

Moving abroad to work remains a key challenge in medical doctor's lives. The EU 'free movement' directive has meant that professionals have very considerable liberty to take their skills across borders. However, many details remain in the small print. Not all degrees and qualifications are universally recognised. This is largely a reflection of different regulations governing postgraduate education in different countries. Not surprising, and more important perhaps, attitudes and working practices also differ internationally. Using Germany and the UK as an example, I will highlight the key facts and considerations of a move abroad.

The scale of the problem hit me when I picked up the Dictaphone to report on a CT brain scan for the first time. The patient had been referred from an out-patient clinic and the examination revealed no significant pathology. I was then expected to write a brief provisional report, pick up the hard copy from the printer, put both report and film into the X-ray envelope, and hand it to the patient, waiting outside. A telephone call had been sufficient to arrange the appointment, the patient had not waited and walked across from the clinic unaided. This could not possibly have happened in the UK. German radiology provides everything for everybody instantly.

There is a triangle of interconnected issues that characterises the main considerations of a move abroad: structures, working practices and attitudes. Following several years at senior house officer level, UK radiologists receive five years of structured so-called higher professional training before board examination and certification. A re-validation process aims to ensure that the consultant-led service performs to a high and consistent standard. Essentially, all UK radiologists are hospital-based. By contrast, German radiologists do not undergo a general professional training but enter specialist training directly. Trainees keep a log book of investigations and procedures performed. Regional chambers of physicians govern approval of posts, as well as the content of the curriculum for specialist training and the oral examination at the end of training. Approximately two-thirds of German radiologists then work in office-based practices.

Apart from training issues, a basic understanding of the fibre of a service may be derived from simple numbers: In manpower terms, an estimated 28 radiologists per million of the UK population compare unfavourably to a ratio of 50/million in Germany. However, the workload also differs, with around 0.5

examinations per head population p.a. in the UK and >1.5 in Germany. The workload of a UK radiologist may thus be as much as 19,000 examinations annually. Nonetheless, a first look at these figures may give a false impression, since Germany has its particular variety of skill mix: 70% of imaging, largely ultrasound, is carried out by non-radiologists. Such resource considerations are

benchmarking, audit and continuous medical education currently lacks foundation in German practice.

Pay and working hours - In the UK, the European Working Time Directive allows for a gradual, i.e. phased-in, maximum hours requirement, reducing from 58 hours weekly in 2004 to 48 in 2009. By contrast, in German hospitals 'medical staff worked

Working hours, salaries and communication between colleagues are the main motivations indicated by German doctors moving abroad. At present, there are already 4,127 German doctors registered with the UK's General Medical Council.

At the interface of these structures, working practices and attitudes lie conceptual differences in the provision of

acquired skills to provide imaging support, the desire to make any test available to everyone, instantly, has considerable resource implications that require the willingness of the general public to pay for it. Finally, hierarchy and its presumed proponent, the all-powerful head of department, are at times in conflict with evidence-based work practices that favour the independent consultant.

Healthcare provision is structurally different in the UK and Germany. Radiologists from these countries have to some extent been trained to undertake a different job. Professional bodies and international recruitment agencies have recognised this and provide introductory courses, continued guidance and practical support for migrants. However, actual differences go deeper, i.e. beyond the specific detail into the future of radiology as a whole, a future the specialty may have, but the practicing radiologist may not. Nonetheless, as suggested in a recent landmark editorial by Forsting (Forsting M (2005) *The Future of Radiology - From the Necessity of a Vision*. *Fortschr Roentgenstr* 177: 1485-1488), structural changes comprising sub-specialisation of radiologists into organ-based imaging experts, as well as active management of service quality, may lead the way to a modern European imaging service, open to truly embrace free movement, a view echoed by Rinck (Rinck PA [2006] *Radiology must regain initiative in research*. *Diagnostic Imaging Europe* 21: 10-13)

The Royal College of Radiologists in particular has embraced these changes and currently consults openly on the future of the specialty. *References available from: jlarsenmd@hotmail.com



Crossing borders

'Is the grass really greener elsewhere?' asks consultant radiologist **Joerg Larsen MD FRCR** of Goettingen, Germany



The EU 'free movement' directive allows us to take our skills to Member States

RADIOLOGISTS WORKING ABROAD - THE REALITY


not entirely trivial but have important clinical and health economical implications. For example, a recent audit by the UK National Audit Office found that, in 2004, 'most patients with a suspected stroke waited more than two days for a CT brain scan' when this should be performed within three hours. Long ago, Wardlaw had called for efforts to be put into 'delivering basic but effective imaging in the assessment of acute stroke'. An in part under-funded National Health Service (NHS) is cannot deliver the basics of its own guidelines, recently adopted for Europe as a whole. By contrast, stroke units in Germany cannot achieve certification status unless on-site diffusion and perfusion-weighted MRI is available at all hours. The other side of the coin is that a recent survey in Germany revealed that 20% of patients believe that they have had an unnecessary (due to the short interval repetition) diagnostic test. EU-guidelines, derived from UK practice and aiming to uniform referral criteria throughout the Community, have not had a significant impact on German radiology practice so far. In fact, their existence is largely unknown. This is symptomatic for a health service that retains a certain element of hierarchy. Equally, the whole issue of clinical governance and revalidation through

more than €2 billion-worth of unpaid overtime' last year. A 2004 review of physicians' earnings, across Europe, revealed that the highest average earnings estimates between Germany and the UK differ by as much as 2.2-fold, with German doctors being the lowest paid in Europe, rising to 3.6-fold for the lowest paid.

radiological services. Comparing hospital-based practice, German radiologists largely fulfil a diagnostic role, whilst their UK counterparts have a wider self-conception, a notion reflected in the different terms for their specialist qualifications. Furthermore, with many German medical disciplines having

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Germany - The cost and user friendly processing of continuously increasing volumes of data, along with new of important technological innovations, were key issues during the 4th International Multislice CT Symposium, held this January in Bavaria.

Combining multislice CT equipment with procedures used in nuclear medicine such as PET-CT (positron emission tomography) and SPECT-CT (single photon emission computed tomography) offers fascinating perspectives of capturing morphological image and functional diagnostics. Multi-modal examination procedures - particularly those used in molecular

imaging - were among the key topics of discussions led by Professor Maximilian Reiser, Director of the Institute for Clinical Radiology at Munich's Ludwig-Maximilian-University, and his colleague Professor Gary Glazer, President of the Department of Radiology at Stanford University, California.

Gary Glazer has witnessed the highs and lows of CT over 25 years. American physicist A M Cormack and British engineer G N Hounsfield built the first computed tomograph - independently of one another. In 1979 they shared the Nobel Prize for Medicine for this work. However, less than a decade later, CT looked



Held in Bavaria, the event attracted 733 participants

4th International Multislice CT Symposium



Multi-modal imaging: a key issue



10 seconds per organ is still too long: radiologists want even shorter CT scan times. Dual source technology could play an important role in this

like 'old hat'. Then, in the early 1990s, Professor Willi Kalender, Head of the Institute of Medical Physics at the Friedrich-Alexander University, Erlangen, developed Spiral CT, and since the tube began to move continuously around the patient, scientists have improved CT enormously. Modern systems record picture signals with 64 detection channels, X-ray beam and detector rotate around the joint axis three times per second and achieve an isotropic, spatial resolution of 0.4 millimetres.

Further discussion revolved around the most recent development project at Siemens - the dual-source-CT, a system with two integrated tubes and detector systems. But the main topic was multi-modal imaging. By combining CT with a SPECT camera, or with positron emission tomography (PET), morphological and functional tissue information can be recorded simultaneously in one examination, and by superimposing both images radiologists can tell whether they are seeing a tumour or simply an infection.

'Scientists aim to improve the spatial resolution of the systems to an extent where molecular structures become visible,' Professor Glazer explained. 'With CT we can only see tissue structures of several billion cells in size. However, for molecular imaging we need to make the smallest numbers of cells visible.' An important question that molecular imaging hopefully will help to answer is: 'What happens with stem cells injected into the heart? Do they remain in the heart and reproduce to the extent that they could possibly close holes in the cardiac wall?' Ideally, we would be able to observe individual cell structures. Before cells start mutating into cancer cells they already have the relevant predisposition and send out abnormal

Joint Meeting of Clinical Neurosciences


Joint Meeting of Clinical Neurosciences


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Abstract deadline: March 31st 2006

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www.neurowoche2006.de
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Maximilian Reiser

'Due to the strong interest, we had to change the venue from Starnberg to the larger congress centre in Garmisch'



Gary Glazer

'Nanotechnology will help us to see even the smallest numbers of cells and detect pathological processes earlier'



Your invitation to Neuro-week

A NEW CONCEPT IN INTERDISCIPLINARY CO-OPERATION



Christoph Groden

The *Working Party for Clinical Neuroscience*, set up two years ago, currently consists of the German Society for Neurology (DGN); German Society for Neuropathology and Neuroanatomy (DGNN); German Society for Neuroradiology (DGNR); German Society for Neurosurgery (DGNC) and the Society for Neuropaediatrics (GNP). In collaboration, these societies proposed a joint meeting for all neurology subjects, which we named 'Neuro-week'.

During this week the DGN, DGNN, DGNR and GNP will hold their annual meetings and the DGNC will present a workshop. From Wednesday to Friday morning the individual societies will hold their annual meetings in their usual formats. This means that the *Academy for Further Training*, within the German Society for Neurology, will take place as usual. From Friday midday, the entire shape of the congress will change. There will no longer be any parallel sessions and all congress

participants, from the various specialities, can follow the four main themes. Each of the interdisciplinary topics, focusing on neuro-imaging, vascular diseases of the nervous system, neuro-oncology and epilepsy, will cover a four-hour half-day.

The programme committee is comprised of interdisciplinary

By Professor Christoph Groden MD, Head of the Neuroradiology Department, Mannheim University Hospital, Germany

experts (Professors: Dr W Hacke, Dr D Karch, Dr M G Hennerici, Dr M Westphal, Dr K H Plate and Dr C Groden), and the joint meeting has five congress presidents, who also serve as congress presidents of the individual annual meetings for each society. To simplify organisation, congress presidents

agreed to involve the chairpersons of the organising committees and programme committees in the practical preparation.

The joint congress, organised by AKM Congress Service GmbH, will be held from 20-24 September 2006, at the Mannheim Congress Centre.

We all trust Neuro-week will offer you scientific excellence as well as an inter-disciplinary dimension that will lead to better interaction between clinical neuro specialities, and that, due to its success, the congress will be repeated in a few years.

Details: www.dgn2006.de
www.akmcongress.com/dgn2006

signals. 'Even the smallest tumours will have grown for several years. To achieve successful therapy, diagnosis must be made at a much earlier time. Molecular imaging can show us how genes function and can even show single proteins or protein-protein interactions,' Prof. Reiser pointed out. Researchers have been able to switch individual genes 'on and off' for some time in animal tests.

Individualised therapy is another aspect of molecular imaging. By precisely determining an individual patient's genetic makeup, doctors hope to discover which patient responds to which medicine. The development of cancer is hormone-dependent. For example, oestrogen levels significantly influence breast cancer. However, the metastases react in a different way to the primary tumour, so require different therapy.

Today, scientists can show individual genes and proteins. However, to make exact predictions they need to show several genes or proteins at the same time. This cannot be achieved with CT alone. The necessary resolution will only be achieved in combination with a modality that can also show cell functions.

Over the next 5-10 years there will be blood tests for many diseases or even for dispositions for diseases. Molecular imaging should help to achieve the change from 'see and treat' to 'predict and prevent'. Professors Reiser and Glazer gave the symposium participants very interesting and fascinating insights into these topics so that many of them are already looking forward to the next symposium which is to be held in January 2008.

Report: Guido Gebhardt
Details: www.radiologieforum.de

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prosound

In September 2002, when Philippe Houssiau became President of Agfa's HealthCare Business Group, he quickly saw that the company possessed huge imaging technology and knowledge that could be focused on producing new products and solutions. 'The firm was threatened to lose its technological advantage in computed radiography (CR),' he explained during our interview. 'We had to regain ground on the development of basic print systems. And we had to catch up with the US market in particular, where web-enabled PACS-systems were produced by Amicas and Fuji. We faced a lot of challenges to concentrate on immediately. So, my first plan - for last year - was to put Agfa back on the map in terms of imaging technologies.'

Acquisitions followed (e.g. Heartlab, specialising in cardiovascular IT) to bring on board any missing components in the drive towards that complete portfolio. 'We worked very quickly on the 4.5 launch for IMPAX, with the new CR range - the 25 and 75 series - already taking a position in mammography. For me, this was not enough because it put us back at level with the competition - but not better than them,' he reflected. 'A company such as ours can only survive if it is a technology innovator. We need to differentiate the technology and differentiate the quality of our sales relationship with our customers; that's the game for us to play. So we went on a very, very tight development programme - in all our business areas. Now, I'm pleased to say we've made the first step with the

At the RSNA meeting in Chicago, **Philippe Houssiau**, President of *Agfa's HealthCare Business Group*, spoke with Daniela Zimmermann, Executive Director of European Hospital, about a strategy that has swiftly launched important new products and solutions into the world's healthcare market



Back on the map

The entire product portfolio needed to be reinvented, he pointed out. The strategy for this, developed with the Agfa team, focused on three major areas: consolidation of the firm's position in radiology, from analogue to digital and from digital into IT fields, to provide a very comprehensive portfolio. The second: To capture a very strong position in image-intensive departments, emphasising workflow decisions that support content management, and the third aim was that the Group would acquire an overall IT infrastructure to allow '...a perfect marriage of technical and administrative workflow,' he explained.

introduction of DX-S, because it basically creates a new market segment between DR and CR. DX-S is not a flying spot scanning system, as in other CRs; it is a line scanner, which digitizes plates based on new needle crystals, an IP technology that limits light-scattering, so it ensures much better quality. It is similar in performance to a DR, but at a fraction of the cost. This is an absolute breakthrough innovation. No one else has it. Together with the highly improved workflow, it has prompted absolutely outstanding reactions from our customers.

'We also launched the 6.0 version for IMPAX and IMPAX

Enterprise, a persona-based web deployable solution - not a thin client, not a thick client but a smart client - that can be operated in a multi-site environment, which is often an issue with other thin client applications and which is basically an enterprise solution because it operates on a community basis way, outside radiology. Then we produced a fully integrated RIS, PACS and TALK solution - speech recognition - a major difference for customers. For the imaging centre - the biggest growth segment in PACS - in the USA, where it's a hot topic, we have a very dedicated practice management solution with inte-

grated speech, and this is really targeted to that segment. It can also be applied in Europe. In Asia-Pacific it's already a huge success, and in Latin America the new product range is bringing our first, very large sales. We are back on the map, and this is only the beginning. I think the next generation of PACS, after 6.0, will be even more of a breakthrough. This probably will be launched during RSNA 2006. It's going fast. We are really shortening the development cycle.

'Then, of course, we have the new bilateral agreement with Siemens on DR mammography. We will distribute and sell their

Mammomat Novation system, complemented by our Musica software and our full range of mammography products - again, a real breakthrough. We also have a bilateral agreement with Siemens: They will distribute our CR products. So I think in terms of re-positioning ourselves, AGFA is back. That's the feedback from our customers and even our competitors.'

DZ: What about Agfa's presence in cardiology and surgery?

'I can't say too much, but we are working hard and coming up with a solution. We have it embedded in the GWI offering already, with a specific tool for that application, but we are going far deeper into it - which is also related to our imaging technologies. The only area in which AGFA and GWI had some issues was differences in sales culture and customer relationships. It takes a little time to marry in to a new culture. We are on our way.



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IT definitions

'Thin client': A simple, low-cost, centrally-managed computer that has no hard drives - no diskette drives, CD-ROM players, and expansion slots. The concept is that its capabilities are limited to only its essential usage, so the machine can be kept small, light and uncomplicated - it also means that refurbished computers can be put to this use. Thus the thin client performs very little application processing - that is done by the 'thick' server.

'Thick' (or fat) client': This refers to a server computer that has an operating system, RAM, ROM, and a powerful processor as well as a broad range of installed applications. A thick client can be either on a desktop or on a server to which it is connected.

'On the fly': Computer operations that develop or occur dynamically in 'real-time', rather than being statically predefined.

PACS PUSHES EUROPEAN CR AND DR UPTAKE

From the development perspective, what I see is, for example with the Tiani-PACS people and our IMPAX people, we have drawn them together and the results are absolutely stunning. In terms of further developments, such as imaging technologies - 3-D - Tiani has an extremely good application, and we are working on virtual colonoscopy, MRI perfusion for mammography... fantastic tools and applications. A lot of this will be surgery-related, so there's a lot we can offer in applications in the 3-D area, the quantification area, that can be bought by customers and just basically launched on a PACS, just like that! And it's going to be a development towards an open-sourced, on-the-fly architecture that can be easily navigated, with applications like the one you see from XTREAM, where basically the server can push out 3-D images. It's very important stuff and really the direction we are heading.

DZ: Heartlab comprises your cardiology division?

'In terms of technology and positioning, our acquisition of Heartlab - the US market leader - means that together we hold about 20% of the US market share, and that's a fragmented market, so we are very strong there - and growing. We are also making big cardio sales in Europe, where it is in the process of being integrated with IMPAX and is already interfaced with the GWI applications suite.'

DZ: Was there a cultural problem with Heartlab?

Any acquisition brings cultural problems. It's a matter of turning them into opportunities, because you have different styles. I always said that where we saw an opportunity we would reverse integrate, because in some cases AGFA can learn from smaller companies. Entrepreneurial spirit, a can-do mentality, is very important and we don't just let that flow away. So what we do, for example with Heartlab, is let them be a little on their own, then we very very gradually integrate or reverse integrate.'

DZ: Which was completely different from the story with GWI?

'No, it was also a little bit like that, but because we were immediately in a sales situation with a fairly broad portfolio - IMPAX - naturally it took a while before we had everything ironed out. However, on the whole, if you look at GWI's continued successes, five out of the seven enterprise IT-deals in Germany have been won by GWI. Up to now, we have sold 40 RIS/PACS systems in Germany, so business is going quite well. However, I am a bit concerned about the evolution of the IT market in general right now. In Europe it is not growing fast enough, for political reasons and because of other medical technology. If a hospital has to make a choice between getting the new 64-slice-CT on board or getting a new IT system they will go for the 64-slice-CT.'

DZ: It's very difficult for hospital administrators to understand IT advantages.

Yes, that's what we are seeing right now. However, we are convinced that the IT business will move very quickly on the next couple of years.

Because input into a PACS is in digital form, the importance of digitisation of radiographic images has increased. According to Srividya Badrinarayanan, Healthcare Industry Manager at Frost & Sullivan, in the report *Strategic Analysis of the Digitisation Initiatives in European Medical Imaging Markets*, continuous price erosion and low adoption rates of PACS in some regions are key challenges to the growth of the computed radiography (CR) and digital radiography (DR) systems market in Europe. Although countries such as the United Kingdom, Germany and France show keen interest in CR and DR

technologies, in Spain, and parts of France, PACS has faced greater financial constraints.

A lower radiation dose, superior image quality, and no manual labour, which increases patient throughput, has increased popularity for DR systems, thus reducing demand for CR systems. However, DR systems cost more, so, for medical cases needing fewer procedures, CR systems are preferred (particularly by smaller imaging centres and private physicians).

For 2005, the European CR systems market was valued at US\$261.9 million. This is expected to reach \$322.9 million in

2010. Although the market shows good growth potential in countries such as Spain, Italy and the UK, it has reached saturation in other large countries, e.g. France and Scandinavia, where CR systems are in more of a replacement market, the report points out. However, revenues in the European DR systems market were valued at \$165.0 million in 2005 and could reach \$318.6 million in 2010. Germany ranks top in the DR systems market with a 23% share of the total European market followed by Scandinavia (18%) and the UK (16%). Full report details: <http://healthcare.frost.com>

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GE imagination at work

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Germany - The Imaging Science Institute (ISI) — officially opened in December by Professor Werner Bautz, Director of the Institute of Radiology at the University Hospital Erlangen and Professor Erich R Reinhardt, member of the board at Siemens AG and chairman of the divisional board at Siemens Medical Solutions (Erlangen) — is the third institute (after Berlin and Tübingen) in which Siemens is participating with internationally renowned universities, researchers and medics. The aim is to extensively test, optimise and further develop medical systems and technology for everyday life in the clinic, Prof Reinhardt explained.

Whilst the Berlin and Tübingen institutes

focus on research into individual aspects of the examination process, the ISI specialises in integrating and optimising individual treatment processes to devise ideal universal concepts for workflow, Siemens reports. 'We put the interaction between the most up-to-date medicine and information technology into practice with selected treatment processes. This is unique worldwide,' Prof Bautz explained, adding: 'We hope this partnership will result in new, significant effects on reducing waiting and treatment times, which in turn will reduce costs.'

The initial project at ISI will focus on the analysis and improvement of diagnosis for acute chest pain.

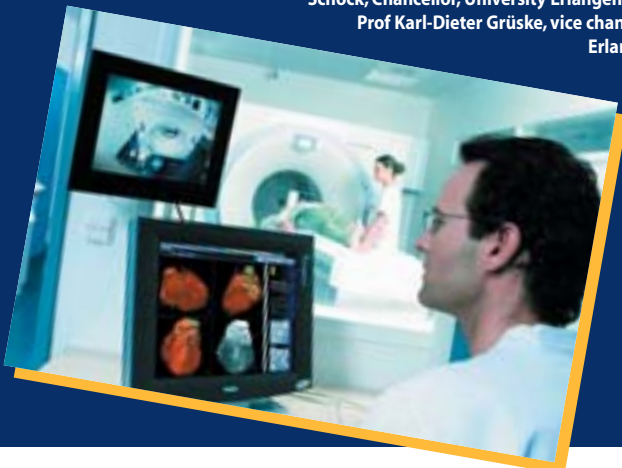
THE IMAGING SCIENCE INSTITUTE **NEW**



Above: The ISI Erlangen is equipped with a 64-slice CT and a new generation 1.5 Tesla MRI. Soon the range of equipment will also include a PET/CT system



Siemens has been integrating strong clinical partners into its R&D activities. From left: Prof Erich R Reinhardt, Prof Torsten Kuwert, Director of the Nuclear Medicine Clinic, University Hospital Erlangen; Prof Werner Bautz; Thomas Schöck, Chancellor, University Erlangen-Nuremberg, and Prof Karl-Dieter Gröske, vice chancellor, University Erlangen-Nuremberg



Right: All systems are integrated into a complex clinical IT environment, which controls image processing as well as individual and complex treatment processes

Dual-So



X-ray computed tomography (CT) has shown an absolutely remarkable and impressive increase in its performance characteristics for many years - remarkable because the modality was declared dead in the 1980s, impressive because these developments seemed impossible to many, for technical and for physics reasons. Today, effective scan times per image of well below 500 ms and isotropic spatial

patient, has turned into a key challenge for the CT industry. Adding more rows to the detector array, and thereby providing possible acquisition of more slices simultaneously, is an option that could be made available easily. It is still open as to drawbacks associated with the use of wider detector arrays, or if related data management challenges can be solved, and what costs might be expected - and finally whether

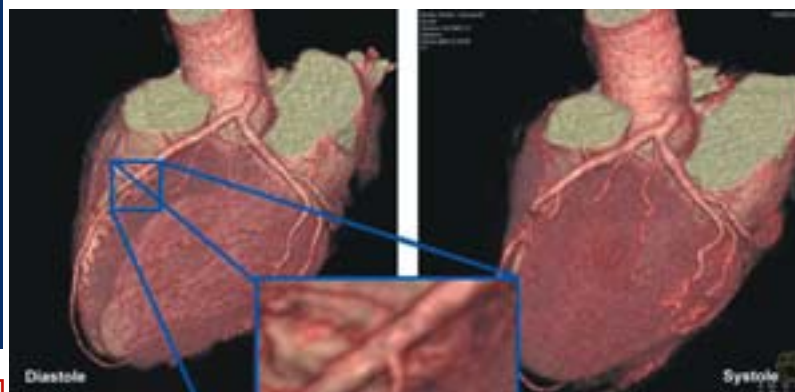


Fig 2: 100% reliability in coronary CT angiography with dual-source CT is now possible (Courtesy of S Achenbach MD, Erlangen)

resolution below 0.5 mm are a clinical reality. All fields of application profit from this performance, especially cardiac imaging and CT coronary angiography, which rely on it. The renaissance of CT began, in the early 1990s, with the introduction of spiral CT, allowing fast and continuous scanning of complete organs and anatomic sections. To make it a practically usable reality the development and introduction of array detector technology and of more powerful X-ray equipment was necessary. The first multi-row detectors became available in 1998. After mastering the technology, manufacturers were quick to add more and more rows and succeeded in making multi-row CT affordable for a wide user spectrum. This was the start of the 'slice race'. At present, multi-row CT technology has become standard and the simultaneous acquisition of 64 slices constitutes the state of the art.

Effective handling and evaluation of large thin-slice data sets, with up to 4000 slices per

there is clinical demand for it. Increasing the X-ray power necessary for faster and faster scanning is more of a problem than increasing the number of detector rows. To provide the number of quanta necessary for a specified level of image quality demands a certain effective mAs product. Every time we reduce the rotation time of the scanner, the tube current or X-ray power must be increased accordingly, to keep the mAs product constant and to maintain the signal to noise ratio. Manufacturers have responded to these demands; these days, 80 to 100 kW X-ray units are on board the rotating gantries. However, just as in electron beam CT, a concept that, meanwhile, was given up, the maximum tube currents are limited not only because of limited generator power, but because of anode durability. The peak power levels that are necessary for typically 5 to 20 seconds cannot be increased easily.

Why should we ask for shorter

The flat panel detector



Over 100 Safire systems are already used in Japan

High Quality still and fluoroscopic images despite reduced X-ray radiation

Recent developments include angiography systems with C-arm rotation speeds of up to 60 degrees/second, digital colour Doppler ultrasound units and mobile X-ray systems - and the Safire flat-panel detector (FPD), the world's first large field flat panel detector to convert X-rays directly into electronic signals using amorphous selenium.

Available in two sizes (9x9 inches and 17x17 inches), Safire's top layer is an X-ray conversion film. When X-rays pass through a patient's body, this uses amorphous selenium to convert the X-rays directly into electric signals. A TFT (thin-film transistor) array then picks up the signal from each pixel and immediately transfers it to the processing system, to create

clearer high-resolution images with less signal deterioration than those from an indirect-conversion flat panel. Noise is also reduced and dosage exposure is 'dramatically reduced', Shimadzu points out. With greater sensitivity than conventional X-ray films, Safire can produce still and fluoroscopic images that are qualitatively equal to, or better than film, even when the X-ray radiation emission is reduced from half to a third of a conventional X-ray examination.

For these reasons the firm predicts: 'Current image amplifier technology, inferior in image quality and dose efficiency, will soon become obsolete.'

Japan's first X-ray images were taken in 1896 - just months after Roentgen's discovery - by Professor Muraoka, of Kyoto University, and Genzo Shimadzu Jnr. 110 years later, the company Shimadzu is well established in the global diagnostics arena with its computer tomography, digital subtraction angiography (DSA), cardiovascular systems, digital radiography & fluoroscopy systems, ultrasound and general radiography equipment.

Source CT

Aiming for even higher performance levels

performance within a standard CT gantry. An in-depth analysis of the considerations presented above and the technical possibilities was recently given by this author in the textbook *Computed Tomography* (Publicis Corporate Publishing, Erlangen 2005).

The results that dual-source CT

provides are impressive and a particular pleasure for any CT aficionado. One of the primary goals - high reliability and robustness in cardiac imaging - has been achieved to a high degree. Effective scan times can be guaranteed to be 83 ms as a maximum; with respective multi-phase retrospective cardiac interpolation algorithms these can be lowered to 50 ms and less, as introduced by [T Flohr et al, *European Radiology*, February 2006]. A first clinical publication by Stephan Achenbach et al.

[*European Journal of Radiology*, in press] reported that all coronary arteries were imaged successfully with 98% of the examined coronary artery segments free of motion artefacts.

CT seems to have made available another impressive step in performance level. It is, above all, the increase in scan speed, which was always one of CT's major advantages. But it may also provide improvements in diagnostics specificity. Combination imaging with PET/CT has already brought major advances in this direction.



By **Willi A. Kalender PhD** (left) Institute of Medical Physics (IMP), Erlangen

Dual-energy imaging with dual-source CT may provide further advances and will be, in years to come, a hot topic in CT research. My conclusion: CT is alive! Contact: willi.kalender@imp.uni-erlangen.de

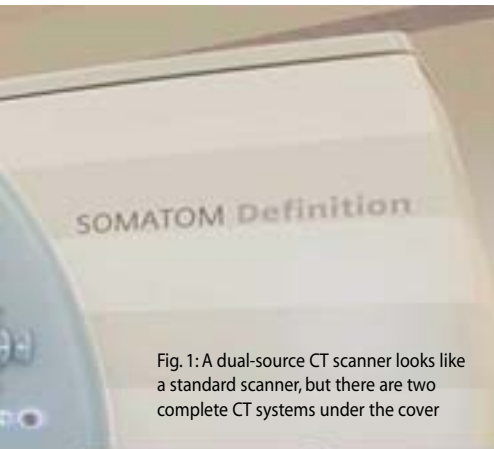
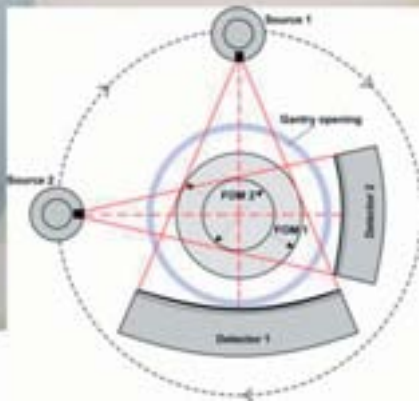


Fig. 1: A dual-source CT scanner looks like a standard scanner, but there are two complete CT systems under the cover



rotation times and higher X-ray power levels after all? CT seems to master almost all demands imposed by clinicians. This may seem true when looking at the impressive and partly spectacular results presented by researchers, clinical radiologists and the industry, preferably rendered in colour 3-D and animated fashion. However, it is known that some demands have not been met fully yet. CT coronary angiography, one of the most demanding applications, yields perfect results in many cases, but not in all. Typically 10% of clinical investigations remain inconclusive due to motion non-sharpness. Just the same, X-ray power may prove insufficient in obese patients, causing delays in the examination. And, after all, there is always the request for more specific information than provided by the standard CT values.

Dual-source CT (DSCT) appears to be one of the potential solutions for increasing CT performance levels further, without technological overkill. It basically consists of a scanner that features two X-ray sources and two detectors. Respective ideas were promoted in the 1970s, when CT scanners were still too slow for many applications. Manufacturers managed to provide improvements and requests for respective innovations died down, particularly since the focus was put on MR imaging. Above all, it was cardiac imaging that made respective technical approaches attractive again for CT. Meanwhile the world's first dual-source CT system, a *Siemens Somatom Definition*, has been installed at the Institute of Medical Physics (IMP) in Erlangen and has been under clinical evaluation since October 2005. This features two 80-kW X-ray systems and two 64-slice acquisition systems under one cover. Patients and users do not notice much difference, since the system's outer dimensions have not changed significantly. Efficient engineering increased the components packing density and provides the increased

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Peter Loescher has worked at the cutting edge of the pharmaceutical industry for 17 years. In the latter part of this period, for example, he headed Hoechst's division in Japan, where he was also spokesperson for the European pharmaceutical industry, negotiating with the Japanese government during its healthcare reform in 2002. He then joined Amersham PLC 'There I met Bill Castell, who was then the CEO of Amersham. We strongly believed in the vision of personalised healthcare and the importance of diagnostics to make that a reality, but soon realised that to achieve it you need a global footprint and the skill that a medium-sized company, such as Amersham, didn't have. Subsequently, there was a meeting of minds - between Jeff Immelt, Chairman of the Board & Chief Executive Officer at GE and Bill Castell, which led to the business combination and the acquisition of Amersham by GE in 2004. I'm responsible for the totality of GE Healthcare Bio-Sciences in this business.

DZ: Your company also has a co-operation with Roche regarding personalised healthcare?

PL: Yes, and we're extremely excited about this, because obviously both companies are leaders in personalised healthcare. Roche is very focused on the neurological franchise, as well as oncology, and we collaborate on Alzheimer's disease. Fundamentally, the mechanism of this disease is not understood. Presently the assumption is that the build-up of amyloid plaques in the brain basically is a key contributor to the development of Alzheimer's. Roche is working on therapy areas, with compounds that basically try to arrest the disease, or diminish the plaque burden and therefore arrest the disease. To really image this you need a biomarker, and we have diagnostic molecular imaging agents that really image the build-up, so using these we can identify the disease in patients before there are symptoms and therefore help Roche to really stratify the patient population in the right way. At the same time we can also image the amyloid plaque burden in the brain - if it is stalled or is decreasing - so we can show the effectiveness of the therapy. So hopefully, through our research collaboration, the result will be that both products will be licensed by the authorities. Then the scenario would be a tandem development of what we have already and you would first get a diagnosis then the therapy, and see, in real time or in a very short period of time, whether the therapy really works or does not work for you. This is very much the paradigm of personalised healthcare. So it's a key co-operation for us.

'Molecular imaging is the future. It will allow us to really understand the disease burden in different areas. So Roche is one example, and we have another collaboration with Lilly, also for Alzheimer's, and in the future these could become role models for working together in the pharmaceuticals industry.

DZ: What's the difference between your co-operation with Roche and Lilly?

PL: It's basically for the same disease - Alzheimer's. Our imaging agents can be used across the pharmaceuticals industry, so it's not specific for only one therapy and we are therefore working with a number of pharmaceutical firms who have compounds that try to arrest the build-up of the amyloid plaque. Lilly is working in the same field, so we have a similar collaboration with them. We can access Lilly's compound library to help us to

agents industries, which has never happened before.

PL: This is the new world of personalised healthcare, and it has needed a very solid understanding of the molecular imaging basis. So, historically speaking, imaging agents used to be structural and now we are moving the whole paradigm to the molecular imaging world, through which we can really create this linkage between therapy and diagnostics. We are very excited about that.

DZ: However, it's not a business yet.

PL: Right. We are at the threshold, an early research and development stage, but over the next 5-10 years this could be a very important way of improving patient care globally. I have just returned from Japan where the overall healthcare costs are 42 trillion Yen (around 295 billion Euros) and government officials made a point of saying: 'If we do not change

activities, focusing basically on oncology, neurology and cardiology, and have the broadest based molecular imaging portfolio in the industry and can link them together.

Kristin Silady, Communications Manager, US at GE: We understand the pharmaceutical challenges. We have been through the radiotherapy processes and clinical trials, so in partnering with pharmaceutical companies we have a very different expertise. Contrast agents are a pharmaceutical business, and we have the actual imaging agents and the machines within one company. This is very different from someone who is on the other side of the wall. There is confidentiality and things that cannot be disclosed. That is another consistent advantage.

PL: I agree, but would not be sur-

Partnerships to personalise medicine

Peter Loescher (right) President & CEO of GE Healthcare Bio-Sciences, discusses the benefits of collaborations to advance the use of contrast agents for the early identification of diseases and to track the effects of pharmaceuticals on diseases. Interview: Daniela Zimmermann



identify, hopefully, a number of leads - which agents or compounds could potentially work as future diagnostics in this disease.

DZ: Which is best, CT or MR, for molecular imaging?

PL: For us it doesn't matter. Finally the medical professionals will decide. It's not a question of either/or. I think both will be hugely important, and you will have PET, for example - PET-CT is an important area. We also work on another compound, C13, in the research field, which, if it works, will allow metabolic imaging on an MR machine. So the answer is, we don't mind. We are advancing the technology in all areas, so physicians can make their own decisions.

DZ: In European Hospital we have written about the Eisenherz oncology project, in which Siemens, Philips and Schering are collaborators. This also demonstrates how competitors can come together to advance medical diagnostics. Given your collaborations with Roche and Lilly, it's a very exciting time in cross-activities between the imaging, pharmaceutical and contrast

healthcare delivery as it is done today, by 2020 the 42 trillion will become approximately 90 trillion. So, who would or could pay for this? You would have to improve prevention and diagnose diseases earlier - one of the ways in which we could contribute.'

DZ: Who is your main competitor in molecular imaging?

PL: We entered the field and focused on this area a number of years ago, so we are the market leader, with a significant lead over our competitors in this field - and these are very good, respected competitors. Schering, for example, is trying to advance in this area. So, yes, the industry is trying to replicate what we are doing, but we definitely have the lead and the advantage of being the only company that can link diagnostic pharmaceuticals together, really the only one to know how the technological roadmap looks for different modalities over coming years, and to be able to ask: What are the imaging needs and unmet medical needs to direct the equipment business to really focus on the imaging agents? We have structured our research

prised if other companies try to follow our lead. When you engage in a strategic partnership, particularly in molecular imaging, you have an element of how you have to adapt the equipment side of the business. What are the software capabilities that you need around the imaging agents? For example: We are the only company that already has a molecular imaging agent (called DatSCAN) on the market in Europe. Of course we have developed a software programme around it, to help physicians to clearly optimise and simplify the reading of images, then to have a database available at the end of the day, which hopefully will link all the cases to a certain database and say, ok, an image that looks like this, against the database, is diagnosed as an early onset. This hopefully allows physicians to make more informed decisions, because finally it's the clinician's decision, although you help him to guide and create more certainty around that decision-making. And this includes equipment, software and imaging agents. It's a clear advantage if you have all three of these together.

DMIST demystified

Cynthia E Keen discusses the controversy evoked by an ambitious 36-month digital mammography trial that has cost the US \$26,000,000

The United States' Digital Mammographic Imaging Screening Trial (DMIST), like Norway's Oslo II Study, represents a historic milestone in the adoption of digital mammography for routine use. Yet DMIST has been very controversial. It was criticised and praised from the day that it was funded in 2001, and it was criticised and praised when the first results were published in the *New England Journal of Medicine* on 16/09/05.

DMIST proved that a digital mammography acquisition system produced superior diagnostic images for radiologist identification of breast cancer in women who have dense breasts, or who are under the age of 50, or who are premenopausal or perimenopausal. Dr Etta D Pisano, DMIST's principal investigator, said that digital mammography was 14-27 percent more sensitive than film

for these three categorical subsets. The images produced of women who do not have these characteristics were equivalent for identifying breast cancer, whether digital or traditional analogue screen mammography systems were used.

So why is DMIST controversial? The study was an aggressive, ambitious, expensive, and bold clinical trial. 49,528 women and 33 medical institutions participated in a 36-month study that cost \$26,000,000. Its goal was to determine the value of first generation of digital radiography (DR) and computed radiography (CR) systems commercially available in the world. This included systems that had not yet received government approval for use in the United States. Distinguished US mammographers persuaded the National Cancer

Institute to fund the trial of this new-to-market technology to determine if its high cost could be better justified by its superiority in detecting early cases of breast cancer.

Individuals who have breast cancer identified in its earliest stages (phases 0-IIB) have a 75-100% five-year survival rate and significantly lower treatment costs. In 2006, an estimated 1,200,000 people throughout the world will be diagnosed with breast cancer.

The controversy of DMIST is that, in spite of the excellence of its design, the product evolution of both the image acquisition technology and the image processing algorithms advance rapidly. The digital mammography systems that were used became outdated even before the image collection phase of the trial was completed. Thus the results, whether favourable or unfavourable for digital mammography, would be based on the capabilities of a first generation product.

When the first of what will be 15 reports were published in 2005, commercial systems had evolved to their third generation of product development, two systems that

were used in the DMIST trial were no longer being sold and, most ironically, the Fuji CR system used for 10,000 mammograms still had not received US Food and Drug Administration (FDA) approval.

Both vendors and current users of the available digital mammography systems believe that digital images produce a superior image due to the ability of improving depiction of low-contrast objects in contrast-detail studies and a wider dynamic range. Digital mammography systems use less radiation, increase equipment utilisation with faster throughput and reduce the number of patient recalls.

The negative is that the DR mammography systems, currently the only type approved for use in the US, are 1.5 to 4 times more expensive than screen film mammography systems. The operational and maintenance costs are also very expensive. In the United States, reimbursement rates for mammograms by both government and insurance companies might not even cover the cost of the exam. To date, only about 8% of US healthcare facilities use digital systems.

The DMIST results have created a dilemma because the installed

systems can only image 33% of the women who would benefit from digital mammography. Physicians are starting to recommend that women with a family history of breast cancer have a baseline mammogram at a much younger age, thus increasing the size of the subset. GE Healthcare, Hologic and Siemens Medical Systems are all seeing a steady increase in sales each month since October 2005, although company representatives state that they cannot directly attribute this to the DMIST results. As more women become knowledgeable about the DMIST results, competitive market pressures and fear of malpractice lawsuits may force US healthcare institutions into acquiring digital systems whether they can afford them or not.

When CR mammography is approved in the US, sales are expected to skyrocket. It's already happening in the rest of the world. Fuji Medical Systems reported that its shipments of CR mammography equipment between April and September 2005 increased 136% from the same term in 2004 and estimates a 160% increase for October 2005-March 2006.



The 3rd Hospital Administrator Forum

ECR 2006 President Professor Andy Adam (St Thomas' Hospital, Department of Radiology, London, UK) welcomes all participants

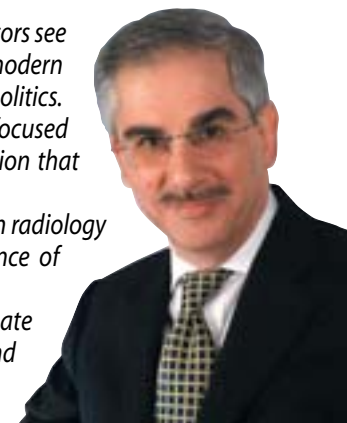
I am delighted that the **Hospital Administrator Symposium** organised by European Hospital is being held in conjunction with the ECR again this year.

The efficient delivery of healthcare is a task that challenges governments all over the world. Most doctors see medicine as primarily an interaction between the doctor and patient; so do most patients. However, modern healthcare is expensive, fiendishly difficult in terms of logistics, and intertwined with local and national politics.

Senior hospital managers have to walk the tightrope between the doctors' individual patient-focused approach and the politicians' obsession with newspaper headlines, trying to ensure that the population that their hospital serves gets a fair deal.

Radiology is already important in your calculations partly because of the heavy capital expenditure in radiology departments and the ever-increasing need for sophisticated information technology. The importance of radiology will be even greater in the future due to astonishing advances in medical imaging.

I hope that this symposium will enable you to assess trends in modern radiology and to try to anticipate how they will impact on what you do. Your skills play a vital part in the success of modern medicine and we greatly welcome your presence here. I hope you will enjoy the ECR!



MANAGEMENT

How to manage your radiologist

Side effects for public hospitals aiming at greater profitability

By Jürg Hodler

Radiology in public hospitals is under economic pressure due to limited public funding, partially decreasing radiology fees, capitation payment systems, central planning of capital investment, as well as the increasing complexity and cost of equipment. At the same time the administrative burden, which includes budgeting rules, WTO purchasing rules, FDA regulations or formal quality improvement procedures, are increasingly using radiologists' time and energy and adding cost. Restructuring and alliance building may be inevitable in the fragmented healthcare systems of *continued on page 10*

A former Research Fellow (osteoradiology) at the University of California, San Diego, for the past 14 years **Jürg Hodler MD MBA** has headed the Radiology Department at the University Hospital Balgrist, Zurich Switzerland.

He is a member of seven international scientific societies, and has published 148 original papers, 44 review articles/case reports, three books, 24 book chapters, and also produced two CDs on his speciality.



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continued from page 9

many countries. From the point of view of a radiologist, however, such projects typically mean disruption of current operations, frustrated employees and additional meetings and paperwork. In addition, radiologists working in the public system tend to carry a more than proportional burden of non-profitable procedures, emergency services, teaching and continuing education. Direct comparison of productivity with private practice is frustrating for radiologists working in a public system.

Privatisation of radiology may reduce many of these problems by reducing regulatory costs. More typically, a satisfactory solution must be found within the current organisation. The radiologists' motivators to stay in the public system, such as educational tasks and research time, should be protected. These activities are not necessarily lost from an economical point of view, because they may represent a marketing opportunity

and a competitive advantage. The radiologist's time required for purely administrative tasks should be reduced by consistently using informatics and the administration's resources. Problems associated with restructuring should not be hidden behind marketing slogans but should rather be acknowledged and solved. On the other hand, the administrator can and should require radiologists' active participation in the economics of running the department. For this purpose, radiologists need training in basic concepts such as depreciation, cost of financing and overheads cost. Economic goals should be included in a radiologist's contract, as far as he/she can influence the result. The administrator may also point to advantages associated with a public hospital setting, such as consistent interaction with clinical specialists, more complex and therefore more interesting cases, a steady flow of emergency and hospitalised patients, as well as pensions and healthcare insurance.

Six Sigma The Son Dureta experience

By **Carles Ricci Voltas**

Healthcare has no room for inefficiencies. Public healthcare managers, especially for hospitals, have to provide an increasing volume of high-level healthcare services with limited resources. The quality of delivered services is not only to do with the users' perceptions, but also with clinic and business metrics. In this environment, processes improvement is the name of the game.

What changes in processes should be made to maximise the impact in our key quality metrics? What are the factors to be controlled to ensure our processes meet specifications? Somebody tries to fix a problem by subcontracting a guru who then applies similar solutions to those problems that have already remedied problems in another, similar organisation. This can prove faulty, if the problem is about a complex organisation, complex process and a complex environment, as in a hospital. If you do not want to try solving a problem by serendipity, you must apply a method based on facts, but 'your' facts.

Six Sigma is a robust, rigorous methodology to reduce defects. Based on measured data, analysed by statistics, it is facts driven. However, some organisations

have found Six Sigma difficult to implement. It was perceived as a hermetic art, understood only by the initiated. If your colleagues do not call you *Master Black Belt*, you probably do not understand what Six Sigma means. In organisations such as this, Six Sigma and quality relates to the quality department.

Other companies claim big earnings due to Six Sigma. These are the ones that think the quest for quality in an organisation is not just a matter for the quality department or methodology knowledge. They believe the search for excellence involves everyone - starting with the management. Change acceptance is the Holy Grail for quality. People need to perceive the necessity of change and be committed to change. Only after gain, and people's acceptance of change, can you apply quality methodology.

This is the vision for Son Dureta Hospital, a 900-bed public hospital in the Balearic Islands, which has a new Board of Directors devoted to healthcare quality and interested in new management methods. The hospital is involved in implementing Six Sigma and change facilitation methodologies learnt not from a consultant company, but from a partner who is using it in his own business.

Carles Ricci Voltas BSc (econ) MHM, is CEO at the 900-bed Son Dureta Hospital, Palma de Mallorca, Spain. He is the first in Europe to implement a method called 'Six Sigma' as a hospital quality model and reports that he is 'migrating his hospital to the PPP managing model'.

As former CEO for *Fundacion Hospital Manacor*, he introduced a new financing public model to Spain.

As Consultancy Director for the *Instituto Gallego de Medicina Tecnica* he helped healthcare institutions in Spain and South America in strategy and business development, organisational change management and technology assessment.

Telemonitoring remote patients

By **Hans-Aloys Wischmann**

Chronic diseases like heart failure (HF), diabetes, and chronic obstructive pulmonary disease (COPD) affect millions of lives worldwide and consume over 50% of health services expenditure.

In many projects, telemonitoring has been shown to improve survival and increase quality of life in a cost-efficient manner, at least for HF. To reach even better clinical and economic outcomes, we have developed an interactive telemedicine platform that aims to support remote patient management by assisting patients to understand their diseases, assess their current state, and adapt their daily habits and behaviour accordingly.

In addition to telemonitoring of vital parameters, the system provides personalised feedback, questions, and individualised educational videos on the patient's TV.

This subject will be discussed fully at the Administrator Forum.

Hans-Aloys Wischmann PhD (physics) became Business Development Manager Telemedicine, at Philips Medical Systems in July 2005. His career with Philips began with work on software for functional brain imaging that evaluated EEG and MEG data with information from MRI images. Later he led a project on flat panel detector calibration and correction. He then became head of Philips Digital Imaging Research Laboratories (Aachen).



Clinical activity based process-cost coupling

A tool for the development of clinical pathways

By **Eckhart G Hahn**, Marion Büchler, Department of Medicine 1, University Hospital Erlangen, and **Tobias Gantner**, Siemens Medical Solutions, Healthcare Consulting Group, Erlangen

Eckhart Georg Hahn MD is Professor of Internal Medicine, Dept of Medicine 1, and Consultant for Internal Medicine and Gastroenterology, working at the University Hospital Erlangen, Germany, and Friedrich-Alexander-University Erlangen-Nuremberg. The professor is licensed to practice medicine in Germany as well as in the USA where he was Rorer Professor of Medicine and Director of the Department for Gastroenterology and Hepatology, at Jefferson Medical College and Thomas Jefferson University Hospital, Philadelphia, from 1987-1988.



Reimbursement for hospitals in Germany has undergone a complete change since the introduction of the German Diagnosis Related Group system (G-DRG). Therefore hospitals need rigorous quality and cost control to survive with a fixed and externally defined income. Evidence-based guidelines and clinical pathways are helpful to achieve that goal, but key problems in their development are relevance for the individual patient and integration into clinical practice.

Aim: The objective is to develop a time-driven clinical activity (CA) system for process and cost con-

control in a complex university department of medicine under G-DRG conditions, and to use it for the development of clinical pathways (CPs).

Methods: We have suggested an approach to process-cost coupling based on defined CA derived from procedures commonly used in internal medicine. We have further analysed components of such activities down to elementary processes and determined its respective staff costs and material consumption. Multidisciplinary teams conducted department-wide interviews, with intensive information and involvement of all

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Managing a modern healthcare organisation is complex. Complexity stems from the variables that need to be entertained, which are highly unpredictable. There has been a change in health paradigm, as well as expectations of the 'new patient'. Existing healthcare systems neither meet the quality goals nor patient expectations. There is a need to identify the vision, strategy and direction of a hospital; this should be reflected in the goals and objectives, which should be transmitted to hospital staff. Healthcare organisations, such as hospitals, are

Managing complex healthcare organisation The essentials

By Professor
Abdulrahman AlNuaim

Abdulrahman AlNuaim MD FRCPC FACP CPE, is Professor of Medicine, Consultant Endocrinologist & Diabetologist, and Assistant Chief Executive Director at the King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia. Medical management qualification: Certified Physician Executive (CPE) from the Certifying Commission in the Medical Management, USA.



dynamic and require periodic revisiting of the organisation structure for more enhancement and better realignment of services. There is need for executive councils/committees to oversee the medical and non-medical operation. There is a need to adopt change and engineering to advance the organisational cause. Leadership and empowerment at different level of the organisation is

an essential component for success. There is a need to identify who should lead and who should manage.

Health information system is a vital component for managing patients, as well as the well-being of the organisation. There is a need for a data warehouse system to provide executive dashboards to monitor performance. New technology and automation of process-

es is essential for augmenting patient care.

Patient safety is an important aspect. Several checking mechanisms should be embedded to ensure delivering the highest safety measures. An online adverse occurrence reporting system will give an accurate estimate of morbidity incidences. Executive rounds and management, by senior hospital executives wandering around, is

important. Medical errors and risk management should be part of the integrated measures for patient safety.

Performance improvement initiatives should be embedded in throughout an organisation's culture. Balanced scorecard is a powerful tool for monitoring and improving hospital performance.

These issues will be fully presented during the Forum.

employees. Processes were acquired by multidisciplinary teams and were mapped in MS Excel by a special template called STOP (Standardised and Optimised Processes). An activity-based instrument was programmed for sustained activity change management.

MS Excel is used to assemble all clinical activities applied to single patients in a particular clinical path (i.e. acute pancreatitis) on each day. 10-20 patients are then pooled and analysed for overlapping CAs. Pathway attributes are assembled in ARIS (IDS Scheer) and pathways modelled using common evidence-based guidelines. Visio software is used to visualise complex CPs.

Results: About 700 activities were defined, analysed and assessed for elementary processes. Human and material resources were measured, calculated or estimated by experts. Complete CA patterns of individual patients and patient clusters could be used efficiently to design evidence-based CPs. The CPs generated with this method reflected actual clinical practice and could be easily used to determine quality (adherence to CP) and costs (time-driven valued CAs).

Discussion: Contrary to common belief it was possible to define all elementary processes in a complex university department of medicine by this co-professional approach, including real costs. It was also possible to use common, practicable clinical entities, CAs. CPs could be composed of such CAs, and quality and accrued costs monitored at all times until discharge of the patient. This system will now be used to further model internal medicine processes, optimise quality and resources used, develop more clinical pathways and construct information technology tools to help in every day application and sustained adaptation to future changes of CA.

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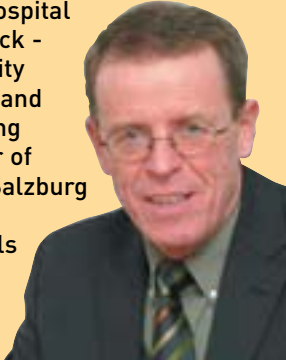


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How to buy a HIS

By Max Laimböck

Max Laimböck PhD (Economics and Business Admin.) is Administrative Director of the State Hospital Innsbruck - University Clinics, and Managing Director of SALK (Salzburg District Hospitals group)



SALK, a hospital company based in Salzburg, has a budget of €350 million for three hospitals and employs 4,500 people who serve 80,000 patients and 300,000 out-patients per annum.

A HIS from a medium-sized company (after an invitation to tender in 1997) and two PACS, from two providers, were running. The HIS provider was sold twice and the last owner decided to terminate the product within the next few years. SALK the only customer in Austria, paid a lot for each exchange in the billing, and major features were not introduced: operating theatre and out-patient scheduling, operating room documentation; hard- and software decisions were pending.

In 2004, SALK's new management ranked IT a high priority and decided to develop a HIS/PACS

strategy. The IT head and his deputy could not provide a reasonable HIS/PACS strategy, so a 'HIS/PACS project group' was established to do this, to be led by two administration managers.

We analysed the market before issuing an invitation to tender, because we did not want to be slaves to this formal process and wanted to understand software products beforehand. We considered providers, who were supposed to be financially solid, major players in this market, now and in the future, with a strong commitment in Europe, active product development and an attractive product for multi-hospital groups. An experienced adviser supported the evaluation process. Four products were identified, presented to user groups and evaluated. During site visits, project group members checked software efficiency. Since one product of a major player was running on a broad scale only in the USA, we made site visits there. The IT manager and his deputy left the company. Our new IT manager is now part of the decision process.

Discussions of available product launches, implementation steps and support began. Two products were left as frontrunners, we contacted their top management and declared our interest. Invitation to tender began, products and offers have been evaluated, objective decisions for one of the two top providers was taken and implementation will begin in February 2007.

Images and data integration in the healthcare information system

By Riccardo Ceccarelli

Riccardo Ceccarelli, Information Systems and Material Manager at the Policlinico Gemelli Hospital - Catholic University of the Sacred Heart - Rome, graduated in informatics engineering at the University of Pisa with his dissertation 'Interoperability between mobile agents systems: integration of a Java platform using CORBA architecture'. Postgraduate courses: Healthcare Logistics Systems.

He has worked on projects for medicines and materials distribution using IT solutions/system for American, Spanish, and Italian Hospitals. For Policlinico Gemelli, he has also produced an innovative informatics/logistics solution for the hospital's 25 new operating theatres in a central building - the Piastra Polifunzionale.



The introduction of digital images to medicine took place in the 1970, thanks to ACR-NEMA studies. The DICOM standard was not born until 1993, and hospitals began to discuss integrated hospital information system (HIS) from the beginning of the 90s. This timing was governed by the necessity to develop more new powerful hard/software solutions and to consolidate international standards.

The Catholic University of the Sacred Heart Hospitals decided to follow the European Standard HISA, to achieve an open platform, capable of integrating all data relevant for the enterprise and making these accessible throughout public services, independent of the specific technical products and configuration.

The architectural principles are structured from the following perspectives: enterprise, information and computation. Such architecture has been realised with a middleware called DHE.

Clinical, administrative and directional information are stored and shared in a reliable enterprise repository.

On this platform, the basic philosophy is: 'All information must be connected to the patient'. This is crucial because a patient has several hospital contacts (admission, day clinics, ambulatory access, etc.) and, during each contact, a patient receives clinical attention (examinations, therapies, surgical operations, etc.) and each uses resources (personnel, materials, medicines, rooms,

modalities, etc.) and clinical items are produced (results, medical reports, etc). All these data are very important - first, for the patient, healthcare processes and clinical history, and second for the DRG, cost analysis and savings.

In the system, the request cycle flow always follows the same steps for each kind of examination.

In current opinion, images and connected reports are a fundamental and integral part of the corporate information asset, therefore such data also must be integrated in the common model, and connect to the relevant coded information (e.g. a patient's image should be connected to that patient's personal data, a scanned referral letter should connect to admission, PACS images should be connected to the requested examination, a PDF report from the lab should be connected to the examination, etc).

The Policlinico Gemelli approach is based on the extension of the scope of the PACS in the overall enterprise, by leading it to represent a sort of 'enterprise imaging archive', responsible for managing the storage of all multimedia data. To implement such an approach it has been necessary define an appropriate hardware solution and set-up for the archiving system, mechanisms that allow other applications to store and retrieve any type of multimedia data objects, in synchronous modality and ensuring performances suitable for embedding in interactive, online transactions.

IT slows you down So why bother?

By Leonie Paskin

Those who live in the 21st century must adapt to technology moving ever onwards. In the home we are connected to the workplace, our bank and retail avenues, any time we choose.

Are the benefits of this IT invasion those we actually perceive? Do we sacrifice speed to gain other tangible benefits? Do similar systems benefit all in the same way? The IT revolution is here to stay and decisions will be taken on investment, education and training and impact on patient management. Evaluation of new hard- and software will be part of our everyday life. Embracing advanced features and keeping our brains in tune with technology advances will be a significant challenge. How should our life plan and work plan reflect this? Is our ability to deliver consistently high quality healthcare ever compromised by our dependence on technology? Does it add to 'medical' fatigue?

The potential for use of IT in the Clinical Imaging environment has changed emphasis on the 'image capture' equipment to just about every other process taking place.

From requesting and scheduling to image processing and distribution; from statistical analysis to measuring outcome; huge reservoirs of information are gathered and never tapped. Audit trails are visible but do they alter efficiency or effectiveness? Is there a conflict between our knowledge and experience that eats up our time as we conflict with the opinion of the computer mastermind?

Technology can be difficult to master leading to error and potentially devastating consequences. How much time is given to designing robust, new systems with intuitive interfaces? If we don't take the lead, then who will? How much of our time should be spent influencing the technology with which we work?

How many of us work in an environment with specific function systems that do not communicate with others appropriately? Moving between systems is time consuming as well as annoying. Trying to move towards a total system approach is the only way forward.

'Connecting for Health' the

Radiographer **Leonie Paskin** heads the Delivery Unit at St Thomas' Hospital, London, a role focused on leading Clinical Imaging on a strategic and performance basis. Reporting directly to the Chief Executive she explained 'I account for the actions and performance of all personnel and services in the unit. It is also my responsibility that diagnostics meets any government targets and also enables other clinical specialties to meet theirs.'



National Programme for IT in England has taken decisions on 'one size fits all technology'. It is striving to address issues of information sharing and connecting, but is it coming up with some fairly insurmountable obstacles? Was speed at all relevant to them in system design?

This presentation looks at the time costs sacrificed when embracing new technology and poses the question 'Are we doing the right thing?'

The vendor, system administrator and manager in a new fully digital environment

The Cardiovascular Surgery Department at Semmelweis University made a big improvement to all its IT systems, as part of a university-wide upgrade plan. The installation of a new Hospital Information System (HIS) preceded the transition to complete digital archiving and was accompanied by the setting up of a new Economic Software platform.

Because all these components are produced by separate vendors (AGFA/Impax, ISH/Medsol, SAP), careful planning and central co-ordination of all events was fundamental. Project members face several issues - expected and unexpected - during such a thorough renewal. A flawless link of all systems was needed, especially the full-featured communication between the systems responsible

for digital data handling and for hospital data management.

The project members needed to solve the problem of the separate buildings of the department. Sometimes it was also hard to establish the communication between the modalities and the PACS, in view of some older medical equipment. It was also necessary to set up a broker and to provide work lists for all possible modalities.

Besides technical tasks, staff training is also vital, to provide smooth transition and prevent a revolt. It isn't easy to satisfy time constraints and avoid outage in medical services. There will always be dissatisfied staff members to handle.

During meetings the stages of our department's approach will be reviewed. Both the planning and

Procuring large equipment

Around €18 billion annually is spent on medical technology in Germany. After the US and Japan, the German medical technology market is the third largest in the world.

The financing of large medical technology equipment for German hospitals (and therefore also for radiology departments) has been regulated by law since 1972: The investment costs are contributed by the Federal States, operating costs must be met by the medical insurers.

There are different types of governmental investment assistance. Individual assistance can be applied for building projects or the acquisition of equipment. Then there are flat-rate subsidies based on the size of a hospital. Although this gives individual hospitals a certain amount of flexibility, one has to take into account that governmental funding has decreased by 25% over the last 15 years, so that the backlog of investments required across the whole of the hospital sector (building and technology) is currently between around €12-50 billion.

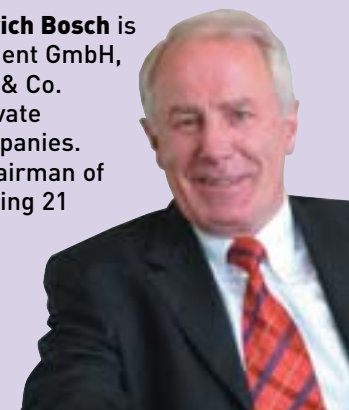
In the past, due to its interdisciplinary use across the hospital, investment decisions on radiology equipment in hospitals have had priority. The purchase of large-scale radiology equipment via governmental funding is by far the most common form of financing in German hospitals (68%). Only 3.6% of investments are financed via credit, 20% are

financed through the hospitals' own resources, and around 6% of investments are financed through the hospital operators.

Apart from these conventional means of financing, more flexible types of financing such as 'try and lease', 'pay per use' and public/private partnerships are on the increase. Even if these types of financing are only reluctantly

accepted by public hospital operating companies, they have become much more common among private hospital operating companies. Considering that more and more public hospitals are now being privately financed, these new types of financing are set to become much more widespread in the German hospital market.

Business management specialist **Ulrich Bosch** is Managing Director of Sana Management GmbH, Munich, part of Sana Kliniken GmbH & Co. KGaA - one of Germany's leading private hospital management operating companies. Earlier, in Styria, Austria, he was Chairman of the Board, responsible for transforming 21 state-owned hospitals into a private limited company. He was also Managing Director of Paracelsus Clinics, responsible for operational activities and acquisitions in Austria, Switzerland, England and France.





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Radiologist **Attila Tóth**, of the Cardiovascular Surgery Department of Semmelweis University, Hungary, is a member of the Hungarian Radiologists Society, Society for Cardiovascular Magnetic Resonance (SCMR) and the European Society of Cardiology's CMR Working Group. His foremost medical interests lie in MRI, Cardiac MR, Vascular MR, Focused Ultrasound, as well as secure operating system and network solutions, HIS/RIS, PACS. Dr Tóth has authored many scientific papers on all related subjects



implementation phases will be discussed in detail. Special features of the actual case will also be presented.

The PACS and HIS systems were introduced successfully. Film costs could be reduced, and the previous ancient system is just a memory. Hopefully, by highlighting necessary steps and some pitfalls, we can provide our audience at the Forum with a guideline for fruitful revolution in their own hospitals.

Acquiring up-to-date medical technology

New leasing and financing strategies

By **Claus Henneberger**

Technology is central to the future of healthcare. It provides the healthcare sector with a wide variety of tools to deliver improved care. At the same time technology also provides a wide variety of tools to manage the healthcare sector more efficiently and effectively.

Providing the technology to upgrade the healthcare industry will require a massive capital investment and present a major opportunity for the leasing industry.

Because of the limited time and capacity of many healthcare providers to focus on the details of their needed capital invest-

ment, the most successful leasing companies will be those competing on service - not price. These will be leasing companies that combine the equipment delivery with additional services, such as service agreements, system upgrades and remarketing services.

Flexible solutions during and after the contract term are essential. Why should a client commit to an inflexible solution with a long lease term, just to obtain a lower monthly instalment and the option to buy at the end of lease at a fair market value, when they could choose a flexible solu-

tion instead, enabling them to react to technological changes and leaving the remarketing to specialists?

These flexible leasing solutions are already established in markets where technological changes are rapid. IT leasing companies, for example, offer 'Swap' contracts, which enable their customers to exchange or upgrade their leasing equipment during the lease and return it End-of-Lease without further obligation. The leasing company will then remarket the equipment or resell them to specialised brokers. Today, more and more customers want this solution.

The required combination of expertise for success in the leasing industry will include an understanding of the general financial benefits of leasing coupled with an understanding of the productivity requirements of the healthcare system and an ability to package and explain leasing services that provide financial benefits, as well as productivity benefits, to the medical community.

These are the challenges medical equipment manufacturers are confronted with today - to satisfy their clients.

Claus Henneberger is General Manager of Philips Medical Capital Europe. With an Economics degree in banking, he has also worked for the Deutsche Bank Group, was Managing Director of Deutsche Financial Services Belgium for the Deutsche Bank Group and, earlier, was Managing Director of SG Equipment Finance Benelux, Société Générale Group, France



Financing methods

The pros and cons

By **Nikos Maniadakis**

Nikos Maniadakis BSc (Econ.) MSc (Econ. & Health Econ. Also: European Studies.) PhD (Industrial and Business Studies) is General Manager & President of the University General Hospital of Herakleion, in Crete, Greece.

Dr Maniadakis has overall responsibility for the organisation and operation of the 800-bed hospital - one of the largest healthcare facilities in Greece. It includes the University of Crete Medical School, has 2,500 employees, a €200 million annual budget, spans over a buildings complex totalling 115,000m², and serves 400,000 patients annually. He is also responsible for the development and implementation of its business plan.

His scholarships and experience are as considerable as his educational pursuits, which continue: his credits include the Certificate in Advanced Methods of Economic Modelling Analyses [2000], from Oxford University, Oxford, Britain. He has also authored many publications, and lectures in Greece and Britain, where he is a member of the Royal Economic Society of England. Other memberships: Operational Research Society, Productivity Analysis Research Network, International Health Economists' Association, International Society for Pharmaceutical Outcomes Research, International Society of Technology Assessment in Health Care.



Over the last 50 years healthcare delivery has changed dramatically. New epidemics, aging populations, patients' expectations, mobilisation of populations, the globalisation and dissemination of information, all demand new patterns of healthcare delivery. Above all the technological revolution is raising healthcare costs in an exponential manner.

These changes put challenges before healthcare managers in terms of how to plan and fund new investments. Private money and equity has been the traditional approach. It is easy to implement projects if you have money, which is not often the case. Leasing represent a good alternative option, especially for medical equipment, because it spreads cost over years and makes it possible to follow technological advances.

Recently, private/public partnership has been used by the

public sector to develop large investments, with initial funding from the private sector. This option has advantages: the cost is spread over years and usually private firms are better at delivering projects on time and on cost compared to the public sector. Donations can be a large source of income and there are prominent institutions that annually receive large amounts of money, but it is not a viable solution for the great majority of hospitals. Overall, different methods of funding have advantages and disadvantages and they are more suitable for certain types of projects. It is important when implementing healthcare projects to obtain other views, apart from the financial one. In many cases it is useful to consider the cost-benefit of new projects not just in money terms, but to consider also the life years gained for every Euro spent in new investments.

Regulations and laws

IT financing, PPP-models, Governmental fund integration and cross border transactions

In 2005, De Lage Landen financed (worldwide) medical equipment worth US\$1 billion, by various methods such as loan, lease, rent and ppp, either directly with end-users or indirectly by refinancing manufacturers.

At the Administrator Forum, **Dr Reiner Vehrenkamp** will address the rise in demand for external financing from European hospitals as they undergo changes such as privatisation, out-sourcing and legal form changes, while at same time the amount of Governmental funds made available to them is decreasing.

'Most hospitals are subjected to various internal and external regulations and civil and tax laws, varying from country to country, which superimpose further difficulties when "designing" any financing solution for a hospital,' he observes. His presentation will provide examples of such cases and he will discuss some potential solutions and 'workarounds'. He will also highlight financing of IT, as well as PPP-models and the integration of Governmental funds.

Reiner Vehrenkamp PhD (physics), Director of Business Unit Healthcare Europe, at De Lage Landen B.V., Europe Division, has 10 years experience in leading sales & management positions in the medical equipment industry and 10 of the same in medical lease companies. He has headed the Health Services Division at Deutsche Leasing AG, since July 2005, was Deputy Director of Business Unit Healthcare, De Lage Landen International B.V., Europe Division, and took up his present post in January this year. The bank is part of the Dutch RABO-Bank group - one of the few AAA rated banks worldwide.



Colour key to Forum sessions and speakers

MANAGEMENT

INFORMATION TECHNOLOGY

FINANCING

3rd Hospital Administrator Symposium

Hospital and Radiology Management - Future challenges for innovation,
transparency, personnel management, training and financing

Austria Center Vienna, Austria
4 - 5 March 2006

Presented and organised by:



EUROPEAN HOSPITAL



Programme

Session 1 – Management - Saturday, 4 March, 12:05 pm - 1:50 pm
Welcome and introduction by Prof. Andy Adam, President of the ECR 2006

How to Manage your Radiologist – side effects for public hospitals aiming at more profitability.

Jürg Hodler, MD, Professor, Chief Radiologist, Head of department Quality Management, University Hospital Balgrist, Zurich, Switzerland
Six Sigma Tools to Improve Hospital Management – the Son Dureta experience.

Carles Ricci, CEO, Hospital San Dureta, Palma de Mallorca, Spain

Remote Patient Management via TV – telemedicine systems for patients with chronic diseases.

Hans Wischmann, PhD, Business Development Manager Telemedicine, Philips Medical Systems, Germany

Clinical Activity Based Process-Cost Coupling – a tool for the development of clinical pathways.

Eckhart Hahn, FACP, MME, Director Medical Department I, University Hospital, Erlangen, Germany

Guest lecture: Essentials of Managing Complex Healthcare Organisations.

Abdulrahman AlNuiam, MD, FRCPC, FACP, CPE, Professor of Medicine, Assistant Chief Executive Director,
King Faisal Specialist Hospital & Research Center, Riyadh, Saudi Arabia

Discussion

Session 2 – IT Solutions - Saturday, 4 March, 2:00 pm - 3:30 pm

How to Buy a HIS - management and strategies for a successful IT implementation.

Max Laimböck, Graduate Economist and Managing Director of Salzburg Federal Hospitals (SALK), Salzburg, Austria
„IT slows you down - why bother?“

Leonie Paskin, SDU Head Clinical Imaging and Medical Physics, Guy's & St. Thomas' Foundation, NHS Trust, London, Great Britain
Vendor, System Administrator and Management in a New Fully Digital Environment.

Attila Tóth, MD, Radiologist, Semmelweis University, Institute of Cardio-Vascular Diseases, Budapest, Hungary
Centralising the Management of Patient Data - e-health becomes reality.

N.N

Discussion

Session 3 – Financing - Sunday, 5 March, 2:00 pm - 3:30 pm

Financing of High-Performance Equipment in Radiology.

Ulrich Bosch, MBA, CFO of Sana Hospital Group, Munich, Germany

New Leasing and Financing Strategies to Guarantee Up-to-date Medical Technology for Practitioners and Hospitals. Claus Henneberger, General Manager, Philips Medical Capital Europe, Germany

Advanced Financing Solutions for Hospitals in Compliance with Regulations and Laws –
IT financing, PPPmodels, governmental fund integration and cross border transactions.

Reiner Vehrenkamp, PhD, Director Business Unit Healthcare Europe, De Lage Landen, The Netherlands

The Pros and Cons of Different Financing Methods to Fund Healthcare Investments – a focus on
leasing, private investments, private equity, PPP and fund raising.

Niko Maniadakis, MSc, PhD, CEO and President, General University of Heraklion, Crete, Greece

Discussion

R
&
M

RADIOLOGY &
MANAGEMENT

Whole Body MRI for Vascular Screening

By **Stefan G Ruehm MD**, Associate Professor of Radiology, Director, Cardiovascular CT, at the David Geffen School of Medicine, UCLA

Atherosclerosis is a serious health problem in developed countries and will likely emerge as the main cause of worldwide morbidity and mortality. Treatment strategies such as surgical procedures, percutaneous catheter based interventions or pharmacological options depend on the accurate classification of atherosclerotic disease with respect to location, extent, and severity of arterial involvement. For this purpose several imaging techniques, including conventional catheter angiography, duplex ultrasound, computed tomography-angiography (CTA) as well as magnetic resonance angiography (MRA) are in clinical use. It is well known that atherosclerotic disease is a systemic disease, usually affecting the entire arterial system. However, vascular imaging techniques commonly use a segmental approach, yielding diagnostic information limited to a single vascular territory. This largely results from inherent limitations of the established imaging techniques, such as risks associated with invasiveness, restrictions concerning contrast and radiation-dose as well as cost and time constraints. 90% of atherosclerotic lesions are identified below the aortic bifurcation. Thus the lower limbs are the most frequently affected vascular territory. Presently, peripheral vascular disease (PVD) accounts for 50,000-60,000 percutaneous transluminal angioplasties, implantation of 110,000 vascular prostheses and 100,000 amputations annually in the USA alone.

PVD is frequently associated with carotid, coronary, and renal arterial disease reflecting the systemic nature of atherosclerosis.

A comprehensive assessment of the underlying vascular pathology is required to manage

atherosclerotic disease adequately. Lack of ionising radiation and non-nephrotoxic contrast agents in combination with a high diagnostic accuracy have prompted the rapid implementation and acceptance of MR angiography as the modality of choice for evaluating arterial disease in many institutions worldwide.

Associated tissue enhancement outside the vascular tree and contrast dose limitations had initially limited contrast-enhanced 3D MRA to the display of an arterial territory contained within a single field-of-view extending over 40-50 cm. The implementation of 'bolus chase' techniques allowed extending the coverage to visualise the entire run-off vasculature, including the pelvic, femoral, popliteal and trifurcation arteries. The implementation of faster gradient systems, which have become available on the latest generation MR systems, enabled the extension of the bolus chase technique allowing for whole body coverage extending from the carotid arteries to the trifurcation vessels with acquisition times for up to five three-dimensional (3-D) MR angiographic data sets of less than two minutes.

In a recent study, whole-body MRA was employed in 180 consecutive patients (3,000 vascular segments) with suspected peripheral vascular disease (Ruehm et al., *Int J Cardiovasc Imaging*. 2004;20(6):587-91). The used dose of contrast agent was comparable to the dose commonly used for peripheral MRA. The examination time of less than 15 minutes per

study can be regarded as very short and exceeds the examination time for monostation MR angiography by less than 10%.

The use of whole-body MRA revealed additional and clinically relevant disease in 42 out of 180 patients (48 vascular segments), including renal artery stenosis (27 cases), carotid arterial stenosis (21 cases), subclavian artery stenosis (5 cases), and abdominal aortic aneurysm (7 cases). Confirmatory studies in 20 patients, performed based on the additional vascular pathologies detected by whole body MRA, revealed no false positive or false negative findings.

The high degree of concomitant arterial disease in patients with PVD underscores the systemic nature of atherosclerosis. Patients with intermittent claudication are at particularly high risk for atherosclerotic disease in other parts of the circulation. Studies on the prevalence of coronary artery disease in patients with peripheral vascular disease show that the history, clinical examination, and electrocardiography typically indicate the presence of coronary artery disease in 40-60% of such patients. Coronary artery disease often may be asymptomatic and masked, because patients may be capable of only limited exercise. The link between peripheral vascular disease and cerebrovascular disease seems to be weaker than that between peripheral vascular and coronary artery disease. Duplex ultrasound has revealed carotid disease in 26-50% of patients with peripheral vascular disease and this group of patients is considered at

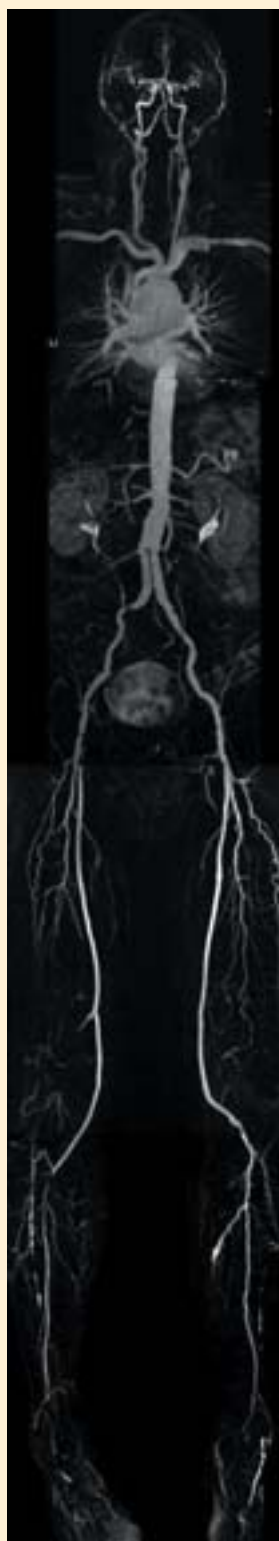
increased risk for cerebrovascular events.

Approximately one-fourth of patients with peripheral vascular disease have hypertension. The possibility of renal artery stenosis should be considered in these cases. In the examined study population 22 patients (12%) had renal artery disease with a degree of stenosis exceeding 50%.

Globally, expert panels have advocated targeting high-risk individuals for primary prevention. Risk factors, which are known to predict cardiovascular events, include systemic hypertension, cigarette smoking, elevated levels of cholesterol and triglycerides as well as low levels of LDL, and diabetes mellitus. All these risk factors are readily identifiable by a combination of physical examination, laboratory analysis, and patient history. Whole-body MRA offers a unique opportunity to assess what damage, if any, has already been inflicted on the vascular system. It might serve as an adjunct to further stratify the risk of a patient with a certain constellation of laboratory and clinical findings.

Arguments are ongoing about the value of screening all patients with peripheral vascular disease, symptomatic or not, particularly for carotid disease and aortic aneurysms. Patients with claudication are undoubtedly more likely to have significant asymptomatic disease in these vascular areas than the general population. Nevertheless the treatment of asymptomatic carotid disease remains controversial. Whereas findings in more recent studies appear to indicate an unequivocal benefit associated with the treatment of advanced carotid artery disease, the issue of the yield versus the cost of such screening tests is significant.

When discussing the value of



Whole body MR angiography in a 72-year-old male with bilateral leg claudication and status post aorto-biiliac graft, as well as bilateral femoropopliteal bypass graft. Note high-grade stenosis of left internal carotid artery and occluded trifurcation arteries

Ultrasound: Improving performance and speeding up communication

With over 55 years experience in diagnostic ultrasound, Aloka is the biggest independent manufacturer that is fully dedicated to diagnostic ultrasound. The company's Prosound Alpha series represents the sophisticated and latest performance level in high-end and premium ultrasound. The *Prosound Alpha 5*, dedicated to high-end ultrasound, was launched in 2004, and the premium ultrasound system *Prosound Alpha 10*, new beamformer/front-end technology, was introduced at ECR 2005. **Alpha 10** - opens a new gateway to improved diagnostic levels. Key technologies, such as 12 bit digital beamformer, Quint Frequency Imaging, Pure Sound Transmission (PST), Hemispheric Sound Technology (HST) and Definitive Tissue Harmonic Echo (D-THE), are the bases of the Prosound Alpha 10 development.

The compound digital beamformer allows full access to all ultrasound parameters, resulting in a unique, exceptional quality level regarding spatial resolution, contrast resolutions, frame rate and artefact suppression in 2-D,



The Alpha 5

Real-time 3-D, M-Mode and Doppler modalities. Another introduction is e-Flow or Contrast Flow, a unique technology to visualise blood perfusion at the highest achievable sensitivity.

E-Flow requires the new compound beamformer technology and is exclusively available on Prosound Alpha 10 systems. A Doppler-based technology, e-Flow allows diagnosis of smallest vessels at lowest perfusion. Whereas contrast agents were required before, e-Flow enables tissue perfusion to be visualised.

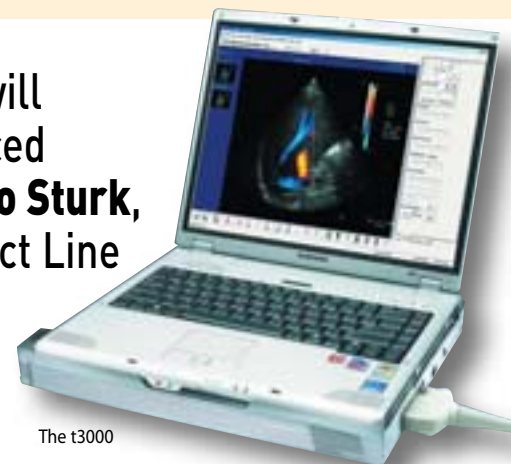
Prosound unlimited is open system architecture, ready for future technology introductions and developments via upgrades only. Access to digital raw data for research is available, along with the use of new transducer generations - Compound Array Probes, a technology that enhances focus precision in elevation direction and provides a homogeneous image performance throughout the entire image depth.

At the ECR, Aloka will present the next generation of Alpha 10 performance. With Prosound

At ECR 2006, Aloka will present three advanced products. **Hans-Guido Sturk**, the company's Product Line Manager, General Imaging, reports



The Alpha 10



The t3000

Alpha 10 and Alpha 10 Premier the company can provide this sophisticated technology at wider spread of budget levels.

Alpha 5 - represents the performance level in the high-end segment, without compromising ultrasound performance in 2-D and Doppler modalities. With the new High Density Digital Front End (HDDF), High Resolution Front Side Bus (HR-FSB) combined with Pure Sound Transmission (PST), Hemispheric Sound Technology (HST) and Definitive Tissue Harmonic Echo (D-THE), Aloka provides the standard in high end ultrasound. Combined with a new intelligent Data Management System (iDMS) reliable clinical diagnosis is combined with easy, fast patient data documentation. In the next level of performance

In production: A scanner with the biggest gantry aperture and widest scan field

screening patients for abdominal aortic aneurysms (AAA) several points must be considered. For unknown reason, the prevalence of abdominal aortic aneurysm has been increasing steadily over the past 40 years. Furthermore, AAAs are rarely symptomatic until they rupture, by which time the opportunity to intervene has usually been lost. In addition, the mortality rate of aneurysm rupture generally exceeds 80%.

Selecting asymptomatic patients to screen for AAA remains a controversial topic with a wide range of recommendations. In random screening groups, the incidence of AAA is reported to be 2-3%, with 75% of the aneurysms found in individuals over 60 years old. The likelihood of having AAA is increased in smokers, older individuals, males, and individuals who have CAD, PVD, or a first-order relative with aortic aneurysm.

Therefore screening for AAA in patients with PVD may be an important way to eliminate a preventable source of mortality, because an abdominal aortic aneurysm is asymptomatic, life threatening, treatable and amendable to detection by noninvasive tests.

In summary, whole-body MRA allows for a quick, risk-free, and comprehensive evaluation of the arterial system. Whole-body MRA is characterised by its noninvasiveness, three-dimensionality, extended coverage and high contrast conspicuity. The technique is well suited for the assessment of the peripheral vasculature with comparable diagnostic accuracy compared to MRA studies focused on the lower extremity vessels only. In addition, it yields accurate data regarding the remainder of the arterial system.

However, it is noteworthy that the outlined technique, although referred to as whole-body MRA, does not include the intracranial or coronary arteries. For both

vascular territories a dedicated approach is still required. Nevertheless, whole-body MRA offers the opportunity to integrate dedicated imaging protocols for the cerebral vasculature and cardiac imaging. Time-of-flight (TOF) MR angiography, a flow dependent imaging modality that does not require the additional administration of contrast agent, can easily be added for imaging of the intracranial vessels. This technique is sufficient to detect small intracerebral aneurysms.

MR display of the coronary arteries remains challenging. Encouraging results have recently been demonstrated based on the combined availability of navigator-techniques and intravascular contrast agents. However, at present the latest generation of 64-slice multidetector computed tomography (MDCT) systems appear to provide more reliable results in patients with suspected coronary artery disease.

Conversely, MR imaging offers the opportunity to most accurately assess right and left ventricular ejection fractions, cardiac mass, and valve function. Furthermore the evaluation of myocardial contractility, both under rest and stress conditions, is feasible, as well as the identification of transmural and nontransmural subendocardial infarcts. The additional incorporation of a cardiac imaging algorithm would prolong the vascular screening protocol based on whole-body MRA by approx. 30 minutes.

Ongoing hard and software improvements, including dedicated surface coil designs, automated table motion techniques, parallel imaging protocols, particularly in combination with high field scanners (3T) and the recently introduced 32-channel MR systems, as well as the development of new MR contrast agents, promise to further add to the practicability and diagnostic accuracy of whole-body MRA.

Contact: sruehm@mednet.ucla.edu

Following enthusiastic reactions to the Aquilion Large Bore (LB) scanner, when shown as a work in progress at last year's ECR, and with orders in hand, Toshiba has commenced production.

Explaining its success, the company said: 'Using technology developed for the very successful Aquilion 64 scanners, the new 16 slice Aquilion LB, multislice computed tomography (CT) scanner offers the best performance yet available in large bore CTs. It features the industry's largest gantry aperture of 90 cm and a 70 cm acquired field-of-view, covering more anatomy with greater accuracy than ever before. The 70cm scan field is 40% greater than other large bore CT systems and offers diagnostic quality without compromises. The larger field-of-view eliminates hidden anatomical areas for improved diagnosis and simulation. By virtue of Toshiba's renowned Quantum Detector technology a full 70cm field of view is accomplished, without extrapolation algorithms. This method provides superior image quality across the entire image.'

Accommodating patients of all sizes, placed in various positions, the 90cm gantry aperture combined with the long scanning range of 1.8 metres has almost no limitations, the firm points out. (Specialised radiotherapy tabletops, fitting a wide range of positioning devices, are also available). Other assets reported by the firm:

- Volumetric chest examinations can be completed easily within a single breath hold. The combination of the 32mm detector width and 0.5-second scanning allows up to 96mm to be scanned per second.

- Due to the long scanning range and high scanning speed, whole-body trauma examinations can be

acquired in under 20 seconds

- This being the widest bore aperture available, new dimensions for maximum flexibility in oncology treatment planning can be set. (To address oncologists' needs, Toshiba Medical Systems Europe worked with the firm CMS, for CT radiation simulation, and A2J, which specialises in laser positioning devices).

Within the 16-slice Aquilion LB the detector technology (ranging from 4 to 256 channels) is the same as Toshiba's established Aquilion series, and provides '...the thinnest, and most accurate 0.5mm slice widths in the market,' Toshiba points out, adding: 'The Quantum detector of the Aquilion LB is the only detector to provide three different slice-width acquisitions, enabling the acquisition of isotropic images in all anatomical planes, using the lowest dose.'

The firm also reports that image quality is superb due to a high-contrast resolution of only 0.35mm in x, y, and z directions, and a low contrast resolution that can depict objects as small as 2mm, with contrast differences of only 3HU.

'The quantum de-noising software lets users balance the trade-off between dose level and image quality,' Toshiba adds. 'Standard doses either can be kept to improve image quality, or doses can be lowered - by as much as 50% - to retain image quality.'



Finland's Kuopio University Hospital will be among the first to install an Aquilion LB

Isotropic data to aid clinical studies

The firm has developed isotropic imaging based on the standards of 0.5mm slices for the head and 1mm slices for the abdomen - a level of scanning that could aid studies of cerebral circulation, lungs, spine, joints and extremities. 'Isotropic data sets also markedly improve the quality of MPR and 3-D reconstructions, which help radiologists not only to diagnose, but also to manage the huge amount of data generated by multi-slice scanners,' Toshiba explains, adding that the CT technology provides true isotropic voxels, which greatly enhance most clinical studies, including examinations of lungs, joints, extremities and CT angiography.'

For advanced image reconstruction the new large bore scanner includes TCOT, a true cone-beam technology that uses a Feldkamp helical reconstruction technique. Thus, Toshiba explains, artifacts related to cone angle are minimised and accuracy across the entire field of view is increased.

(to be introduced at the ECR) Contrast Harmonic Imaging used with leading ultrasound contrast agents impressively demonstrates technology migration to the Prosound Alpha 5 system level. Detection of the lowest contrast agent concentrations allows visualisation of tissue perfusion on smallest vessels level.

The t3000 - This mobile laptop-based ultrasound machine, which weighs under 3.6 kg, results from a co-operation with Terason Inc. Burlington, MA, USA. It has a 256-channel-hybrid-digital-beam-former, and addresses all major applications and probe technologies.

The software is standard OS-based and can be driven like any other PC application, resulting in exceptional ultrasound performance that is easy to learn and use. Latest screen/ monitor technology produce excellent images and display on large sizes.

Ambulances, A&E and other departments can use this smaller equipment without compromising ultrasound performance levels. The reliable system architecture supports highly swappable probe connector technologies, changing probes during examinations. High-resolution 2-D and PW- and Colour-Doppler capabilities are standard on any t3000.

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CONTRAST at the right time - at the right place

Medtron AG, which designs and markets high-performance contrast agent injectors for use in CT, MRI and angiography, constantly aims to meet the demands of the latest scanner generations and advancing medical requirements, along with patient comfort and cost effectiveness. 'Injection systems for simultaneous or sequential injection of contrast agent and saline solution, meets those demands,' Medtron points out. 'We recognised at an early stage the chances of CANopen technology and were the first to support an interface based on this standard.'

Based in Saarbrücken, Medtron has qualified partners in many countries who distribute and maintain the firm's devices and corresponding disposables - e.g. syringes, automatic filling kits or specially designed customer solutions.



MEDICAL DEVICES



Save time! Don't change media containers



NEW

In 1982, **ulrich medical** - a 3rd generation family concern based in Ulm - presented the first contrast agent injector for CT examinations. Twenty years on, ulrich not

only offers a high-end portfolio of contrast agent injectors - many installed on the fastest MSCTs - but it also has a highly active international distribution network.

'Unlike common syringe injectors,' ulrich explains, 'all our injectors are based on the special roll pump system. Pre-loading syringes is not necessary because injection is made directly from the media container, a feature that allows big storage bottles to be mounted. So several injections can be made consecutively without loading or decanting media. This comfortable handling contributes to a high patient turnover, as well as the saving of time and costs for disposables. In addition to the economic performance and consumption, the construction principle

of a roll pump system reliably ensures the hygienic safety for multi-dosing.'

In addition to its CT injector **ohio tandem**, the company has now developed the **ohio M**, to also provide the tandem function for MRI examinations. This means two different contrast agents can be chosen without a time-consuming change of media containers. 'Because two of the three media accesses can be equipped with different contrast agents, the optimal contrast medium, plus NaCl for each patient or examination, can be chosen without re-organising the daily workflow,' ulrich points out.

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Contrast agent injector with NaCl for CT and MRI
ohio M with tandem function

One for all - come and find out:
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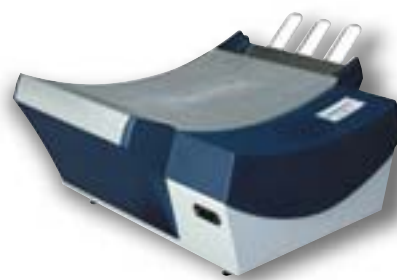
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NEW ■ NEW ■ NEW

The tabletop film processor

NEW



Ecomax - a brand new plug and play system for analogue X-ray film processing - is being launched at the RSNA by the Oberstenfeld-based company **Protec Medizin-technik GmbH & Co. KG**. The firm reports that this concept of mounting all components that substantially influence image quality (e.g. pumps, heaters, guide bars, rollers etc.) has resulted in:

- optimised image quality due to a brand new tank design
- reduction of wasted chemicals due to oxidation, because of smaller tank sizes (environment-friendly and money-saving for consumables)
- less required space, due to the more compact overall processor design
- easier access to components that require regular maintenance saves time and reduces maintenance costs

• preset, optimal parameters ensure consistent good results. To be marketed early next year, Protec adds: 'Ecomax convinces with its simplicity, its design and the image quality it produces.'

Protec entered the X-ray film processing market in 1984, then, in 2001, in order to play a major role in digital growth, the firm set up **Protec medical information systems**. Today the company has a worldwide dealer network of dealers that sell its products in almost 100 countries, accounting for an export share of over 90%.

Mammography

Greater control plus comfort

Immobilisation of the female breast for diagnostic examination and biopsy is one of the prime foci of the Noras Company. In 1996 the predecessor of the firm's well-known MR-BI 160 Biopsy Unit was submitted for a patent; today over 500 of these are at work worldwide.

Based on resulting clinical experience, this unit and other products have been further developed: the MR-BI 160 PA Unit consists of a padded patient support table and a variation of the **MR-BI 160 Unit**. Using this version, imaging can be carried out



with the spine coil and/or other coils of an existing system, for example.

The device immobilises the breast under examination and provides needle guidance during a biopsy. Immobilisation is realised by the compression unit, which can be rotated by 360° parallel to the frontal plane for optimum

accessibility to the lesion. Noras also points out that a further development of the well-known **PE 162 Positioning Unit** is used for needle guidance and offers access to areas close to the axillary region (chest wall).

System independence, simple assembly and disassembly and easy cleaning (the system is 100% plastic), plus comfortable patient bedding, are among the unit's many other advantages. Additionally, the components of the biopsy unit are made of Peek and can be reused after disinfection/sterilisation.

* A special Noras adapter permits use with the Vacora Vacuum Biopsy System of the C R Bard Company.

Mobile patient positioning table with quick-change battery

The bucky table is an inexpensive tool for X-Ray departments. However, due to the increasing use of movable stands, especially combined with digital imaging receptors, further requirements for a patient positioning table arise. Along with tabletop movements in XYZ directions, to optimise the advantages of movable stands, table movement is desirable with a patient in the room. To this end, **Provotec GmbH & Co. KG**, based in Espelkamp, has developed the **Prognost XPE** - a mobile patient positioning table with floating and motorised elevating tabletop that allows variable patient positioning as well as

the optimal use of modern X-ray tube/image receptor combinations.

Not having a line cable makes the **Prognost XPE - Akku** particularly comfortable, Provotec also points out. 'A rechargeable battery (accu) supplies sufficient energy for moving approximately 120 patients up to desired working heights. While one accu supplies energy to the table, another is loaded in the loading station. This is very user-friendly, because the accu can be changed simply, quickly and without a tool. Even if charge signals are overlooked and the accu is "suddenly" empty, changing it takes only seconds. The

loaded accu can be removed with one hand from the loading station and replaced in the Prognost XPE - Akku against the empty one.'

To take a look at the bucky table during ECR please visit Elektron, Booth 352, Expo C or General Medical Merate, Booth 315, Expo C.



Gender differences in cerebral activation when viewing erotic stimuli in fMRI

By **Dr Elke Gizewski**, fMRI specialist, Dept. of Diagnostic and Interventional Radiology and Neuroradiology, University Clinic Essen

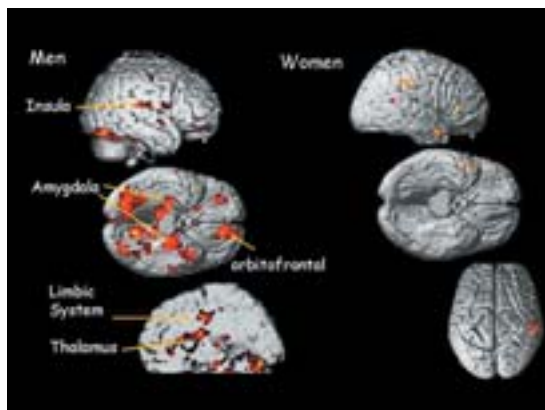


Fig. 1: For analysis of specific activation, the contrast images of all groups were entered into a two-sample t-test. Interaction-related increase in MR signal is superimposed on three orthogonal sections of 3-D T1 weighted standard brain. When viewing erotic film excerpts, statistical parametric maps of areas activated more prominently in men compared with women. Results show activation of left thalamus, left amygdala, anterior cingulate, bilateral orbitofrontal, and insular cortex

left thalamus, bilateral amygdala, anterior cingulate, bilateral orbitofrontal, bilateral parahippocampal and insular regions (Fig. 1). When comparing men with women scanned during their menses, similar superior activation was found in men. There were no areas of significant superior activation for women compared with men. Comparing women in mid-luteal phase and during their menses, superior activation was revealed for women in mid-luteal phase in the anterior cingulate, left

insula, and orbitofrontal cortex (Fig. 2). Sexual arousal was assessed using standard rating scales and did not differ significantly for the men and women during mid-luteal phase, but women in menstrual phase rated significantly lower than the two groups.

Differences in cerebral activity during processing of erotic stimuli can be studied by functional brain imaging. Although hormonal phases of the menstrual cycle influence the specific activation

patterns associated with viewing erotic stimuli, gender has the greater influence on differences of cerebral activation patterns. However, there are differences in cerebral activation for women in different cycle times with superior activation in emotion related areas during mid-luteal phase.

These findings may represent a biological representation of differing processing of erotic stimuli, but we cannot answer the question of the underlying mechanisms (genetic predisposition, learning, social factors etc.).

Functional MRI (fMRI) is a widely used method capable of mapping functional regions of the human cortex in near real time during specific tasks. Of particular interest is the opportunity to observe secondary cortical responses, activation due to imagined tasks, memory function, time-resolved pathways through cortical regions, and activation in sub-cortical structures. fMRI uses blood oxygenation changes, which can be imaged continuously while functional centres are being stimulated. Image intensity becomes brighter in signal if more oxygenated blood enters the particular brain area. This concept allows the use of blood oxygenation mechanism to image neuronal activation. Visualisation of this effect is accomplished by simple image

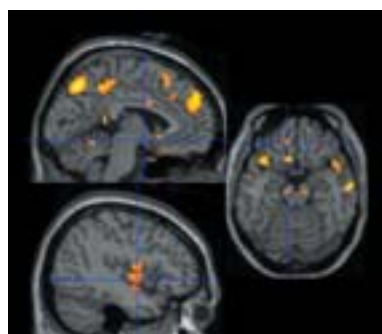


Fig. 2: When viewing erotic film excerpts, statistical parametric maps of areas were more prominently activated in women in mid-luteal phase, compared with women scanned during their menses (paired t-test). Results show a superior activation of women in mid-luteal phase in the orbitofrontal, cingulate cortex and left insula

subtraction, or by comparison of intensity changes as a function of the paradigm application frequency. Using this method, and statistical analysis of every voxel, leads to a functional map.

There is evidence in common sense and psychological studies that men experience more sexual arousal than women, but also that women in mid-luteal phase experience more sexual arousal than women outside this phase. Recently, a few functional brain imaging studies have tackled the issue of gender differences as pertaining to reactions to erotica. The question of whether or not gender differences in reactions to erotica are maintained with women in different cycle phase has not yet been answered from a functional brain imaging perspective.

To examine this issue, fMRI was performed in 22 male and 22 female volunteers. Subjects viewed erotic film excerpts alternating with emotionally neutral excerpts in a standard block-design paradigm. Arousal to erotic stimuli was evaluated using standard rating scales after scanning.

A superior activation for men compared with women in mid-luteal phase was found in the

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