 1.5-T MRI Vantage ELAN system is not only cost-effective, the firm reports, but truly compact; it needs only 23 square metres of space. Yet, the system uses the same type of magnet as other Toshiba products to achieve excellent image quality. ‘With its widely recognised complete M-Power clinical application software suite and HHS (High Speed Switching) technology to facilitate the use of 16 channel coils, the Vantage ELAN manages to maintain ease of use for the operator while offering a quiet and comfortable patient experience due to Toshiba’s renowned Pianissimo noise reduction technology,’

That low-noise level, which significantly improves patient experience, was among the system’s features that particularly attracted radiologist Dr PeterThorsten since it’s innovation. When expanding his radiology practice in Güstrow, Germany, he selected this system – the first outside Japan – as a ‘natural choice’ due to his successful relationship with Toshiba since 2010, when the firm installed a Vantage Titan MRI scanner.

All types of examinations

Dr Thorsen is particularly enthusiastic about the user interface of the Vantage ELAN and because his staff is already familiar with the Toshiba protocols he feels the shift to the new system will be smooth. ‘I had the opportunity to look at the system at RSNA in Chicago and was so impressed by its performance and the coil concept that we decided to acquire it,’ he explained. It will be used for all types of examinations from the head to the spinal column and joints. ‘Abdominal MRI is also an important area in our office and the Toshiba sequence strategy has enabled us to specialise in MR phlebography,’ he added.

Aiming to grow its market share, particularly in Europe, Toshiba is confident that the addition of this new system to its MRI portfolio boosts market opportunities.

Alain Bertinatti, Toshiba Medical Systems MR Business Unit Manager in Europe, underlined that the current cost pressure on hospitals and healthcare systems was a major consideration in the development of the new product. Faced with the decision to either compromise on its renowned image quality, design, technical innovation or unique set of features, or to endeavour to deliver a high quality product at a competitive price, the company clearly opted for the latter. The resulting competitive price, the company clearly

In practice - less contrast agents in MR angiography

Dr Isabelle Parienty-Boyer from the Radiodiagnostic and Medical Imaging Centre, Hauts-de-Seine, France, is a specialist in non-contrast renal MR angiography. She has performed about 700 examinations of renal arteries in renal insufficiency patients. Since referring nephrologists often ask her to refrain from using gadolinium she works with Toshiba’s Vantage MR system without contrast agents because the results are as good as the contrast-enhanced scans, sometimes even better. In her opinion Toshiba offers the best equipment for this type of examination because of the ability to use two planes, axial and coronal.

Quick and easy installation

Hans Baartman, Senior Product Manager at Toshiba Medical Systems Europe, highlighted another major benefit: the ease and speed of installation. Since the new system requires little space it can simply be integrated into the examination room.

With all elements integrated, such as ECG and recording equipment, the system is ergonomically designed to be comfortable for operators. Feet first imaging significantly enhances the patient experience, Hans Baartman added, and the Pianissimo capability, integrated coils and sound suppression technology reduce the noise of the MRI. There is also the option to tilt the patient’s head 10 or 20 degrees to make the patient feel a little more comfortable.

In addition, the new light design of the board helps reduce the claustrophobic feeling many patients experience; he pointed out. The Vantage ELAN has a 63 cm aperture with feet first imaging available for all types of examinations, except for scanning of the head and upper torso. Full angio and cardiac suites are available, and the body package can be extended to include the SpineLine application offering fully automated planning of spine examinations. Together, these options enable head to toe imaging.

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Ultrasound in progress

The ability to monitor therapy effects personalises care

Ultrasound technology is continuously developing and competing with other imaging procedures – for the reason that therapy progress can be monitored, facilitating personalised medicine.

At Heidelberg University Hospital there is excitement about the first use, worldwide, of the latest ultrasound innovation from Siemens. The brand new HELX Evolution not only offers much-improved image quality and far more precise and detailed examination facilities for clinical routine but also, thanks to the special measuring procedure for tissue elasticity, new opportunities to monitor the treatment of cancerous diseases.

The objective in Heidelberg is to use the new scanner to research whether the use of higher-impact procedures, such as CT and MRI scanning, as well as the visualisation of the vessels and ducts with contrast media, can be replaced by much lower-impact ultrasound examinations.

Measuring tissue elasticity with the help of elastography is, in itself, not a new procedure, but the HELX Evolution from Siemens also makes it possible selectively to determine tissue elasticity within the ROI (region of interest) after the examination. ‘It is possible to not only measure a certain point while scanning, but also to examine the entire ROI of a size of 6cm x 6cm quantitatively at any time.’

With current standards, the scanners only deliver a colour-coded map without absolute values, but now it’s possible to extract the absolute value in metres per second at any individual point within the colour-coded map after the examination,’ explains Dr Erick Amarteifio, a senior physician in the Diagnostic and Interventional Radiology Department at Heidelberg University Hospital.

The importance of the actual diagnostic benefit of this absolute value will now be researched. It is known that the speed at which the shear waves spread within the tissue allows conclusions regarding tissue elasticity. The faster the waves spread, the harder the tissue.

As many tumours have harder tissue due to high cell density, this can be a first pointer towards a tumorous disease.

One possible application area could be to assess therapy response for hepatocellular carcinoma (HCC) after transarterial chemo-embolisation (TACE). ‘At the moment, the determination of perfusion during an MRI allows conclusions as to the vitality of the tumour. With larger subcapsular focu in particular, we believe it is beneficial to evaluate whether the change of tissue elasticity may allow conclusions as to therapy response with the help of elastography,’ he explains.

‘It’s important to mention that one possible application for both by far became very popular for surgeons to take images with them into the operating room.’

With what kind of access? Various types of applications allow access to images: Web apps enable access to images through a web portal, but all the image manipulation and handling is done on the server. No data is transferred or stored on the tablet.

‘Another type of application will query images from a server and store them temporarily on the device itself. The first solution is easier to implement, the second needs appropriate security features, but has the advantage to allow continuation of the review of images “off line” even without network access.’

The second solution will need special access management to query images from a server. ‘In some settings the portable tablet can also be a simple extension of a desktop computer where you transfer or “synchronise” your data by data transfer. Our portable viewing osirix HD for iPad and iPhone supports those two last solutions and is fully compatible with DICOM query from most PACS systems.’

What kind of apps is available? ‘Commercial ones provided by imaging vendors as extensions of their PACS – including Siemens, Philips, Fuji, TeraRecon, MimVista, and more – and there are some stand-alone applications, with Osirix considered the most popular.’

How do they differ from desktop/ workstation applications? ‘The tablets don’t have the same features as desktops do. No computers will soon disappear from the professional market. The top computers only for professional usage. Portable devices have changed our daily life and are rapidly penetrating the professional market. The professional use of mobile devices will soon disappear from the consumer market and that we will only use “devices”. I believe part of that is true and we will use desktop computers only for professional and repetitive tasks. There is no reason to put workstations in the clinical ward if you can do the same thing with a tablet.’

Is acceptance and penetration general? ‘There is no reason for differences in different countries. There has been widespread adoption of tablets in medical applications in India and China. Of the other hand, all radiologists and physicians walk around the hospital with a tablet in hand. Whether or not they use it to access medical data is just a matter of time – for IT departments to adapt to the demand.’

What are the risks, limitations and barriers to widespread implementation? ‘There is always a risk when you handle patient data. Strict rules of confidentiality and data protection must be respected and enforced. This is true for every information technology in medicine. It might require some special settings for securing the tablets, but technical solutions already exist.’

What’s the prognosis for mobile IT in radiology? ‘In a few years everybody will ask how we did it before. Portable devices will just be part of normal life. While we have “large” servers or workstations to work on, we’ll certainly benefit from portable devices in a large variety of medical applications in radiology, but mostly outside radiology.’

(left) Elastography measurement in the mammary gland: The qualitative analysis shows a distinctly higher propagation velocity of the shear waves within a carcinoma (coded red)

(right) Elastography measurement of a nodule in the thyroid. The nodule in the middle of the image is coded green in the qualitative analysis. The determination of the qualitative value shows the propagation velocity of the shear waves to be 2.48 m/s, which is higher than the propagation velocity of the shear waves in the normal thyroid tissue, pointing towards a firm nodule
Teleradiology and education

Although night diagnoses have high quality, teleradiology services could negatively affect junior radiologists training

Given the ever more complex radiological examinations, the need to provide care in sparsely populated regions, or new labour law provisions such as the EU working time directive, radiologists are under increased pressure to find solutions to provide imaging services during off-hours.

This holds particularly true for Great Britain where the severe shortage of radiologists is exacerbated by the fact that implementation of the EU working time directive highly impacts the training structures in radiology. Therefore, several hospitals decided to outsource imaging reporting services to a teleradiology provider. Among those hospitals is University College Hospital, London, where Dr Joachim Hohmann headed the acute services radiology team in 2010.

To gain a better idea of the teleradiology reporting quality, Dr Hohmann and team began to evaluate the images following the day, then recorded their own findings and compared them to the night readings. The review of CT scans of 1,028 patients showed only minor discrepancies that could not be considered medical errors but at most led to a delay in therapy, he recalled: ‘A very positive result!’

To structure the comparison of the findings, Dr Hohmann used a disagreement scale from ‘no discrepancies’ (category 0) to ‘significant discrepancies with potentially life-threatening consequences for the patient’ (category 3). No imaging report was classified as 1 and in 79% of cases the team matched the assessment of their teleradiology colleagues (category 5). 16 percent of the cases were classified in category 2: discrepancies regarding style or presentation of the findings. Differences in opinion as defined in category 3 and 2 were found in percent, resp. 1.3% of cases – with the latter percentage translating into exactly 15 patients. Since the patients were followed up for six months, Dr Hohmann could assess the accuracy of the readings. In eight out of thirteen cases my team was correct, in two cases the teleradiology provider was correct and for three patients we did not come to an unambiguous result. In short, he concluded, the error rate of the teleradiology provider was 0.8 percent, which is not higher than in regular readings:

Indeed, these results are better than results in comparable studies where the error rate is above 1.6 percent – perhaps because Dr Hohmann demands high quality standards from the teleradiology company: reports between 7 and 9 pm are to be prepared exclusively by specialist physicians in the UK, between 9 pm and 8 am by Australian colleagues on day shifts. In Great Britain and other anglophone countries teleradiology is much more common and is organised in a very structured way, since regulation is not as restrictive as for example in Germany. Moreover, he points out, there is basically no language barrier.

However, teleradiology also has ‘adverse effects’. In Dr Hohmann’s London-based hospital teleradiology was introduced to avoid night shifts for junior physicians. ‘While with the implementation of the EU working time directive junior physicians are entitled to longer compensatory rest for night and weekend shifts, due to this law they can no longer complete their training in the prescribed period. In the short run, professional teleradiology services are a good solution, in the long run they may compromise the level of training junior radiologists receive. As a junior physician it is very important to learn to make your own decisions and take responsibility – that’s exactly what night shifts require,’ he stressed.

There are also other issues to solve. Dr Hohmann is concerned about price wars for reporting services and job security for hospital radiologists and he fears that commercialisation of radiology will increase. ‘Nevertheless, I’m convinced that we will be able to find a sustainable solution. In view of the fact that demand will increase by ten to fifteen percent, but per year, we will only have two percent more incoming radiologists, teleradiology is unavoidable.’

Case study: 80-year-old patient with acute liver failure. Imaging was requested to clarify the presence of a hepatic artery thrombosis, indications of acute infarctions in the abdominal region and/or other causes of the acute kidney failure. A four-phase liver CT was performed. While the pre-exam had shown an open coeliac trunk, the present CT showed an initially overlooked closed coeliac trunk (3 cm). (a) Pre-exam (b, c) present exam: (b) axial and (c) sagittal view of the coeliac trunk with thrombosis (circles and arrows). CT = coeliac trunk; SMA = superior mesenteric artery
Small bowel imaging

Cynthia E Keen reports on prototype software with potential to automate motility measurements

For gastrointestinal exams, MRI fluoroscopy offers an alternative to conventional methods of swallowing and gastric emptying that are so repugnant to patients. MRI exams eliminate radiation dose exposure, provide full views of soft-tissue structures, and produce multiplanar imaging. For radiologists, the value of MRI of the small bowel lies in its ability to display both morphology and motility. Small bowel motility (the bowel wall motions and contractions of muscles within the intestinal walls) dysfunction can be a symptom of inflammatory bowel disease, Crohn's, obstructive bowel disease, diabetes mellitus and scleroderma (a disease of connective tissue that causes fibrosis to form). The standard protocol for MRI motility assessment begins with the acquisition of several coronal 2-D sequences over the entire small bowel using fast imaging pulse sequences, such as echo planar imaging, fast spin echo, or steady-state free precession.

Evaluating small bowel motility is tedious and time consuming. The quantification of small bowel motility patterns, such as contraction frequencies and amplitudes, can be made by measuring the cross-sectional diameter change of selected single small-bowel segments over time. That calculating and plotting measurements is so time consuming and susceptible to errors has formed one of the primary barriers against using MRI-assisted motility assessment in hospital radiology departments. The challenge is that all measurement points must be corrected due to the inherent modality movement or shifting of the small bowel segment.

Radiology researchers at the Institute of Diagnostic, Interventional, and Paediatric Radiology at University Hospital in Bern, with software engineers at Sohard AG in Bern, developed a software prototype (Motasso) to quantify small bowel peristalsis. The software permits semi-automatic measurements of small bowel diameter over long time periods, thus displaying motility.

With colleagues at Zürich University Hospital, ECR session* presenters Doctors Michael A Patak, Sebastian Bickelhaupt and Johannes M Froehlich, conducted a study to validate Motasso software for small bowel motility tracking by comparing it with the traditional manual measurement method. In January, they reported their analysis of 45 MRI enterography exams online in Clinical Radiology.

The research team analysed 91 small-bowel segments. Small bowel motility parameters including contractions per minute, luminal diameter and amplitude were measured three times each in identical segments, using both manual techniques and the semi-automatic software assisted method. They compared the methods for agreement, repeatability, and time needed for each measurement.

The Motasso software worked very well. It produced standardised, accurate identification of the small bowel wall and subsequent quantification of small-bowel motility. It expedited measurement, and performed each assessment in half a minute compared to a minute and a half when done manually. It also provided higher reproducibility and standardisation of data acquisition made by different individuals.

"Measurements with Motasso are faster, more accurate, and significantly more reproducible than measurements by hand. The user-friendly point and click interface facilitates widespread clinical adoption of the software," the authors wrote. They also believe that the Motasso software can provide new insight into the pathophysiology of small-bowel motility-related gastrointestinal complaints. Research is on-going.

* ECR SS201b: GI Tract: Advances in small bowel imaging

For your diary
2 pm. 6th March, Room E2