France: Transplant surgeons perform outstanding feats

Simultaneous surgical successes open new perspectives for multiple transplants

Three exceptional transplant procedures successfully occurred in France within one month as 2012 neared its end. Two were on cancer patients; the third involved the simultaneous transplant of five organs of the digestive system.

At the CHU (University hospital) of Rennes (western France) the head of the biliary-hepatology department Professor Karim Boudjema performed ex vivo surgery on a 64-year-old woman suffering liver cancer. The tumour being quite large (60% of the liver), the liver had to be removed from the abdominal cavity, refrigerated and placed under extra-corporeal blood circulation. First, the damaged organ had to be removed, with a sectioning of arteries and veins while the patient was connected to a blood circulation device outside her body. Then the work was centred outside the body and the cancerous area of the organ was removed. Finally, the organ could be re-transplanted.

The whole procedure took around 11 hours, involving 15 members of staff.

This was the fifth surgery of its kind in 10 years in France. Compared to some 3,000 ‘classical’ liver cancer operations conducted in vivo, inside the body. ‘In France we are the only ones able to do it because our centre has both surgery and liver transplant specialists,’ Prof. Boudjema explained, adding that this type of surgery has been performed once in the United Kingdom and once in the USA.

The ex vivo technique is necessary when the tumour has invaded the arteries and the veins, which must be reconstructed, and when more time and accessibility to the damaged organ is necessary. The liver has to be extracted and refrigerated and maintained at a temperature of 4°C, to avoid asphyxia during this lengthy procedure. ‘It would have been impossible to do that job, which took two and a half hours, inside the body’, the professor explained.

Coincidentally, another exceptional surgical procedure took place at the same time in a public hospital.
The Cerdanya Cross-Border Hospital

**Spain – France**

**Report:** Dr. Eduardo de la Sota

In response to the need for quality health services as well as urban development, the European Commission has supported a project to build a cross-border hospital in North Catalonia. The ERDF (development fund) has agreed to support the project to the tune of €31 million, or 60% of the total cost of €51 million.

Given that this is considered a priority, the project is currently progressing despite Spanish healthcare economics. The new Hospital is planned to begin functioning by mid-2015.

Cerdanya's Cross-Border Hospital is pioneering as Europe's first health care centre to provide care for populations on both sides of the border, i.e. we serve both the Catalan and French sides of the regions of Cerdanya and Capcir (France). The center will significantly improve health-care provision in this border area, which, due to its mountainous location, suffers accessibility problems. The hospital will care for a permanent population of 60,000 as well as influxes of over 100,000 more during holiday seasons. Initially, residents of Cerdanya and Capcir had no facility for acute or surgical care within their hospital territory. Nor did they have access to obstetric care. These issues will be resolved when the 68-bed hospital opens in 2015. Basically, the project aims to:

- Improve access to healthcare for people in Cerdanya and Capcir, by removing barriers to the liver, pancreas, stomach, duodenum and small intestine.

During the highly complex operation, four surgeons, four anesthetists and one intensivist, took part in the operating theatre over a period of 12 hours. All the digestive medicine departments also participated in the operation.

The young man was suffering from a rare congenital disease identified when he was eight years old, which led to a damage of alimentary canal muscles preventing him from feeding himself normally. Helped by his family, he had survived up to now through parenteral nutrition, but for some time that feeding had become impossible due to a thrombosis of the venous axis. To overcome such a major obstacle, radiologists in Prof. Vilgrain's department and anesthetists and intensivists in Prof. Wiener's department, installed a catheter directly into the vena cava inferior, to enable an intestinal transplant that had become of vital importance. To allow oral alimentation, this transplant case had to include the stomach and duodenum. Since there was hepatic damage because of long-term parenteral feeding, a concomitant liver transplant appeared preferable. Considering the multiplicity of transplants, the surgical team made the decision to conduct a single joint operation of the whole alimentary canal.

### Challenges

The ageing population, lack of professionals, financial management, harmonisation of policies of the different administrations, coordinating the different countries and parties involved, ensuring that the project’s ideological strength takes precedence over political agendas and ensuring that the beneficiaries of this project, i.e. the general population and healthcare workers, embrace the project, are all difficulties to be faced.

### Current situation

Dr. Victòria Peralta, Director-designate of the Cerdanya Hospital, presented in mid-2013. An ambulatory centre has already opened, thus advancing the Cerdanya region’s healthcare network.

### France: Transplant surgeons perform outstanding feats

Continued from page 1

The Cerdanya Cross-Border Hospital

**Victòria Peralta, Cerdanya Hospital**

- jointly set up a cross-border organization to construct and manage the complex, which is designed to provide acute care to short stay patients
- integrate the two regions’ healthcare systems
- establish a hospital that makes setting up a cross-border health network possible
- ensure a special governance and management structure that respects the identity characteristics of both sides of the border
- integrate the project in the Euro-region and take account of future European issues, such as the ageing population and ageing healthcare workers, notably attracting and retaining the latter.

**Project background**

In 2001, the Pobres de Puigcerdà Hospital Private Foundation (FHP) and Perpignan Hospital Centre reached an emergency service and training agreement to accept French patients sent for emergency care from the Perpignan Hospital Centre.

In 2008, the Cerdanya Cross-Border Hospital Private Foundation (July 2006) is responsible for sponsoring, monitoring and promoting the project.

**Multiple organs removed and replaced**

During December, a rare case of surgery was performed. It involved the removal of a stomach, the duodenum pancreatic duct, liver and small intestine, as well as the removal of 37.5% of the patient's spleen. In this case, it was performed in the world, the hospital management stated.

It was the only surgical team available for this patient to eradicate the cancerous lesion. The success of the procedure proves it’s possible, in certain cases, to treat patients efficiently who up to now could only be offered palliative treatment, and... at this point, the patient who is in her fifteenth month, shows no complications. The head of AP-HM (Assistance Publique-Hôpitaux de Marseille) announced.

The surgery lasted for more than 12 hours. Initially, it was necessary to remove more than 50% of the pelvic bone and retrieve a part of the rectum. Then the missing part of the pelvic bone was reconstructed, using the removed rib in the section and a prosthesis. The nerves were grafted using the removed rib, but for some time that feeding had become impossible due to a thrombosis of the venous axis. To overcome such a major obstacle, radiologists in Prof. Vilgrain’s department and anesthetists and intensivists in Prof. Wiener’s department, installed a catheter directly into the vena cava inferior, to enable an intestinal transplant that had become of vital importance. To allow oral alimentation, this transplant case had to include the stomach and duodenum. Since there was hepatic damage because of long-term parenteral feeding, a concomitant liver transplant appeared preferable. Considering the multiplicity of transplants, the surgical team made the decision to conduct a single joint operation of the whole alimentary canal.
Russian cancer research team gains international funding

Heinz Kölking, president of the European Association of Hospital Managers (EAHM), passes the ball to the hospital managers. They, Kölking stresses, need to screen their staff with utmost care taking into account professional qualifications, experience, and social skills – no matter whether the physicans applies for a permanent or a temporary position and whether they are from Germany or abroad. The EAHM President recommends that hospitals need to work on and implement standardised procedures with defined criteria and steps. ‘The criteria must be designed in a way that formal qualifications of a foreign applicant can be evaluated.’ But we genes similar in its structure and supplemented by an Internet search. He hopes that such a certificate will help hospitals to screen their applicants better.

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A large survey for leading German health insurers has resulted in a hospital evaluation portal that enables patients to compare and choose a doctor and treatment or care centre very quickly.

Report: Dr Jörg Raasch

Thanks to compulsory health insurance in Germany no citizen is without insurance cover. A mere 7 percent of people’s healthcare is privately insured. Nevertheless, over the past decade the number of patients who changed doctors or hospitals has decreased significantly, mostly by way of mergers and acquisitions, and price-driven competition. Today, large and powerful insurance companies shape German healthcare. Several of these major insurers commissioned repeated surveys of their members to get a clearer picture of customer satisfaction with the medical services provided – and to distinguish themselves from the competition. Between November 2011 and October 2012, two big players, AOK and Barmer GEK, surveyed about one million patients right after their hospital stay; 450,000 insured responded. The scientifically designed survey questionnaire contained 15 questions regarding satisfaction with medical care, the organisation of the hospital and whether they would recommend the organisation of the hospital. Finally, the patients were asked whether they would recommend the facility. The results were integrated into the so-called White Lists (White List), an online portal created in 2008 by the not-for-profit and privately funded Bertelsmann Foundation and the umbrella associations of all major patient and consumer organisations. This portal allows patients in Germany to compare healthcare institutions and supports their search for a suitable hospital, physician or care facility.

Survey results

In general, the patients were satisfied with the care they received: 82 percent of the surveyed would recommend their hospital; 83 percent were satisfied with the medical care and 82 percent would recommend the nursing care. At 79 percent, the satisfaction with hospital organisation and service was slightly lower. However, patients did notice significant differences between hospitals. Two thirds of the facilities mentioned by the patients receive a positive rating of 80+ percent. The rest is lagging; 2.1 percent were rated below 70 percent, meaning they are recommended much less, Jürgen Grauland, Chairman of the Board announcing survey results in Berlin of AOK Bundesverband explained, summing up the results when the survey was presented at a Berlin press conference. He also pointed out that younger patients tend to be more critical than older ones: while about 84 percent of the 60-80-year-old patients were prepared to recommend their institution, among the 20-40-year-olds the rate was only 75 percent.

No ‘soft’ data

The significance of patient experience is confirmed by a study headed by Felix Greaves, whose results were published in the February 2012 issue of ‘Archives for Internal Medicine’ (Associations Between Web-Based Patient Ratings and Objective Measurements of Hospital Quality). ‘According to this study the patient evaluation of British hospitals correspond to a large extent with objective quality assurance results. For example, patients’ perception of a hospital’s cleanliness and the rates of infections with dangerous pathogens in this hospital, correlate.’

Thus, any argument that data derived from scientifically sound patient experience surveys are merely ‘soft’ data is not convincing, Gerd Billen, head of the umbrella association of the consumer protection organisations, said at the conference.

Online portals drive quality improvements

Patient evaluations are not only integrated into the hospital portals ‘Weisse Liste’ they are also an important feature of the websites maintained by the participating health insurers. A consumer-oriented glossary with 5,000 healthcare terms was created and today complements the information on the hospitals’ service portfolio and quality. (www.aok.de/healthcarehaus- nachwort; www.krankenhausausweis.barme-ger.de). German hospitals are required by law to report quality assurance data covering services areas and quality indicators with the aim to offer a transparent view of the quality of care. Service areas are, for example, inpatient and outpatient delivery and cardiac catheter interventions; quality indicators encompass inter alia the frequency of complications or readmissions.

What is the influence of differing payment models?

‘There may be a great diversity of users in the US – national and regional payers, federal payers, and private pay – but there is a noticeable trend towards standardisation of models in the context of reform. Premier is involved with the evolving accountable care delivery models, which will also drive change.

Why does the US pay a higher price for equipment than Europeans?

‘For one, there is a deeply ingrained system of reps over here, who all take their margins, and there is an added cost associated with increased advertising addressing end customers – the consumers. The standard of living is higher in the US and Europe will learn from each other. There is also more demand for absorbing this tax in working aggressively to protect our members from higher costs. Tax is the responsibility of the manufacturers. Healthcare reform rests on the principle of shared sacrifice; hospitals are not responsible for absorbing this tax, simply and plain.’

Can Americans learn from Europe and/or vice versa?

‘Innovation in care will be required regardless, and the US may be a leader in that respect, which in turn may drive costs up. However, play- ers on both sides can learn about the values of a free market. Premier strongly believes in a highly competitive market for goods and services in the healthcare sector; in such market, without patient’s hospital margins that are not eliminated by the market, we’ll go in and eliminate competition, except for low-skill tasks such as sourcing - stoking the fire of competitive- itiveness. There are some very large economies of scale. In pharmacy care, reimbursement and for patient empowerment. In the US, not many pharmaceuticals are used. Patients in Europe many will be able to pursue a healthier diet. Improvements in lifestyle could help prevent disease – it will be exciting to see how the US and Europe will learn from each other;’

Interview: Michael Reiter

Premier is a provider-owned performance improvement alliance of 2,700 hospitals and 90,000-plus non-academic medical centres in the US, as well as the German Hospital Procurement Congress (Bewirtschaftungskongress) in Berlin. Durlal Gilbert, President of the US firm Premier Supply Chain Services, who was presenting cost-cutting strategies that might also help hospitals in Europe.

‘Lending has loosened a bit in the US over the past year, after a very difficult situation in the preceding two years,’ Durlal Gilbert observed, when asked about the US hospital financing situation. ‘However, debts have to be serviced, which is where the issue of liquidity comes in. In the context of reimbursement cuts, American hospitals face the challenge of cutting cost and optimising profitability and cash flow.

How is Premier’s alliance post- tered for the US healthcare hospitals and health systems?

Gilbert: At Premier, we understand that the price pressure is well beyond the supply chain cost, but includes eliminating any unnecessary waste, inefficiencies and human capital costs, such as benefits. The second focus is on increasing quality of care. For a long time, the belief was that achievements such as reducing length of stay, minimising complications and avoiding infections, as well as improving mortal- ity rates, were impossible in the context of hospital reimbursement. Our alliance of hospitals have demonstrated, at a national level, that it is possible to improve health care at a lower cut cost by, for example, reducing readmissions.

How was this achieved?

‘Transparency is a core aspect in this context. It requires being able to compare one’s financial and clini- cal performance to that of peers – hospitals that are similar or which are located in the same region, to identify influences by geography. Reducing supply chain costs is another key aspect. Direct sourcing helps cut excessive cost by taking links out of the supply chain. For example, in lieu of specifications that manufacturers come up with, we have clinicians in our mem- ber hospitals who define specifications exactly for the gloves, isolation gowns, etcetera, that they require. Premier then sources these products that meet the demand of the hospitals.

We cut out the intermediaries that all take their margins, and there is an added cost associated with increased advertising addressing end customers – the consumers. The standard of living is higher in the US and Europe will learn from each other. There is also more demand for absorbing this tax in working aggressively to protect our members from higher costs. Tax is the responsibility of the manufacturers. Healthcare reform rests on the principle of shared sacrifice; hospitals are not responsible for absorbing this tax, simply and plain.’

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Speaking at the German Procurement Congress late 2012 – Durlal R Gilbert. President of supply chain services with Premier: a USA-based provider-owned performance improvement alliance of 2,700 hospitals and 90,000-plus non-academic care providers, Gilbert joined the management of the University of North Carolina at Chapel Hill, where he was inducted into the prestigious Order of the Golden Fleece, and Duke University’s Fuqua School of Business, where he was selected for the distinction of Executive Fellow. He has previously served as Provost of Mercy’s随意 School of Business, where he was selected for the distinction of Executive Fellow. He has previously served as Provost of Mercyandleading in health care, insurance and financial services, as well as a provider of emergency services. In senior executive roles with a wide range of health care providers, and manufacturers. But whereas providers have endured billions in reimbursement cuts and more, some manufacturers are attempting to pass on the newly introduced medical device tax – a Federal Excise tax addressing drug products as well as pharmaceuticals – to hospitals. Premier has been a leader through- out the history of this tax, working aggressively to protect our members from higher costs. Premier has been a leader through- out the history of this tax, working aggressively to protect our members from higher costs. This tax is the responsibility of the manufacturers. ‘Healthcare reform rests on the principle of shared sacrifice; hospitals are not responsible for absorbing this tax, simply and plain.’
Ambulatory surgery

A leading expert reveals ways for hospitals to tackle more out-patient procedures

Report: Bettina Döbereiner

Massive and increasing cost pressure urges many hospitals to look for alternatives to expensive in-patient surgery. Ambulatory (or out- or day-patient) surgery centres associated with the hospital may be an option because these spin-offs promise significant savings in terms of beds, staff and valuable operating theatre time. Professor Michael Möllmann of St. Franziskus Hospital in Münster, Germany, is a renowned expert on the future-oriented design and operation of ambulatory surgery centres.

‘A hospital looking to offer day surgery services should consider a separate and lean organisation, which requires less staff that can be efficiently deployed,’ he points out, adding that, ideally the day surgery centre is a purpose-built, single-storey construction that is physically attached to the hospital. He recommends a circular or semi-circular building where a minimum number of staff can cover a maximum number of tasks and where the waiting, preparation, examination and recovery areas can be monitored from the centrally located admission area.

No matter what building shape is chosen, short distances are imperative: ‘The distance from the admission area to the operating theatre (OT) table must never exceed 10 metres, so the patient can cover it without assistance and quickly,’ he recommends. In many hospitals, he notes, it takes ten minutes from the patient admission area to the OT. ‘In the time staff spends en route,’ four to five additional patients could have been treated. ‘This adds up to an annual loss of several hundred thousand Euros,’ Professor Möllmann estimates. Moreover he recommends OTs with two tables, to ensure transition times between interventions of five minutes maximum. ‘With transition times of 30 or 40 minutes, ambulatory interventions are no longer profitable as only the mere OT time is being reimbursed.’

A successful day surgery centre also needs intelligent management. Professor Möllmann recommends workflow-oriented theatre planning as well as a fixed schedule with only one type of surgical procedure per day, to reduce transition efforts. The surgeon stays in theatre between procedures and no valuable time is lost. Anaesthesiology preparation for day surgery patients remains a crucial open issue, the professor points out. In Germany, prior to an intervention the surgeon assigns the patient to one of three groups in line with the classification of the American Society of Anaesthesiologists (ASA). Only patients in group 3 (ASA III) need to come for a pre-operative anaesthesia consultation; patients in the other two groups simply show up just before the surgery. ‘This intervention frequently leads to the difficult situation that a patient scheduled for surgery needs a more in-depth assessment and the anaesthesiologist is forced to decide whether to call off the intervention or turn a blind eye,’ Prof. Möllmann points out. A promising approach, Professor Möllmann explains, is a risk assessment and a pre-medication screening by telephone before the surgery, as developed by Professors Guy Ludbrook and Cliff Grant at the University of Adelaide, Australia. The surgeon forwards the relevant patient data to a call centre, which contacts the patient. The study so far indicates that the data quality provided by that telephone screening is comparable to that provided by conventional methods. Thus the surgeon has sound data on which to base a decision whether the patient needs to come for a pre-operative consultation or not.

Continued on page 6
Colorectal cancer screening

Aiming to raise safety and lower costs: The new NBI-based endoscopic classification (NICE)

Colorectal...regards to national guidelines also final diagnosis of the polyp nature endoscopist is obliged to leave the (hyperplastic) or adenomatous. The copy is to detect and remove any...Current clinical practice in colonoscopy is therefore to detect and remove any diminutive colorectal polyps...The economic downside of this well-established concept is the huge cost associated with the histopathological workup of retrieved polyps – particularly to evaluate diminutive polyps that are almost all benign anyway. Given that over 14 million colonoscopies are performed annually in the USA, and assuming that 44% of them find at least one diminutive polyp, Keswani et al. (Endoscopy 2011; 43(6): 683-691, DOI: 10.1055/a-0030-125681) have estimated that the cost for evaluation exceed US$1 billion annually in the USA – ‘a conservative estimate that does not consider related costs such as...‘...Therefore, recently an international group of renowned endoscopy experts suggested the so-called NBI International Colorectal Endoscopic (NICE) classification for assessment of small colorectal polyps (Hewett et al., Gastroenterology, Volume 145, Issue 3, September 2012, Pages 599-607.) This classification is based on the observation of three major criteria using NBI in close-up view:

1. Colour: light vs. browser relative to background
2. Vessels: None, or isolated, lacy vessels coursing across the lesion vs. tubular or branched white structures
3. Surface pattern: Dark or white spots of uniform size or homogeneous absence of pattern vs. oval, tubular or branched white structures surrounded by vessels.

The former alternatives suggest a hyperplastic, the latter an adenomatous polyp.

Is optical diagnosis safe?
As stated previously, current guidelines do not allow endoscopists to completely rely on optical diagnosis of polyps. In the USA, to change the state of care the American Association of Endoscopists (AAE) has issued a PIVI (Preservation and Incorporation of Valuable Endoscopic Innovations) (Gastrointestinal Endoscopy, Volume 73, No. 3; 2011) on real-time endoscopic assessment of the histology of diminutive colorectal polyps. For colorectal polyps <=5 mm in size to be resected and discarded without pathologic assessment, endoscopic technology should provide at least 90% agreement in the assignment of post-polypectomy surveillance intervals when compared to decisions based on pathology assessment of all identified polyps. The PIVI is intended to guide technologists and clinical investigators toward the design and testing of technologies that address these important clinical needs in diminutive polyp management, the AEGE explains in the rationale for this PIVI. Once endoscopic technologies meet an established PIVI threshold, those technologies are appropriately incorporated into clinical practice…”

What we need to make it happen
Some years ago, a first publication in the United Kingdom (Ignajatovic et al. The Lancet Oncology, Volume 10, Issue 12, Pages 1171 - 1179, December 2009) already showed that optical diagnosis of small colorectal polyps during routine colonoscopy is feasible with 98% agreement between optical diagnosis and histopathology for screening intervals (British Guidelines) and 95% (US multi-society guidelines).

As for NICE, several studies are underway to collect further evidence that the classification can be successfully used in a discarded and reset regime using the latest high-tech endoscopes (EVIS EXERA III, Olympus Research and Development, spring 2013). However, providing clinical evidence is just the first step towards spreading the concept and eventually changing the state of care. Endoscopists will need extensive training on NICE, guidelines for colonoscopic examination and the histopathologic follow up will need to be revised as well. This can be achieved through different schemes – changes such as those already established in Japan, where NBI-based optical diagnosis with zoom endoscopes already enjoys reimbursement.

A new LED brings many benefits

Data collected during the screening are on the anaesthesiologist’s desk before the patient arrives on the surgery day. Since “the physician already knows quite a bit about the patient, which significantly increases patient safety,” Prof. Moellmann considers introducing such a system in Munich. “We are currently conducting a study to develop an algorithm for our patients,” he explains. However, the interview will be conducted by care staff and will not replace premedication. It is much more designed as a pre-check to give us an idea of the patient we will be seeing.”

The professor expects initial study results to be available in spring 2013.

Ambulatory surgery

Continued from page 5

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EUROPEAN HOSPITAL Vol 22 Issue 1/13
The 33rd International Symposium on Intensive Care and Emergency Medicine

Brussels – 19 March 2013

BELGIUM – Last year, the annual ISICEM event attracted almost 6,000 participants from 101 countries. Its chairman, Professor Jean-Louis Vincent, from the Intensive Care Medicine Department in Erasme University Hospital, Brussels, offered EN a few reasons for its continuing success:

The ISICEM is the largest meeting in this field in the world; the three major meetings are those of the Society of Critical Care Medicine (SCCM) at around 4,000 participants, the European Society of Critical Care Medicine (ESICM) at around 5,000 and we are at almost 6,000, he explained. ‘Of course, other meetings are larger, for example, the American Thoracic Society (ATS) meeting, but this includes all pulmonologists, and doesn’t just focus on critical care.’

Has the financial crisis caused a decrease in participants? Jean-Louis Vincent: ‘Meetings in general are seeing some decline in numbers. This is not only the financial crisis but also the development of internet-based education programmes and other factors related to improved communication platforms and data transmission. However, for the ISICEM, a slight decline in participants from European countries (some European countries in particular) has been compensated by an increase in the number of participants coming from further away, for example, North America, China and the Far East, so the number of participants is actually quite stable; and the meeting is becoming even more international. This has always been a particularly attractive aspect of our meeting because the opportunity to exchange ideas with colleagues right around the globe is an important means of promoting and expanding critical care medicine.’

How vital is industry support? Industry support is essential and, for many meetings, this has become a big issue. With budget cuts, exhibitions are shrinking everywhere but, at our meeting, we have actually seen support increase every year, not only in terms of the number of companies, but also total financial support. This is because of the ‘top down’ approach in which companies choose just the very few most important meetings to maximise cost-effectiveness - and the Brussels meeting is at the top of their list.’

Briefly, what’s the secret of the ISICEM’s continuing success? ‘I believe one of the most important positive aspects is that the ISICEM is fully independent - we are not part of a scientific society that needs to follow a fixed ethos and please all its members, we can operate free from internal politics and just focus on looking for top quality speakers from around the globe.

Finally, the ISICEM is now in its 33rd year - when will it end? Personally, I’d like to continue until we reach our Golden Anniversary - the 33rd year – when will it end? Personally, I’d like to continue until we reach our Golden Anniversary – the 50th ISICEM, but others will take over. After all, it would be a shame to stop this winning formula!’

The lamp that offers many choices

LEDs layout gives a visual comfort and produces a uniform, homogenous and shadowless light. The light is easy-to-move and has an easy-to-grip and removable handle for sterilisation.

An I-Sense series touch panel controls all lamp functions, including intensity, parts selection (SEP) to choose single parts of the light beam and activation of the desired LEDs in a sequential way according to needs, and also a brightness increase (BOPOST), used to obtain a maximum light intensity in case of a wide light field. This approximate 10% increase deactivates automatically after five minutes.

The lamp comes for ceiling, wall and trolley mounting.

Details: www.acem.it

www.european-hospital.com
**Traumatic brain injury (TBI)**

TBI is a common cause of death and disability. The use of endotracheal tubes with a subglottic suction can reduce VAP.

**Dr Christine Geffers** studied medicine at the Free University Berlin, and then became a resident at the Institute of Pathology at Mühlen Hospital in Berlin for two years. In 1996 she became a research associate at the Institute of Hygiene and Environmental Medicine at the Free University Berlin. Since qualifying as a Hygiene and Environmental Medicine specialist, including a 12-month residency on the intensive care ward at the Charité, Dr Geffers explained that, having read about an official recommendation, the hospital’s anaesthetists and intensive care specialists discussed the device’s introduction and weighing up possible improvements in medical devices. ‘We were immediately convinced by the system’s findings of the first meta-analysis from 2005, which was then available and confirmed a reduction in VAPs of up to 50% in the US, these special tubes that drain respiratory secretions, sub-glottic suction, over time during mechanical ventilation, have been officially recommended for a while (CDC and Healthcare Infection Control Advisory Committee 2005 recommendations). However, in Germany, we have no national recommendation yet, the last recommendation was from the German Medical Commission for Hospital Hygiene and Infection Prevention (KRINKO) who only published guidelines in 2009. Studies on these tubes were not published until later.

‘When introduced in 2011, we opted for an ET, which differs from conventional tubes in two ways. On the one hand it has this special aspiration function, which works via a small opening above the cuff to which a tube is attached, which aspirates the respiratory secretions of the patient. The secretions can either be drained manually via a syringe or, as recommended for clinical practice, into a vacuum pump that aspirates the secretions permanently or intermittently. The other difference is that the ETs we use are equipped with a very thin cuff material. The finer the material of the cuff the better it adapts to the trachea and the fewer secretions get into the lower airways.’

Use of the micro-thin cuff has not been backed up in studies to the same extent as the benefit of subglottic suction, he noted, but is convinced its use does no harm.

**Indications for use**

The most important indication for intubation is a general anaesthetic during surgery. All patients who are being intubated for ventilation for more than 24 hours after surgery are fitted with ETs with subglottic drainage during a meeting regarding considering possible improvements in medical devices. ‘We were immediately convinced by the system’s findings of the first meta-analysis from 2005, which was then available and confirmed a reduction in VAPs of up to 50% in the US, these special tubes that drain respiratory secretions, sub-glottic suction, over time during mechanical ventilation, have been officially recommended for a while (CDC and Healthcare Infection Control Advisory Committee 2005 recommendations). However, in Germany, we have no national recommendation yet, the last recommendation was from the German Medical Commission for Hospital Hygiene and Infection Prevention (KRINKO) who only published guidelines in 2009. Studies on these tubes were not published until later.

‘When introduced in 2011, we opted for an ET, which differs from conventional tubes in two ways. On the one hand it has this special aspiration function, which works via a small opening above the cuff to which a tube is attached, which aspirates the respiratory secretions of the patient. The secretions can either be drained manually via a syringe or, as recommended for clinical practice, into a vacuum pump that aspirates the secretions permanently or intermittently. The other difference is that the ETs we use are equipped with a very thin cuff material. The finer the material of the cuff the better it adapts to the trachea and the fewer secretions get into the lower airways.’

Use of the micro-thin cuff has not been backed up in studies to the same extent as the benefit of subglottic suction, he noted, but is convinced its use does no harm.

**Feedback**

‘In the beginning some people were a bit critical because the vacuum pumps make very loud slurping noises, considering that we try to make an intensive care stay as comfortable as possible, i.e. with as little noise as possible and with pleasant lighting. The level of noise is a distinct disadvantage, but not significant enough to outweigh the advantages.

**Disadvantages?** ‘There are studies which, with the help of endoscopic examinations after mechanical ventilation using these tubes, have found that the suction may cause damage to the mucous membrane in the trachea. However, it isn’t clear whether the pressure of the cuff caused this, or the suction itself. In any case, we haven’t been able to see any irreversible damage to the mucous membrane, although we did not explicitly look for it.

The further meta-analysis from 2011, has now arrived alongside the one mentioned earlier. Whilst the first analysis evaluated five randomised, clinical studies with 896 patients (the second study evaluated 15 with 2,442 patients). This analysis also confirmed a reduction potential for VAP of 45%. Asked whether she has been able to observe the same type of outcome, Dr Geffers stated that she does not believe that the pneumonia rate under real-life conditions are actually halved. However, I do expect to see an effect just based on the fact that the most intensive ventilation using these tubes, have found that the suction may cause damage to the mucous membrane in the trachea. However, it isn’t clear whether the pressure of the cuff caused this, or the suction itself. In any case, we haven’t been able to see any irreversible damage to the mucous membrane, although we did not explicitly look for it.

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**Meta-Analyses**


**Reducing ventilator-associated pneumonia**

Used during surgical procedures and long-term ventilation management by tracheal intubation and evacuation or drainage of the subglottic space, the Mallinckrodt Hi-Lo Trach Tube Seal Guard, Murphy EYE, is reported to reduce micro-aspiration by at least 95% compared to the Mallinckrodt Hi-Lo trach tube, barometrically controlled to provide a better fluid seal at a 20 lower intra-cuff pressure compared to the Mallinckrodt Hi-Lo trach tube. The tapered polyethylene plug prevents the presence of folds and channels through which secretions can leak, the manufacturer reports.

**Traumatic brain injury**

Traumatic brain injury (TBI) is the main cause of accidental death in Europe and all highly developed countries, accounting for around 40% of all accidental mortality. Often, such injuries also cause permanent inva-

lidity. Road traffic accidents are the most common cause by far, around 20-30% of patients with severe TBI have intracranial bleeding or intracranial pressure, and have undergone surgical intervention. More than 70% of patients with traumatic brain injury have associated neurological disorders, which can be surgically treated, although it is important to know that primary and secondary brain damage can be differentiated, i.e. the management of a delayed secondary injury the post-traumatic cerebral under-perfusion of the tissue (ischaemia) plays a decisive role. The cerebral perfusion pressure (CPP), defined as mean arterial pressure (MAP) minus mean arterial pressure (MAP) minus intracranial pressure (ICP), together with cerebral vascular resistance are the physiological variables that control cerebral blood flow (CBF) and metabolic supply. Therefore, there is a close link between CPP and ischaemia.

There are currently very different views about the level of the necessary cerebral perfusion pressure. The guidelines from the European Brain Injury Consortium (EBIC) and the American Association of Neurological Surgeons (AANS) recommend a CPP targeted treatment as ischaemia and hypoxia (lack of adequate oxygen supply) of the brain are considered to be main factors of post-traumatic brain swelling. For a long time this was the accepted treatment approach.

However, the high mortality rate of this treatment made Dr Per-Olof Grände and his neurological colleague Dr Karl Henrik Hurdal, at the University Hospital in Lund, look for an alternative. The alternative he developed is the use of an endotracheal tube equipped with a very thin cuff which, with the help of endoscopic examination of the mucous membrane, although we did not explicitly look for it.

There were various studies which, with the help of endoscopic examinations after mechanical ventilation using these tubes, have found that the suction may cause damage to the mucous membrane in the trachea. However, it isn’t clear whether the pressure of the cuff caused this, or the suction itself. In any case, we haven’t been able to see any irreversible damage to the mucous membrane, although we did not explicitly look for it.

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**Professor Per-Olof Grände** gained his MSc in technical science in 1969, PhD in circulatory physiology in 1979, and graduated as a medical doctor in 1981, from Lund University, Sweden. In 1986 he became a specialist in anaesthesia and intensive care and served as consultant for Anaesthesia and Intensive Care at Lund University Hospital. His research significantly lowered the number of head trauma and sophs, while his circulatory physiology study has concentrated on control systems of the peripheral circulation and particularly mechanisms controlling transvascular fluid exchange. An important part of his research has dealt with the Lund Concept to treat severe brain trauma.
Experts across Europe believe the combination is beginning to demonstrate its broad potential as a hybrid imaging tool

By Mark Nicholls

Whilst PET/CT remains the gold standard in hybrid imaging at this stage, PET/MR has shown great promise for imaging of head and neck cancers, prostate and breast imaging and, over the last two years, radiologists have recognised its value and potential as a diagnostic tool.

However, evolution has not been pain-free for those pioneering its development. During the PET/MR: A marriage made in heaven or hell? New Horizons session (ECR 2012, 9 March, NH8 8-10 a.m.) when the latest position on PET/MR will be presented, it will also serve to underline only too well that the journey has not been easy.

Professor Osman Ratib, Chairman of the Department of Medical Imaging and Information Sciences and Head of the Division of Nuclear Medicine at the University Hospital of Geneva, Switzerland, is among the speakers. His department was the first in Europe (2010) to have a whole-body PET/MR.

With questions over whether such technology will replace, or complement PET/CT, he said that the session would offer a clinical perspective on the new hybrid modality. ‘We know there are problems; that’s why we have the ‘heaven and hell’ scenario. It can be hell in terms of protocols and the logistics of putting two complex modalities together, but can be heaven by having all the answers in one study. ‘In some areas, we have demonstrated it has really improved the quality of the diagnostic process by having those two modalities perfectly aligned and perfectly superimposable.’

Professor Ratib said one area where they were particularly challenged was how to protocol the studies with the standardisation and complexity of MR protocols in this context ‘uncharted territory’.

His team had to be creative about how to protocol to obtain high quality PET/MR with PET/MR quickly. The future is multi-parametric diagnostic criteria, which will combine things you see on PET with the different behaviours in functional MRI. Having those two together, we believe brings more diagnostic accuracy and more diagnostic confidence and that is something that is very important clinically. We saw a clear improvement in PET/CT when the reports became more conclusive and we are seeing the same with PET/MR.

Patients benefit from having one study instead of two and more conclusive diagnostic results, which will lead to better treatment as well as the reduction of radiation exposure with MRI.

The future

Professor Ratib believes this lies in the coupling of the two rapidly evolving technologies - a quantum leap in PET with fully digital detection compatible with the MRI magnetic field and new MRI imaging protocols and multi-transmit detection – combined with the development of new tracers.

With PET/CT and PET/MR now more widely available, the development of biomarkers and tracers that was slow because of limited access to machines, he said, has suddenly accelerated and seen the availability of specific tracers for specific cancers, and also specific biological receptors.

One final wish for Professor Ratib is that this hybrid technology will breach a gulf in radiology and instead of having a radiologist and nuclear medicine physician there will soon be training and certification of hybrid physicians who have capability in both areas.

Professor Osman Ratib is Chairman of the Department of Medical Imaging and Information Sciences and Head of the Division of Nuclear Medicine at the University Hospital of Geneva. Previously, he was Professor and Vice-Chairman of the Department of Radiology at the University of California Los Angeles (UCLA). His clinical activities and areas of expertise include cardiovascular MR, CT and PET/CT imaging. Prof. Ratib is active in medical imaging research in Europe and is a member of several societies of computed radiology and telemedicine and the former President of the EuroPACS Society. He has pioneered several innovative projects including the first whole-body PET/MRI unit in Europe.
PET/MR: The opportunities are almost unlimited

MRI has become the gold standard for many indications in cardiac imaging, apart from imaging the coronary arteries. For function and morphology assessment, MRI is the leading technology. A further advance into as yet unknown territory is myocardial imaging aided by MRI has become the gold standard for many indications in cardiac imaging, apart from imaging the coronary arteries. For function and morphology assessment, MRI is the leading technology.

Last year, the Essen team published the world’s first case report on PET/MR: cardiac imaging in the renowned journal Heart. Opportunities for cardiovascular imaging are nowhere near being fully known and explored, enthused Felix Nensa, a member of Essen’s Cardiovascular Imaging Working Group. ‘MRI has the advantage that it lets us assess the individual anatomical compartments and different soft tissues much better than CT. The heart is not simply positioned in an axial transverse but in a quite complex position in the body. With the help of localisers, we position the MRI scanner along the anatomic axis, rather than the body axis, and we can also determine many different axes, planes and contrasts,’ he said, explaining some MRI advantages over CT. An MRI examination initially starts with a standard protocol that provides an overview over the heart and surrounding areas. This is followed by different, specific heart protocols, and often includes an assessment of the heart function, i.e. moving heart imaging.

Myocardial Infarction: How T-2 weighted sequences and late enhancement can provide information on the point in time when an infarction occurred

‘If the heart function measurements, such as 5-D volume reconstruction or four-chamber view, result in conspicuous findings we perform further diagnostic evaluations with T-2 weighted sequences. As fat is suppressed in these examinations and water becomes more visible, this is a particularly good way of visualising oedema within the myocardium (tissue oedema). Accumulated oedema can be seen in PET, the late-enhancement is shown in the underlying MRI. * + No-Rafox zone within the infarction as a sign of microvascular obstruction.

Myocardial blood-flow is assessed with a dynamic contrast-enhanced perfusion examination. This is followed by one of the most important sequences of the cardiac examination: Around ten minutes after the perfusion with contrast media, it is possible to detect the so-called late enhancement – bright areas that result from the contrast media accumulating in certain parts of the myocardium. This is clear evidence of perished myocardial tissue, which could have been caused by an acute infarction or a chronic scar. ‘This sequence is incredibly sensitive and anatomically of a very high resolution, therefore also making very small scars in the myocardium visible. But we can only determine how long the tissue has been dead by assessing it in combination with the T-2 sequence. Only once an oedema is also visible in late enhancement can we be sure that it is an acute infarction, however, if no oedema is visible in this location it is an older scar,’ Felix Nensa explained. This is important because it impacts the treatment and the chance of a cure.

Tricking cardiac metabolism with glucose

Many of the examinations described can also be carried out with procedures used in nuclear medicine: in this context, PET images have a significantly higher resolution than, for instance, those from myocardial scintigraphy. The basis of PET scanning is the imaging of the metabolism, which is also utilised for PET/MR scanning: Under normal circumstances the heart specifically metabolises fatty acids; however, if it is exposed to a real "glucose shock", with the patient taking 75 grams of glucose, the heart changes its metabolism to sugar. ‘This is helpful to assess infarctions. In a healthy patient, the radio-labelled glucose ‘glauxes’ homogeneously in the left ventricle; if it doesn’t, then this indicates a type of pathodily. The lack of glucose metabolism is an indication of dead tissue,’ he pointed out. However, there are other situations: for example, where the myocardial tissue is still intact, but no sugar or only a little sugar is being metabolised, as is the case with the so-called ‘stunned myocardium’. If it was possible to open the coronary artery very soon after an infarction occurred the damaged tissue in this area might recover, which is why an oedema is normally visible on the MRI scan but no late enhancement, because the tissue has not died yet. In those cases the PET scan provides complementary information that might help to further assess the state of the jeopardised myocardium.

There are also cases where the left ventricle ‘glauxes’ very intensively. This can be an indication of a ‘hibernating myocardium’, characterised by chronic under-perfusion. PET/MR has shown that this area is less perfused, which may point towards a problem with heart wall motion. ‘One assumes that the tissue acts auto-protectively and that a stimulus sends signals to the heart tissue to use as little oxygen as possible to stop it from dying. Normally one would also expect that less glucose is used in this area, but the opposite is actually the case. Unlike beta-oxidation during the fatty acid metabolism, anaerobic glycolysis requires almost no oxygen during the process. Although researchers don’t yet agree, one possible explanation may be that the myocardium switches to the lowest-impact metabolic procedure when there is little oxygen available. Assessment of myocardial, but not under-perfused tissue is also particularly important for planning of further treatment because the partial ischaemia of obstructed coronary arteries only makes sense if the tissue is potentially still alive and completely dead, Dr Nensa explained.

Tracers as keys for metabolic information

With PET/MR, excellent anatomical results are combined with metabolic information delivered by the PET. The most established tracers for PET are 18F-FDG, a radio-labelled glucose. For myocardial perfusion examinations radio-labelled ammoniac (13N-NH3) is commonly used. These tracers are also the basis of purely nuclear medical PET examinations without MRI, as only the combination of the two tracers allows for a safe diagnosis.

In Europe, radio-labelled water and rubidium are less established tracers for perfusion. Rubidium has the advantage that it can be manufactured with a generator on site while its half-life is only 90 seconds. Perfusion assessment with classical MRI contrast agents suffer from contrast agents entering the intercellular spaces and remaining there for some time – an effect that is very welcome for late enhancement, but less so for perfusion, as it makes the conversion into absolute flow rate very difficult. In the case of a patient with three-vessel disease we are then missing the point of reference. Water, which can freely diffuse, is ideal for perfusion. However, not all tracers can be combined in one examination because they all emit the same radiation of 511 keV. When several tracers are to be combined, such as 18F-FDG with a...
perfusion tracer, the nuclear team carries out an overlay, meaning that an image with a certain tracer and a certain intensity is overlayed by a tracer with a markedly higher intensity.

**On the trail of cardiac insufficiency**

Further, very promising tracers are C-11-hydroxyephedrine (C-11-HED) and iodine-marked MIBG (12^3^I-MIBG), which act as a nor-/adrenaline analogue, taking the neurotransmitter’s place, i.e. in the heart’s sympathetic nervous system. With these tracers the regrowth of sympathetic connections between the heart and the nervous system can be verified in patients with heart transplants.

A further important area of application for nor-/adrenaline analogues is cardiac insufficiency. As more and more people survive cardiac infarctions these days there is an increasing number of patients with heart failure because of reduced cardiac output due to areas of myocardial scarring. Left ventricular ejection fraction, which is reduced in the case of cardiac insufficiency, is an important parameter for the assessment of cardiac performance. The big advantage of PET/MR is the fact that it not only allows us to determine the left ventricular ejection fraction but also the sympathetic innervation, which is usually also compromised. We can now visualise this with the PET/MR; the radiologist explained. 12^3^I-MIBG has been used for single-photon emission computed tomography (SPECT) for some time, although so far without good anatomic reference – which is now possible through PET/MR.

**Inflammatory changes and tumorous diseases**

In future, PET/MR scanning is also likely to play an important role in the diagnosis of cardiac inflammatory changes and tumorous diseases. Myocarditis, an inflammatory disease affecting the myocardium and most often found in young people as a result of protracted flu, is very dangerous. So far, inflammation in those places where glucose accumulates, as inflammatory cells are not capable of a fatty acid metabolism and only able to perform glucose metabolism.

This means that an 18^F^-FDG scan after one day of Atkins diet makes it possible to distinguish between inflammatory cells and normal cells. The same applies to tumorous diseases of the heart. Tumour cells also metabolise sugar to a great extent. This even makes it possible to distinguish between benign and malignant tumours. It also enables detection and treatment of diseases that are hard to diagnose, such as cardiac sarcoidosis, at an early stage. It’s specifically the combination of both procedures that is so promising and where there are almost unlimited opportunities for cardiovascular imaging, he noted.

Presently, the Essen team is entering considerable uncharted territory and the relevance of their results is not always obvious and clear. However, in many cases, the response to certain treatments can already be assessed with more ease.

Essen’s traditionally close cooperation between radiology and nuclear medicine on the one hand and device manufacturer Siemens on the other hand greatly facilitates the clinical evaluation of that complex technology. We’ve come a long way and are now in the process of implementing the first, concrete studies, Nenna revealed.

Only with clear clinical indications the project PET/MR will become truly established and economically viable. As a reference centre for Siemens the Essen team are among the first to clinically evaluate newly developed technology. On the other hand, Siemens are also happy to listen to experiences and suggestions from Nensa and his colleagues. This exchange is extremely important for both sides; it’s give and take – we have the very latest technology at our disposal and deliver the latest findings about it. Both sides have the same objective: to advance technology even further to ultimately improve patient care, the radiologist is happy to report.

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The importance of MRI for gynaecological malignancies

Hedvig Hricak, Chair of the Radiology Department at the Memorial Sloan-Kettering Cancer Center, New York, USA, describes emerging applications and potential trends in gynaecological cancer treatment described at the 15th International Symposium Crossing Barriers.

Combining technological advances, new clinical management paradigms and discoveries from epidemiology and biology has been and remains the hallmark of our specialty. The presentations at the 15th International Symposium, Crossing Barriers, are in keeping with this tradition and show how our profession continues to elevate the quality of clinical care by applying increasingly powerful imaging techniques to clinically relevant questions.

MRI has become integral to the diagnosis and management of patients with gynaecological malignancies, as it provides exquisite anatomical detail and allows quantitative, multiparametric functional assessment of tumours. Adding functional sequences – such as dynamic contrast-enhanced MRI (DCE-MRI), diffusion-weighted MRI (DW-MRI) and most recently Intravoxel incoherent motion (IVIM) MR imaging – to conventional MRI, has been found to be particularly helpful for lesion characterisation, assessment of tumour response to treatment and differentiating post-treatment changes from tumour recurrence.

The emerging hybrid imaging modality PET/MR has the capacity to combine anatomical detail with an even richer supply of functional and metabolic information and will fundamentally change the way we evaluate gynaecological cancer patients. Its application in the laboratory as well as in the clinic will aid drug discovery and enable the delivery of substantially more individualised cancer care. The value of PET/MR will be further enhanced by the advent of clinical hyperpolarised MR (HP-MRSI). Clinical HP-MRSI can increase the MR signal 10,000–100,000-fold, allowing imaging of nuclei other than 1H with unprecedented sensitivity and speed. Thus, it not only can identify the location and quantity of a targeted hyperpolarised agent, but can also identify the agent’s downstream enzymatic products, elucidating an entire chain of metabolic events in vivo. Multiple hyperpolarised substances can be injected and examined simultaneously, enabling multiple metabolic pathways to be probed in the same imaging session.

With clinical HP-MRSI, imaging is crossing a threshold into a new level of real-time, quantitative assessment of tumour biology that will open up unprecedented opportunities for developing powerful predictive, prognostic and early response biomarkers for cancer management.

HP-MRI, conventional MRI, and PET have different, yet complementary, strengths. In the future, combined PET/MR/HP-MRSI will allow results from the various imaging approaches to be precisely correlated – providing new insights into cancer biology and increasing the value of imaging biomarkers in both drug development and clinical care.

MRI’s role in gynaecological oncology

MRI has become integral to the diagnosis and management of patients with gynaecological malignancies as it combines exquisite anatomical detail with functional, multiparametric and quantitative assessment of tumour burden and its response to treatment. Techniques such as dynamic contrast-enhanced MRI (DCE-MRI) and diffusion-weighted MRI (DW-MRI) enable the radiologist to move from morphological to functional assessment of gynaecological malignancies.

In patients with endometrial cancer, MRI plays an important role in pre-operative evaluation and surgical planning. Not only does it allow non-invasive assessment of important prognostic factors such as depth of myometrial invasion, cervical stroma invasion, presence of pelvic implants and lymphadenopathy, but through the use of functional imaging techniques, such as DW-MRI and DCE-MRI, it can also provide insights into tumour aggressiveness and micro-environment.

In patients with cervical cancer, MRI is the preferred imaging modality for evaluating primary disease, as it can determine tumour location (exophytic or endocervical) and size as well as invasion of the parametria, pelvic side-wall or adjacent organs, and lymph nodes with greater accuracy than clinical examination. Additionally, quantitative DCE-MRI and DW-MRI parameters serve as predictive biomarkers of response to chemo-radiotherapy, thus allowing for individualised tailoring of patients’ treatment.

In patients with ovarian cancer, MRI is a problem-solving modality. There is growing evidence that DW-MRI allows more accurate mapping of the extent of peritoneal disease than does CT.

MRI plays an important role in patients with recurrent ovarian cancer by assessing the resectability of high-grade serous papillary adenocarcinoma of the ovary. Axial T2W FRFSE (a), DW (b) and fused images (T2W + DWI) (c) at 3-Tesla demonstrate bilateral solid adenocarcinomas (T in a, b and c), peritoneal deposits outlining the pelvis (arrows in a, b and c) and serosal deposits along the sigmoid serosa (* in a, b and c). The latter are better appreciated on DW and fused images.

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therapy are independent and changes early during chemo-radiotherapy and subtle tumour volume imaging heterogeneous tumour perfusion in cancer. DCE-MRI parameters reflect in patients with advanced cervical cancer. DCE-MRI as well as more detailed metabolic imaging with MR spectroscopy. Will PET/MR give additional clinical information? This is a very new and exciting area of clinical research. The preliminary reports suggest that PET/MR may provide additional information for tumour staging and thus may influence patient management. In the future, with the development of new, targeted radiotracers, PET/MR will supply powerful biomarkers for multiple purposes.

The benefit of a higher magnetic field MRI is the most sensitive technique for delineating small lesions due to its superb soft tissue resolution. A higher magnetic field strength improves image quality (due to an increased signal to noise ratio) and enables more effective use of functional techniques such as DW-MRI and DCE-MRI as well as more detailed metabolic imaging with MR spectroscopy.

MRI can help to plan and tailor the pelvic exenterative procedure by accurately depicting local tumour extent and invasion of adjacent organs in patients with treatment-resistant or recurrent gynaecological cancer.

The gold standard CT is still the gold standard for evaluating disease extent in patients with ovarian cancer, whereas PET/CT is routinely used to evaluate distant metastatic disease (including lymph nodes) in patients with primary and recurrent gynaecological malignancies. The maximum standardised uptake value (SUVmax) – a quantitative parameter derived from PET/CT – serves as a prognostic biomarker in patients with primary cervical cancer as well as in patients with recurrent ovarian cancer.

MRI’s role in chemo-radiotherapy planning and monitoring MRI plays a central role in planning chemo-radiotherapy and monitoring the response to such therapy in patients with advanced cervical cancer. DCE-MRI parameters reflecting heterogeneous tumour perfusion and subtle tumour volume changes early during chemo-radiotherapy are independent and better predictors of tumour recurrence and poor survival than are clinical prognostic factors. Preliminary data also demonstrate that the apparent diffusion coefficient (a parameter derived from DW-MRI) may serve as a predictive biomarker and has the potential to allow early assessment of response to chemo-radiotherapy.

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The development of sensitive molecular imaging biomarkers for ovarian cancer may enable repeat molecular imaging to substitute for preventative oophorectomy in high-risk patients by allowing detection of the disease before symptoms arise.

Future roles PET/MR, which has the capacity to capture an unprecedented diversity of functional and metabolic parameters in the context of exquisite anatomical detail, will change the way we evaluate gynaecological cancer patients and will greatly aid in drug discovery and the delivery of individualised clinical care.

Radiogenomics will provide the ability to match MR imaging traits with genomic information, furthering the development of prognostic and predictive imaging biomarkers. Imaging (by MRI and or PET/MR) will be central to the way we design future clinical trials, as a more adaptive trial design is urgently needed.

The use of molecular imaging techniques, including HP-MRSI, will allow the development of more powerful predictive biomarkers, particularly for treatment selection and response assessment. Intra-operative molecular imaging will likely facilitate more complete tumour resection.

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Mark Nicholls discovers how a CT scan at a British hospital played a critical role in identifying the long-lost remains of a 15th Century English king

Richard III – modern imaging transforms a historical image

For many centuries, the image of the English monarch King Richard III was that created by playwright William Shakespeare, who depicted the last Plantagenet King of England as an evil, hunch-backed murderer. That image endured virtually unchallenged over the centuries – primarily because of a lack of any contemporary paintings of the monarch, or the recovery of his remains. The remarkable discovery of a skeleton a few months ago on the last Plantagenet King of England, was to change all that.

In February, DNA analysis confirmed the bones to be those of King Richard III, who is known to have been killed at the Battle of Bosworth on 22 August 1485. It was modern hospital imaging technology that was to throw an added dimension on the remains and also help experts recreate his facial features. A team from the radiology department at Leicester Royal Infirmary scanned the bones using post mortem CT scanning protocols, similar to a normal clinical scan, to produce detailed images of the bones.

The unit has had a research interest in conducting a standard clinical scan using hi-res bone protocols, as well as performing CT scans on post mortem CT scanning for several years, so was well placed to offer the skills needed by archaeologists to unravel the mysteries surrounding Richard III’s remains.

Claire Robinson, lead forensic radiographer at University Hospital Leicester carried out the scan with Professor of Radiology Bruno Morgan and Home Office pathologist Professor Guy Rutty and his team from the East Midlands Forensic Pathology Unit.

The bones were initially laid out on the scanner as close as possible to the anatomical position in which they were found. After the initial analysis of the images, a further scan of the bones was taken, using a bespoke polyester template to better position them, in order to reconstruct the images to make a ‘virtual’ three-dimensional model.

Professor Morgan said that as well as conducting a standard clinical scan using hi-res bone protocols, the University of Leicester team also used micro-CT to conduct a long but very high resolution scan of the skull. This was used to create the 3-D print used by the team at Dundee University to help reconstruct the facial features of the dead king (see above).

After his death, Tudor historians, as well as Shakespeare, portrayed Richard III as a villainous monarch with a curved spine who was rumoured to have murdered his brother’s young sons in the Tower of London. He was eventually challenged by Henry Tudor (later Henry VII) and killed at Bosworth after only two years on the throne and given a hurried burial beneath the church of Greyfriars in the centre of Leicester city, in a clumsily cut grave with sloping sides and too short for the body, forcing the head forward.

Richard’s bones were scanned three times in the 16th Century and its exact location was forgotten. However, a team of enthusiasts and historians managed to trace the likely area – and, crucially, after painstaking genealogical research, they found a 17th generation descendant of Richard’s sister with whose DNA they could compare any remains. Joy Ibsen, from Canada, died several years ago but her son, Michael, who now works as a furniture maker in London, provided a sample.

The Leicester scans show that the skeleton’s spine was indeed curved, a condition known as scoliosis, but there was no trace of a withered arm or other abnormalities described in the more extreme historical characterisations of the king.

Professor Morgan said: ‘Richard III’s bones were scanned three times and while it was relatively straightforward when compared to difficult clinical cases, there was the constant care needed because of the
age, delicacy and importance of the remains.

For us, one of the key elements was in trying to work out just how crooked he was. There is no doubt that the skeleton had scoliosis, but it was a case of working out just how bad it would have been and how easily it would have been to hide it.

‘It has been a great opportunity to be involved in the project and learn a little more about Richard III’s scoliosis and about the man himself. He did have scoliosis, though it was not as exaggerated as Shakespeare made out, but it was not made up. The big advantage of the scanning is that means that once the bones go back into the earth again, we have still got a very accurate facsimile of his bones. We have a permanent record for people to use for research in the future, especially as the CT images are being used to make a full 3-D print of the skeleton at the University of Loughborough.’

With University of Leicester osteo-archaeologist Jo Appleby and Piers Mitchell, anthropologist at the University of Cambridge and consultant paediatric orthopaedic surgeon for Peterborough and Stamford Hospitals NHS Foundation Trust, who have studied the skeleton’s scoliosis, Professor Morgan will help produce a scientific paper looking particularly at how bad the scoliosis of Richard III would have been. He said that the Richard III project has been invaluable in promoting the role of the post mortem imaging team at Leicester and its capabilities. Post-mortem CT (PMCT) is becoming an option as a minimally invasive alternative to post-mortem examination. Leicester has become an established centre in PMCT, developing post-mortem coronal imaging techniques and running a number of courses designed to introduce professionals to the use of computed tomography (CT) in the investigation of sudden death.

The bones are of a man in his late 20s or early 30s and have been carbon dated to 1455-1540. Richard was 32 years old when he died in battle. The skeleton had suffered 10 injuries, including eight to the skull, at around the time of death.

Dr Appleby said: ‘The CT scans of the bones, carried out at Leicester Royal Infirmary by the Radiology Imaging Unit have been a crucial part of the investigations. The three-dimensional images of the skeleton that have been produced have played a central role in our interpretation of the injuries. In addition, the CT scans mean that we will have a full record of the skeleton even after the bones are reburied.’

While the CT scan provided a permanent 3-D record of the bones which cannot be obtained by other means, enabling images and models to be reproduced, minimising any potential damage that could be caused by repeated handling of the fragile bones and facilitating further analysis and comparisons after the bones are interred, the Leicester CT scans were also critical in helping build up an image of the enigmatic monarch’s facial features.

When it came to reconstructing Richard III’s face, the Dundee team used CT scans and photographs of the skull, which they ran through a computer programme. Caroline Wilkinson, Dundee University’s professor of craniofacial identification, said chez from the skull of the monarch’s face used to reconstruct features while a specific formula enabled researchers to predict what the soft nose would look like from the underlying bone and the shape of the brow.

‘The width of the mouth can be determined exactly by the position of the teeth,’ Professor Wilkinson explained. ‘The little bump on the outer orbit is where the outer corner of the eye is. We can use these anatomical standards to help us rebuild the face.’

Over the centuries, some scholars sought to re-evaluate Richard III’s brief reign and highlight his good work, such as reforming the English legal system. That debate is set to continue. But with the bones scanned and confirmed as the remains of King Richard III, planning is now under way for a formal reburial of a long-lost English monarch.

Improving X-ray technology

A new technique being pioneered in a UK hospital aims to help orthopaedic surgeons with spine and hip surgery

The Image Overlay Template Alignment (IOTA), now being used at Leicester Hospitals, improves on current X-ray technology and helps increase the accuracy of complex surgery, such as spinal fixation following a car crash.

Gareth Robinson, a senior radiographer at Leicester’s Hospitals, who invented the technique, said: ‘Currently, our very skilled surgeons use X-ray images to help guide operations, together with their knowledge of the body and their eyesight. However, X-rays can be difficult to interpret because their exact magnification is unknown and there is little information on the X-ray to suggest depth. In other words, they’re rather two-dimensional. My technique uses laser lights and templates that can be laid over X-ray images to help surgeons make even more accurate surgical decisions.”

Thus surgeons gain more information about precise angles at which pins and other prosthetics need to be placed and the system reveals parts of the implants or shapes of the bones into which the implants are to be inserted, which are normally hidden to X-rays and the human eye.

Accurate measurements would confirm lengths of screws and other implants to be fitted. These can be cross-checked with the surgeon’s initial calculations.

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Finding that perfect match

Advice from an ‘old hand’ for juniors wanting to work in a department where they fit in and which also suits their personal hopes and ambitions

At the end of his lecture, the chairman of the department’s Recruitment Committee spoke of several aspects that ought to figure prominently in this career phase.

Typically, the recruitment person is seeking someone who is ready to assume the role of a senior, someone who will attach him/herself very much to the department and the discipline. However, the applicant’s self-assessment is as being someone between a junior and senior role, Prof. Menu explained.

Consider key factors

There are turning points – moments that turn up in someone’s life when s/he thinks a major decision should be made – on the assumption that s/he is aware of the relevant facts, skills required, within a context that includes external, family events and many more factors. Based on a firm foundation, it appears to be rather safe to go for an opportunity. However, someone who has just come out of residency is not endowed with the solid grounding that such a major decision would need – that point only comes perhaps two or three years later. According to Prof. Menu, who adds: ‘Young people should be aware of these kinds of factors and of turning points.’

Choosing a department does not mean choosing a fixed environment, he added. For example, if you decide in favour of a specific department in an organisation because of its modern equipment, this is not really a future-safe approach – because that equipment will be outdated at some point. Many young physicians do not realise this; he said. ‘If I were in a position to choose, I would vote in favour of a department with a lot of machines, but ones that are due to be replaced by brand-new equipment.’

Furthermore, applicants should not underestimate a department’s and organisation’s history, as well as the atmosphere within the team. Is the feeling compatible with his/her own way of interacting? Applicants should also analyse themselves, and never pretend to be something other than what they are. ‘Accept your weaknesses – you may be able to compensate them to some extent, or even accept them, and this will only help to accom-pany you all your life. Therefore it’s better to find a position and place where your weaknesses will not sig-nificantly impede your performance.

For example, if you find it hard to get up early, don’t join a department where you are expected to start work at 7.30 am. By keeping these pointers in mind, and looking beyond a department’s work and equipment, applicants might avoid adaptations that might become painful – and such advice holds true beyond borders.

40 years of CT scanning

From left: Prof. Reto Balse, Dr. Johannes Trenkler, Prof. Gerhard Mostbeck, Prof. Christian Loewe and Prof. Werner Jaszke, President of the Austrian Society of Radiology (ÖRG)

The professor giving sound advice at the Junior MIR (Management in Radiology) course held in Milan in October

Cardiovascular and Interventional Radiology, Radiodiagnostic Clinic, Medical University of Vienna at a 40 years of CT scanning press conference held in the Austrian Radiological Society: ‘It’s possible; he pointed out, to visualise and quantify stenosis of the carotid arteries and occlusion in the cerebral arteries and then to plan the adequate treatment in just a few seconds of examination time, without the need for arterial puncture in the groin and with high resolution and diagnostic safety.’

Technological advancement has not only increased the temporal and spatial resolution of CT angiography but also significantly reduced the exposure to X-rays from CT scanning. This has also made CT angiography the method of choice to investigate aortic disease and aortic aneurysm. ‘Modern endovascular treatment procedures for aortic aneurysms via vascular endoprosthesys (stent graft) would be impossible without the above mentioned advances in CT angiography,’ the professor emphasised.

‘The modern procedures available now also facilitate imaging of the coronary arteries and any changes within them via modern CT scanning in mere seconds.’

The high validity of this technique, particularly to exclude coronary artery disease (CAD), was confirmed in numerous national and international publications. Only for patients with a clear clinical indication for the presence of CHD does CT scanning currently not deliver added value, the Austrian radiologist pointed out.

For many years, CT scanning has also played a central role in the diagnosis, treatment planning and monitoring of cancer patients. ‘Modern multi-detector CT scanners produce high-quality, contrast-enhanced images of organs and, combined with modern 3-D navigation systems these procedures facilitate local curative treatment of various tumours of up to 10 cm in diameter,’ explained Prof. Bale. ‘This is a minimally invasive addition, or alternatively respectively, to surgical procedures.’

As an alternative to a colonoscopy, virtual endoscopy allows a quick evaluation of the entire colon using reconstructed 2-D and 3-D images. A Tfly-thru programme lets the radiologist see into the intestine as if he was carrying out a colonoscopy. In this way colonic polyps can be detected and examined non-inva-sively. Modern software also facilitates the automated 3-D reconstruction and determination of the size of lung and liver tumours. ‘This allows us to recognise changes in the tissue and to more objectively assess these over time,’ Prof. Bale explained, concluding his outline of CT applications in today’s oncology.
Zero-Field MRI

UK research team pioneers a new type of scanning system

Scientists at Aberdeen University, Scotland, are developing Zero-Field MRI (ZF-MRI), to enable diseases to be ‘seen’ at an earlier stage than with standard MRI. They also suspect that ZF-MRI may reveal biomarkers that could help pharmaceutical firms to develop new drugs for neurodegenerative diseases, e.g. Parkinson’s and Alzheimer’s, plus cancer and osteoarthritis.

The University of Aberdeen researchers – from medical physics, radiology, neuroscience and neurology – are creating the new technology in the biomedical physics building. Aberdeen has a long record of ground-breaking scanner developments, including clinicians there being the very first, worldwide, to scan the body of a patient using MRI in 1980.

ZF-MRI is a major departure from standard MRI because it takes the magnetic field within the scanner - including the Earth’s own magnetic field - very close to zero, in order to see disease-related tissue changes not revealed by conventional MRI.

Dr Lionel Broche, a Research Fellow at the University, said: ‘Right from the early days of MRI it has been known that the contrast that can be seen between normal and diseased tissue is greater at lower magnetic fields, because of the way in which molecules move around in tissues, altering the signals that are detected and used to form the detailed MRI pictures. At low magnetic fields the speed of the molecular motion is more closely matched to the frequency of the MRI signals, making the technique more sensitive to changes.

ZF-MRI should provide us with exquisite sensitivity to subtle changes in brain tissue, bringing the possibility of early diagnosis.’

ZF-MRI will be used with another MRI technique, pioneered by Professor Lurie’s team, called Fast Field-Cycling MRI (FFC-MRI), which can also ‘see’ extra information, compared to normal MRI. Unlike conventional MRI, FFC-MRI switches rapidly between different magnetic fields - an effect rather like having 100 or more scanners with differing scanning capabilities within the one scanning machine. With the ZF-MRI technology incorporated into an FFC-MRI scanner the researchers will initially modify the FFC-MRI scanner to enable zero-field measurements. The team plans initially to use ZF-MRI to scan small objects, e.g. bottles containing protein gels to mimic normal and diseased tissues, and then, towards the study’s end they hope to image patients with neurodegenerative diseases, particularly Alzheimer’s and Parkinson’s.

The ZF-MRI project team is led by medical physicist Professor David Lurie (centre). Their funded research will last for three years.

CT angiography - within mere seconds CT facilitates the complete imaging of the arteries - from head to toe - as needed. Thus it is possible, quickly and non-invasively (i.e. without the need for arterial puncture in the groin) to rule out or confirm arterial disease in the context of atherosclerosis and to plan treatment - also for out-patients.

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Perfusion imaging: The future of CT?

CT scanners now nicely cover morphology. The challenge is moving to CT functional imaging without freezing patients

Left: High-resolution CT derived from a CT perfusion study. Note occlusion of a side branch of the middle cerebral artery (arrow)

Right: CT perfusion map demonstrates reduced perfusion in affected territory

Report: John Brooky

Cardiac scanning was the driving force behind recent developments in computed tomography (CT) that saw the introduction of multi-detector imaging as well as innovations such as dual-source flash scanners and wide 64-slice detectors. The next five years will see the development of a combination of CT angiography (CTA) and CT perfusion imaging as a one-stop shop for cardiologists, according to Professor Mathias Prokop. Radiologists will be able to offer examinations including stress tests capable of predicting the presence of ischaemia equally well as SPECT.

Prof Prokop and his group at the Radboud University Medical Centre are looking further to a day when CT perfusion can offer functional diagnosis throughout the body, starting with applications in the brain but spreading to oncologic and functional imaging.

The challenge is to create good-quality perfusion scans at an acceptable radiation dose. If perfusion imaging was done using convention al settings for each time point of a perfusion series, then radiation dose would have to be multiplied with the number of scans, and thus be larger than current techniques by a factor of 20-40. Since freezing patients is not an option, low-dose approaches are being developed that can achieve perfusion imaging at comparable dose, but these approaches so far struggle with reduced image quality. Hence, we have to look for quality as the key issues and is working on developing techniques for high-quality perfusion at acceptable dose levels. Widespread use of perfusion imaging is not going to happen any time soon, according to this year’s book ‘Spiral and Multi-slice Computed Tomography’ by John Brooky.

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An indirect sign of obstruction or other abnormalities.

On developing techniques for high-technology as the key issues and is working that does not sound too bad. However, the local dose, for example to the eye, lens, is much higher – well above 100 mGy which is substantial.

We are trying a couple of approach es, and while we are not there yet, results look promising. We are now acquiring such low-dose images during the perfusion series that a single image is almost impossible for diagnosis. The challenge is to understand how we can retrieve relevant information from these ultra-low dose, noisy-looking images.

One approach, for example, is a 4-D noise filter that can improve the image quality quite dramatically by using not only 2-D or 3-D information but data from the whole acquisition series. We are now already able to look at all the dynamic information: inflow and outflow of contrast via arteries and veins, and areas with delay in perfusion as an

Mathias Prokop trained as a radiologist at Hanover Medical School, Germany and gained a BSc in Physics at Maburg University, Germany. From 1998 he was an Associate Professor of Radiology at the University of Vienna Medical School. In 2002 he went to the Netherlands and became Professor of Radiology at UMC Utrecht in 2004.

He has been a Professor of Radiology at Radboud University Nijmegen as well as Chairman of the Department of Radiology from 2011.

Dr Prokop is an expert in body imaging with a special focus on multislice CT. Prof Prokop was invited to lecture in over 160 countries. The past decade he has concentrated on chest screening using CT (cancer, cardiovascular disease, COPD) and has been a major player in the Dutch-Rotterdam lung cancer screening trial (NELSON).

You’re working in Japan with a Toshiba grant to develop a phantom that allows us to play around with the CT acquisition parameters without having to expose patients to radiation. It allows us to determine doses that can fully rely on the study of each variation we are testing on the accuracy of perfusion measures, noise, spatial resolution, signal-to-noise ratios and, ultimately, visibility of small perfusion abnormalities, such as lacunar infarcts. ‘The phantom needs to be organ-specific to replicate the noise that comes from real scanning. The noise in the brain is, of course, different from the chest, for example. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain. We will probably develop such a phantom for the abdomen, and it will be interesting to see how it performs in the brain.

In recent investigations we have taken CT perfusion beyond the heart. What potential do you see?

What’s coming next is dynamic perfusion imaging that consists of a series of short scans covering the target area. It can be done with more scans with decent results, though again there is an advantage in covering an entire target, such as brain, liver, or heart, with a wide detector that gives good signal-to-noise at a relatively low dose.

These perfusion scans have been successfully used in stroke imaging to discriminate between infarct core and penumbra and to identify proximal vessel occlusions that would warrant intra-arterial stroke treatment. We see increasing indications in oncologic imaging: we’d like to be able to distinguish early between malperfusion of the myocardium.'
Interventional radiology

Report: Dr Jörg Raach

Since the dawn of the 1960s, interventional radiology has been a speciality within radiology that goes far beyond diagnosis, aided by imaging modalities such as CT, MRI and ultrasound, the discipline concentrates on minimally invasive treatment of chronic pain syndrome, vascular and tumorous diseases. ‘The advantage of the interventional radiological method is its minimal invasiveness,’ explained Thomas J Kröncke MD Priv.-Doz., Congress President of IROS 2013 and Deputy Director of the Clinic for Radiology (Campus Mitte) at Charité University Hospital, Berlin. ‘Under local anaesthesia, minimally invasive catheter systems are inserted into the blood vessels, or other ductal systems, to gain access to a diseased body area and to carry out the appropriate treatment.’ Apart from the success rate of these less invasive procedures without scapsels the shorter recovery time is another strong argument in their favour as shorter hospital stay helps to cut costs.

Helping with treatment-resistant hypertension

Around 50% of women and men in Germany aged 65+ years are known to suffer arterial hypertension. High blood pressure (BP) is among the most important risk factors for cardiovascular disease and therefore an essential determinant of the most common causes of death in adults. Therefore, correction of high BP is very important. In most cases this is achieved by regular administration of one or several drugs. However, if a sufficient lowering of BP is not possible with medication, this is known as treatment-resistant hypertension, now believed to result from faulty signals from the kidneys, which continuously monitor BP and send the respective signals to increase or lower BP to the brain, explained Christian Scheurig-Münkler MD from the Clinic for Radiology Clinic at Charité University Hospital Berlin, Campus Benjamin Franklin (CBF).

‘If this control mechanism is disturbed, interventional radiologists can intercept the faulty signals and improve cardiovascular regulation by means of renal denervation, a medical device that has also been approved for clinical use in Germany since the dawn of the 1960s. This method allows for the renal nerves being interrupted using heat from the inside in several locations, which makes the nerves lose their function without damaging the wall of the vessel. The faulty signal can no longer be transmitted. The treatment takes around 45–60 minutes and is now being offered all over Germany,’ said Professor Dietl Vorwerk, Director of the Institute for Diagnostic and Interventional Radiology at Ingolstadt Hospital and Chairman of the German Society of Interventional Radiology. ‘The intervention itself is low risk and the effectiveness of the procedure since its introduction in 2008 has been demonstrated in 19 studies involving 683 patients over an observation period of one to 24 months. All studies confirm a significant lowering of systolic and diastolic blood pressure. The maximum reduction in blood pressure ranged from 18mm Hg to 50mm Hg (systolic) and 9mm Hg to 15mm Hg (diastolic),’ said Professor Michael Uder, an authority on renal denervation at the University Hospital Erlangen, quoting from the new meta-analysis study. ‘Because this procedure results in a long-term lowering of high BP based on long-term studies with large patient collectives. Larger studies for medical devices prior to their admission to the market are also required (currently), unlike drugs, medical devices are often licensed based on tests involving only 100 patients.’ Present studies investigate whether, apart from the long-term success of the treatment, there may also be a possible benefit for other diseases such as cardiac insufficiency, cardiac arrhythmia et al.

Ensuring quality of life for diabetics and cost-cutting

Interventional radiology makes it possible to improve diabetic care significantly through early, less invasive interventions. ‘With just under six million diabetes patients in Germany the costs of their care are around 60.5 billion annually. Most of those costs are caused by follow-on diseases resulting from diabetes, e.g. coronary heart disease, stroke, diabetic foot and vascular occlusion,’ said Professor Petra-Maria Schumann-Draeger, internist, endocrinologist and diabetologist at the University Hospital Munich quoting from a current Robert Koch Institute study. It is these diseases that can be treated particularly effectively through interventional radiology if the intervention is carried out at an early enough stage. This has also been recognised by the International Working Group on the Diabetic Foot (IWGDF), which already includes interventional radiology procedures in its guidelines as first line, standard methods of choice.

A 50% drop in diabetic foot amputations

In the case of diabetic foot syndrome, chronic vascular changes right down to complete arterial occlusion in the legs caused by diabetes, it is possible to prevent or delay amputation through IR procedures. By inflating a tiny balloon in the affected artery (balloon-angioplasty) it is possible to re-open it. This prevents the tissue, which is now again supplied with sufficient blood, from dying, and thus a surgical intervention, including amputation, can often be avoided. In most cases the patient can leave hospital the same day or a day after the procedure. Apart from maintaining quality of life, and possibly the ability to work, this also avoids the enormous costs resulting from an amputation.

Professor Gross-Fengels, from the Department of Interventional Radiology at the Asklepios Hospital Harburg, Hamburg, explained: ‘Specialist facilities have been able to lower the rate of amputation by up to 50%. This gives us hope considering that half of all patients die within the first five years of a leg amputation.’
MRI holds a key role in cervical cancer

Modern imaging techniques greatly enhance the treatment selection

The key added value of MRI is in treatment selection and planning – selecting patients who wish to preserve fertility and triaging patients suitable for surgery vs. chemo and radiotherapy. Radiologists are key members of a disease management team leading to individualised treatment planning and follow-up of patients with cervical cancer.

Proved to be significantly inferior to MRI especially in the early stages of the disease spread to the adjacent tissues (parametrium).

Speaking of other applications for MRI, Dr Sala pointed to the evaluation of tumour recurrence. ‘MRI can map out recurrence very nicely in the pelvis and the lymph nodes. MRI can be combined with PET/CT if there is a question about distant metastases, for example, in the chest,’ she added.

In general, functional MRI techniques, such as perfusion and diffusion MRI, may serve as prognostic and predictive biomarkers in patients with cervical cancer.

Future perspectives

One of the major future developments Dr Sala predicts is the use of hybrid imaging for cervical cancer. PET/MR combines local stag-

ForSaTum: Determining obstacles to drug development

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The fourth component of preclinical tumour research that connects the project is the development of molecular probes and diagnostics. The initial focus here was on molecular optical and ultrasound probes. Some of these probes are now so reliable that even small differences in the expression of molecular markers can be reliably captured in vivo. Thanks to all these measurements and developments the consortium has succeeded in increasing the trust in imaging in preclinical research.

**Funding**

Prof. Kiessling hopes to have created a platform that facilitates the meaningful testing of drugs, contrast agents, new devices and treatment procedures and which eases the transfer and implementation of these into the hospital. Although the project is part of the interdisciplinary, integrative and inter-faculty (3) Institute for Technology and Medicine promoted via the excellence initiative and secured from an academic perspective, it is a shame that follow-on funding for this project is currently not yet secured as the three-year term of the EU-NRW Objective 2 Programme Regional Competitive Capabilities and Employment 2007 – 2013 (EFRE) expired at the beginning of 2013. However, further suitable funding currently seems hard to envisage.

‘It’s very important that the consortium receives further funding,’ warns Prof. Kiessling, ‘particularly if the industrial partners are to stay on board and if jobs are not to be endangered.’

**Standardisation benefits**

The consortium does not only work around innovative medical devices technology. The more important step for the project as a whole is the development of a specialised animal testing platform that offers pharmacokinetic and toxicological examinations as a service, as well as supporting the testing of new treatment concepts with specific consultancy services. ‘When the pharmaceutical industry wants to carry out animal testing the approval procedure takes more than six months. However, by way of a highly standardised animal testing application adapted for the needs of the consortium we can act within just a few weeks. But the time saving, the shortening of the developmental pipeline, is only one aspect. It’s also very important that all our examinations are carried out and documented according to standard operating procedures. This ensures the quality of the measurements and makes the costs of the studies easier to calculate,’ the professor explains.

processing makes for higher temporal and spatial resolution. Therefore, we achieve a significant improvement in image quality; at least first measurement results indicate this. I’m confident that this is a large gain,’ he adds, ‘even though the final proof is currently still the object of research.’

**Extracting the essence.**

Tumour recurrence after chemoradiotherapy for cervical cancer:

Sagittal T2W fSe image (a) demonstrates a normal cervix and a small soft tissue nodule of intermediate signal intensity in the posterior bladder wall (arrow in a). The lesion is better appreciated as an area of high signal intensity on DWI and fused images (T2WI +DWI) (arrow in b, d). Restricted diffusion is seen on the corresponding ADC map (arrow in c). Biopsy confirmed presence of tumour recurrence (images courtesy of Dr. Evis Sala).

For SaTum: Determined to eradicate obstacles to drug development

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Mindray is quick, flexible, highly international and open to all

Interviewee: Daniela Zimmermann

‘We want to help’ European customers improve healthcare quality by providing them with high-quality innovative and cost-effective products and a very good service team and very good professional clinical support team, David Yin of Mindray confirmed. ‘There is competition everywhere, and we are so glad that increasingly European hospitals have accepted us – and also, very importantly, that they are very happy about the product, service and support. This gives us a lot of confidence. We walk very closely with the end-user and customer and medical professionals.’

We also make many very good installations in university hospitals and city-level hospitals in all of Europe. If you had asked about that about five years ago I couldn’t speak of the big hospitals but now I can – in every country. That’s very important for us and for the other Chinese. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users. They can trust what our product is. A lot of university hospitals and end-users.

‘Mindray is from China and its products are produced in China, but basically, as a first step, that product consolidates all the information from all the countries. The second step: we use local people. In every country, for each office, our general manager is local and knows the customer really well.’

Each manager in each country reports to the General Manager for Europe, he explains. ‘We have six offices in Europe: the Netherlands, France, the United Kingdom, Germany, Italy and Spain. So, all the countries with the offices are our interest, along with others, such as Scandinavian countries.’

All the Scandinavian countries are not even a tenth the size of Germany or France, so, which in Europe is the most interesting for Mindray?

‘Germany is the top.’

Where you have to compete against Siemens.

Not really. Our product line is different from Siemens. We have some products with little overlap. Ultrasound has very little overlap. Patient monitors – I think Siemens had this product line ten years ago but sold it to other companies. It’s what big companies do; because of their structures and size they can do many things. The electronic part, like us with a patient monitor, is quite a faster moving product. In all industries, the price of electronic products is decreasing. Faster reactions and taking the most advantage of electronics technology, a company like us can do it very quickly. This is also important. We are quick and flexible and there’s also innovation. How to make it fast is very important to us. When we understand something, we know the market needs, we can just use the new technology. For other big companies, because the product is already there, if they put out something new, that means the old product will discontinue. So, that is a painful decision. For us, everything is new. We are quite flexible, and we move faster.

‘Maybe 20 or 50 years later we’ll also become bigger. So then, how can we be faster? That is another question, another challenge.’

What are China’s strengths? In Germany, for example, Siemens’ strength is absolutely high-level engineering. France and Italy are good at design. Does the strength of the Chinese lie in electronics or engineering?

I cannot speak generally about the Chinese, but if we talk about Mindray, we have a very strong engineering team: more than 1,600 engineers and engineering team. We also consolidate resources, knowledge, from outside China. We have R&D centres in the USA and Stockholm and we consolidate all requirements. We also work very closely with our local general managers, people who have a long history in the market and the industry and know customers’ needs. Therefore, they also contribute a lot. Of course, we also have our own design team and win a lot of global design awards.

Those prizes have included the internationally recognised ‘red dot’ design award in 2011 for the firm’s Hi-ELED operating light; the 2010 red dot award for the M7 diagnostic ultrasound system; China’s IF Design Award in 2009 and, in 2006, the same for its BeneView T8 patient monitor.

So, what’s missing for Mindray?

‘Two things: Because it has become a global company, you need increasing numbers of local people and talented people to join the company. I think everything is related to people, because people are very important: people from China and people outside China. That is the key to being a great company; you must have a lot of excellent people all together.’

Siemens, for example, has engineers from India, China, France, America, Germany, in a multi-cultural team. Does Mindray also try to employ French, English or German engineers and, say, post-graduates, when they are new and fresh?

In response to this question, a Mindray representative pointed out that the Shenzhen base has grown considerably. ‘You’ll find our colleagues from every country, such as India, Germany, Italy and America. It is really an international company – Mindray is open to everyone.’

Mindray is now known internationally for its products that cover patient monitoring and life support, in-vitro diagnostics, medical imaging and veterinary. During Daniela Zimmermann’s interview with David Yin, General Manager of Mindray Europe, he described the firm’s clear strategy for Europe and beyond.
Silent Scan overcomes the clunk, clunk, clunks

MRI technology has been in use for 50 years, and throughout those decades the high noise level during an examination has stressed many patients – along with being in the confined space of the tube for quite some time.

Today, almost all manufacturers produce tube openings up to 70cm in size and thus help to reduce claustrophobia – also enabling examinations of obese patients. However, noise annoyance has remained – until recently. GE Healthcare has now succeeded in removing that endless clunking sound at its very source.

With conventional MRI systems noise levels of up to 100 dB are measured for some frequencies, which is on a par with the noise levels during rock concerts. With the Silent Scan MRI, GE has now succeeded in reducing this noise level with new sequencing technology to such an extent that apart from normal background noise resulting from the cooling of the gradients nothing else can be heard, explains Professor Christoph Herborn, Director of MR Future Concepts at GE Healthcare.

Previous attempts to reduce noise levels during examination were mostly aimed at sealing the gantry with isolation methods instead of eliminating the noise at the source. The results were unsatisfactory. With the Silent Scan technology the T-1 and T-2 weighted examinations are now performed with noise levels comparable to those of a CT exam, i.e. very quietly.

Noise reduction at source

‘MRI imaging is complex and consists of multiple parameters that define how the tissue to be examined is stimulated and how this stimulation is scanned by the MRI receiver coils. These parameters include the repetition time, flip angle and so-called echo time (TE). Through modulation of these parameters, but particularly by a significant reduction in the echo time, it has been possible to reduce the noise while the gradient is switched on and off to such an extent that the examination can now be carried out quietly. We have impacted all parameters, but the most dramatic reduction has been in the echo time, which means the sequences, and therefore the examination times, not becoming much longer than with a comparable ‘load’ sequence. One example: With a T1-weighted three-dimensional frequency of the head, the examination time with a conventional MRI is around 90 seconds, with the Silent Scan it is extended by 8–10 seconds, using the same parameters and relating to the same image of the examination area,’ he explains.

This is a dramatic development indeed, which will significantly improve patient comfort during MRI examinations – in line with the company’s philosophy. Moreover, the radiologist is optimistic that further development and expansion of the Silent Scan technology to other examination sequences, such as diffusion, will not only be more comforting for the current, slight extension of the examination time.

Presented for the first time at the RSNA 2012, GE is currently awaiting FDA 501(k) clearance to introduce Silent Scan technology to hospitals. First study results from the USA underline positive feedback from patients – with the new system they need neither headphones nor any other ear protectors. This significantly eases communication between the doctor or other medical staff and the patient in the MR machine.
High volume mammography centres yield high quality research

With 550,000 mammography screenings annually, Unilabs Sweden finds itself on the leading edge for research in mammography and pioneering patient education programmes. John Broacky reports

Unsurprisingly, prototypes for every new modality in breast imaging are found at one or another of the 25 mammography centres managed by Unilabs Sweden. In addition, as the centres perform more than 2,500 breast cancer screenings per day, it also is quite expected that research institutions are keen to conduct studies within this network, which covers half the women in Sweden.

What is unusual here is the enthusiasm and passion for this leading edge work among a very busy staff in an efficiently run private company necessarily focused on high patient through-put. Even more surprising is the company’s financial support for multiple studies, the surprising is the company's financial support for multiple studies, the third is for pre-operative diagnosis, the fourth is for angiography that will present a study showing a 57% increase in breast cancer detection.

Landmark studies to be reported

The European Congress of Radiology will present a study showing a 57% higher detection rate for cancer with automatic breast ultrasound (ABUS) compared to conventional mammography will be presented. The study of 1,671 asymptomatic women with dense breast tissue was supported by Unilabs and conducted at its centre at Capio Saint Göran Hospital in Stockholm, Sweden.

Preliminary results from the ‘Malmö Breast Tomosynthesis Screening Trial’, reporting data on 9,000 exams of women with dense breast tissue, is now being prepared for publication. Unilabs joined the Skåne Region to sponsor this three-year study that will ultimately include 15,000 women.

‘This work is a big part of our daily routine in practice,’ explained Karin Leifland MD PhD, Head of Mammography for Unilabs Sweden. One year ago, the Unilabs centre at Lund University joined the Karolinska study being conducted by the Karolinska Institute to identify risk factors for breast cancer among 70,000 women. Each patient who agrees to participate completes a lifestyle questionnaire, allows an assessment of her breast tissue density and undergoes a blood work up for genetic information.

According to the lead investigator, Karolina Professor Per Hall, 'We are now wearing a almost a thousand women a week, which is a stunning figure. Without Unilabs Skåne’s cooperation this could never have been possible.'

The goal of the Karolinska study is to create the world’s best-characterised breast cancer cohort by following the patients to see who develops breast cancer over 10 years and then determine why.

There are three MRI studies under way at Unilabs centres. One follows women with a hereditary risk of breast cancer, which compares the results of conventional mammograms with ultrasound examinations and finally an MRI exam. A second MRI study funded by Unilabs is for a doctoral thesis on vacuum biopsy. The third is for pre-operative diagnosed breast cancer that randomises patients with one group undergoing an MR exam to see if more cancer is detected than in the mammograms and ultrasound.

It helps that Swedish women are the nicest mammography patients in the world, Dr Leifland points out. ‘When we ask them to take a biopsy for tissue samples, they say, “OK.” They are really interested in participating in various studies because they know even if it may not benefit them, it may benefit their sisters.’

Pioneering Preferential RF Ablation studies

In collaboration with Capio St Göran Hospital and the Karolinska Institute, Unilabs is validating the efficacy of Preferential Radio Frequency Ablation (PFRA) in a study with three patient cohorts.

In this procedure a well-defined, solitary tumour of less than two centimetres is targeted using ultrasound so that a thin electrode can be inserted. PFRA technology induces an enzymatic destruction of the tumour by heating it for 10 minutes to a homogenous temperature of around 70-90 degrees Celsius.

Where Swedish women have an incidence of breast cancer 30-40% higher than the immigrant population, an immigrant woman in Sweden is 30-40% more likely to die of breast cancer because the condition is not detected until in an advanced state.

The first challenge, says Dr Leifland, is the high rate of literacy among the large populations of these women in urban areas.

‘Yes, it works!’ Dr Leifland said, explaining it is effective with a woman who thinks that having visited once, she does not need to return the next year. ‘If we can do this – identify women with a tumour, ask them to come back in a week, heat it up for 10 minutes and know that it is gone – it is already a fantastic outcome.’

Accutron HP-D


the precise multitalent for angiography

Vienna / 07-11.03.2013
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Mammography expert Karen Leifland MD PhD is head of the Unilabs SA Mammography Department at Capio St. Göran’s Hospital in Stockholm, Sweden between 70 and 90 degrees Celsius. Surrounding fibrous and fatty tissues are left unharmed.

The first patient group are women already on the operating table. Immediately following the ablation, the tumour is surgically removed for a study of the heat-induced effects.

A second cohort of patients in this group is asked to wait three weeks before the tumour is removed surgically. The third group are much older women who cannot undergo surgery. After treatment they are followed with imaging exams to determine if the tumour has been destroyed or if the cancer returns.

We have completed this procedure on 55 women, six of whom are in the third group, and not one has any cancer left,’ said Dr Leifland. The experimental approach without surgery could never be applied to younger women, she explained. But the older patient cohort allows the group to validate the effectiveness so that with enough evidence it may someday be performed on younger women.

‘If we can do this – identify women with a tumour, ask them to come back in a week, heat it up for 10 minutes and know that it is gone – it is already a fantastic outcome.’

The Unilabs Sweden team revised its invitations to come for a screening so that a seven year-old child, who often is asked to read the letter, can tell his or her mother why she should go for a screening.

Once the woman does come for a screening she is given a key ring holding four rubber balls ranging from 24 millimetres in diameter to just 3mm. The staff explains that the largest ball is the average size of a tumour that the woman will be able to feel when palpating her breast. The next is the average size of what a doctor would feel and the third is what can be seen in a mammogram.

The smallest, she is told, is the size of a tumour the Unilabs radiologist will be able to see if the woman comes for follow up visits, when they can consult her prior exams.

‘Yes, it works!’ Dr Leifland said, explaining it is effective with a woman who thinks that having visited once, she does not need to return the next year.
Dresden will treat patients in 2014

Report: Brigitte Dinkloh

While the first cancer patients are due to be treated with proton therapy in Dresden, Germany, in spring 2014, this autumn physicians and scientists will begin to work with this internationally unique research and development platform for innovative technologies in radiotherapy.

Over several days in February, the centre piece of the unit – the proton accelerator and treatment facility consisting of a gantry and nozzle – was transported in a heavy duty convoy from Belgium to the river Elbe, and then installed at the new site on the Dresden University Hospital campus.

Called Oncoray, the scientific institution is a joint enterprise organised between Carl Gustav Carus University Hospital and the medical Faculty of the University of Technology, and the Helmholtz-Centre Dresden-Rossendorf (HZDR), is aiming to develop a new dimension in gentle radiotherapy: over the coming years the use of protons in cancer treatment will be further advanced with a close focus on the patient and away from commercial constraints.

The dimension of this high-tech installation from world proton therapy facilities market leader, Ion Beam Applications S.A. (IBA) of Belgium, sets benchmarks. The gantry alone, a steel construction that, once assembled, measures 13m x 11m and is rotatable by 370 degrees, weighs 110 tons. The focused proton beam travels across this steel colossus for the last few metres of its journey to the patient.

Installed at the same time at the Dresden site, the proton accelerator accelerates the particles to around two thirds of the speed of light – about 160,000km per second. To ensure the proton beam reaches the patient with the highest precision on its 50m journey from the cyclotron via the beam line and gantry, more than fifty quadrupole and dipole magnets guide it, each weighing several tons. Set to an accuracy of a thousandth of a millimetre, the magnets ensure the correct shape and direction of the beam.

Alongside the proton acceleration facility, which is based on electromagnetic fields, the scientists at HZDR and Oncoray will test a new technology. Utilising high-energy laser beams to bring the particles up to the necessary speed, the objective is to drastically reduce the costs of the construction and maintenance of these treatment facilities in the future. This is a prerequisite to ensure all patients needing this gentle therapy will indeed be able to benefit from it. The coexistence of a conventional and a laser-based proton accelerator will be unique worldwide – the Dresden competency centre is becoming established as a reference- and crystallisation point for further research in this field.

OncoRay’s Scientific Coordinator Stefan Pieck, with at Carl Gustav Carus University Hospital Board Director Professor Michael Albrecht, and Oncoray spokesman Professor Michael Baumann, with the first gantry component fitted in the proton therapy facility looking into the lower area of the cyclotron, one can see which way the protons travel during acceleration in the four copper tubes.
By creating a single interface with the patient medical record, Agfa HealthCare’s ICIS can bring any type of image and linked meta-data into a patient’s record to be viewed and retrieved.

Interview: John Brosky

Integrated diagnosis, where multi-disciplinary teams focus on a single patient’s care, can be an effective model for diagnosing illness and monitoring treatment. But it only works if every team member can access the same images at the right moment.

Using the patient medical record as the vehicle, and embedding a universal viewer called XERO inside that record, Agfa HealthCare’s innovative Imaging Clinical Information System (ICIS) for the first time enables access. With sometimes surprising results.

During our interview, the President of Agfa HealthCare, Luc Thijs, explained ICIS and shared lessons learned from installations at referrers in North America, Spain, Belgium, Russia and the United Kingdom.

**This new Imaging Clinical Information System sounds as if your engineers named it. What is that and what does it do?**

**Luc Thijs:** One of the biggest problems in healthcare today is bringing imaging information out of individual departments and into the mainline care process. We are solving this problem through the integration of images into electronic health record. It does not simply store images, which many others do, but provides tools that capture meta-data and clinical information linked to those images – which very few can do. Departments outside of radiology or cardiology can now have a workflow to bring these medically relevant images into the patient record and share them with care givers.

**Are there really so many images relevant to clinicians?**

Point of care images are captured in many departments. In surgery there may be a C-arm taking X-ray images; there may be an endoscope capturing images; there may be ultrasonic images. They do not make it to the patient record. Pathology is creating a lot of images, typically through a microscope. These biopsy samples and slides are stored, but the images? Where are they? There are medically relevant images in systems and devices stored in departments all over the hospital. We go into departments where we’ve never been before – into pneumonology, where we need to connect with endoscopes; into obstetrics and gynaecology, where there are a great deal of images being generated that have nothing to do with radiology.

Radiologists have been sharing images for years. Why is there a problem for other departments? Other departments don’t always have the tools used in radiology, such as workflow, orders and accession numbers. With the Imaging Clinical Information System (ICIS) services platform we create an order and an accession number, capture meta data about that image and ensure the data and images themselves make it to the patient record. This becomes very important because healthcare systems not only need to store this data, they also want to retrieve it. For example, to review all images for a specific organ that has been treated in a certain way. The meta-data makes this possible.

**The Cleveland Clinic is your flag-ship installation for ICIS. What have they learned there now that they are using the system?**

‘On top of all the clinical advantages discussed before, some things we’ve found out have little to do with the care process. Sometimes there are patients who come into the hospital who may already have a pressure wound. Having images of the patient on admission provides proof that they did not receive these wounds while being treated at your hospital. It can be a form of protection against a false charge that a patient got worse in your hospital. Is it part of a clinical care process? No. Does it cost? Probably.

Another example has to do with documentation. Depending on a country’s reimbursement system, in certain cases if you can prove by means of an image that you performed an epidural to anaesthetise the patient, then you can receive reimbursement. Today no one does this; hospitals miss a reimbursement they earned. It is easy to take this image, and with ICIS it is easily registered, stored and retrieved. It generates revenue for the hospital.

**Finally clinicians will see everything, but do they need all this?**

‘ICIS is not just exciting for Agfa HealthCare but for hospitals. It can’t be done in a week. Hospitals want to move step-by-step because they do not know themselves, and are surprised to find how many sources of relevant images they do not find in the patient’s medical record.’

Carestream’s new patient portal, MyVue, recently successfully completed its practice run in Europe at Italy’s Delta Hospital in Lagosanto. European Hospital editor Brigitte Dinklosh asked Dr Giorgio Bena, Director of the hospital’s Department of Diagnostic and Interventional Radiology, about staff and patients’ reactions to the system.

**MyVue is the first portal to allow secure transmission of sensitive patient data in line with privacy regulations. After examination a patient**
does not need to return to hospital, but instead can await results and images at home.

**Dr Giorgio Bena, radiologist at the Delta Hospital, explained that since MyVue was installed in early September last year, 455 patients have been involved and he has received direct patient feedback about the portal via a telephone survey, to which each patient was requested to respond about 20 days after admission. More than ninety percent of patients are very satisfied with MyVue and the reactions of doctors involved with the patient portal have also been extremely positive,** he confirmed.

**Security encryption**

‘Patients who take part in the patient portal can not only view their images and read the results in any location with internet access, but also store them on their own computers and share them with whoever they wish – their physicians and specialists as well as family and friends – the data is owned by the patients; he explained. The only important prerequisite is the safe transmission of the data to its owners without access by third parties. Carestream ensures this through its security encryption. To use MyVue the patient is initially sent an e-mail with a temporary password that enables log-on to the patient portal. The patient selects his/her own personal password, which is only valid when combined with their personal e-mail address. If the patient wants to share his/her data with someone, s/he first sends the guest an invitation by e-mail. The guest can then log on to the system by activating a personal password, which is only valid when combined with the personal e-mail address. If the patient wants to share his/her data with someone, it is possible to make access to the guest.

**Accessibility**

The key benefit: Access to MyVue is possible via any browser and any type of device, be it iPad, laptop or PC. Thus the concept of a patient who can control his or her data anywhere in the world has become a reality.

The new portal not only helps to avoid repeat examinations but also helps to save money and earnings potential because neither CD nor DVD burning is necessary or hard copy printing. As the patient is in charge of the transmission of his images the workflow becomes more structured and effective and there’s...
IHE-Europe takes on the world in Istanbul

The movement for interoperability among health information devices and systems has spread across Europe reaching Turkey, which will be host to the European IHE Connectathon in Istanbul this April.

Report: John Brooky

Launched 13 years ago with the first ‘connectivity marathon’ in France, Integrating the Healthcare Enterprise (IHE) has steadily gathered in nations and vendors in its drive across Europe to finally reach the eastern edge of the continent – Turkey.

The ambitions of the Brussels-based association IHE-Europe do not stop there. Delegations from the Middle East are expected at the 2013 event, aptly reinforcing the theme ‘Connecting Where The Continents Meet.’

Reaching even further, IHE International is organising the first-ever World Summit for HIT interoperability to be held in parallel with the five-day Connectathon testing event in Istanbul. Over two days the summit offers three concurrent tracks aimed at specific levels of interest in IHE deployments from strategic planning for hospital executives to how-to sessions for IT engineers responsible for an implementation.

For the third year in a row the testing event, called Projectathon, will run concurrent to Connectathon to enable validation of cross-border patient data exchanges for the large-scale project, Smart Open Services for European Patients (epSOS). The IHE-based system came on-line in April 2012 and today counts 24 participating nations.

Both testing events are powered by IHE-Services, which was spun out of IHE-Europe to offer customised testing sessions and demonstrations for vendors and regional health networks.

Making available the suite of tools and simulators on the Gazelle platform that is the heart of this annual ‘plug-fest’ for HIT engineers is expected to accelerate the momentum toward interoperability.

The core testing activity among 500 software engineers at Connectathon shows how far IHE has grown beyond its roots in radiology to include technical frameworks and integration profiles for nine healthcare domains, including the laboratory, pharmacy and even ophthalmology.

Radiology continues to make up almost half of the tests performed at Connectathon. This year validation to the IHE Mammography integration profile will be a highlight in this large domain.

For the past two years the testing of cross-enterprise document sharing, which facilitates management of electronic health records, accounts for the greatest number of tests at Connectathon. Cross-enterprise Document Workflow (XDW) will be the hot area for testing activity this year.

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Less strain on staff and budgetary capacities in the imaging departments, Dr Benea pointed out. Although the professor cannot yet put the exact savings potential into figures, he is certain that the acquisition costs of hard- and software will have been amortised within a very short period.

www.european-hospital.com
The pros and cons of tablet-computers in radiology

Although not yet suitable for primary readings, tablet technology does offer potential for second opinions, sharing information with patients and clinicians, and seeking expert support, according to radiologist Dr Erik Ranschaert from the Jeroen Bosch Hospital, Den Bosch, The Netherlands.

Tablet advantages: More flexibility, less expense

He pointed out that new applications are emerging, including RadSnap, a free mobile app for cloud-based radiology that enables professional consultations for difficult cases sent via iPhone or iPad. ‘This helps referring physicians and radiologists in areas of the world where they cannot afford expensive PACS software,’ he pointed out.

In terms of taking teleradiology forward they offer quicker communication between medical professionals – for instant consultation – or even between medicals and patients and facilitate expert consultations and second opinions.

Tablet drawbacks: ‘Intra-institutional’ purpose

For ‘intra-institutional’ rather than ‘external’ purposes.

Increased resolution and even smaller pixels, automated calibration, HTML5 viewers for multi-platform compatibility and integration of IS and access to priors via PACS, cloud storage and server-side processing capabilities for image manipulation and 3-D volume rendering.

‘Certainly a friend, if used correctly,’ Dr Ranschaert qualified.

The new WiFi flat-panel digital detector

Bringing freedom to paediatric imaging and extremity X-rays

The new ultra-light flat-panel detectors designed and developed by the Shantou Institute of Ultrasonic Instruments Co., Ltd (SIUI) can be used in mobile teleradiology, bringing better communication with clinicians, communication with patients and online expert consultations, but he warns they are not comparable to diagnostic screens and have no FDA approval for primary diagnosis.

The increased bandwidth for mobile technology/teleradiology is the increased power and speed of tablets, increased bandwidth for mobile viewing (greater availability of 4G network, higher bandwidth).

Another, very different kind of tablet in medicine: During ECR this year there will be an appraisal of the use of these flat, light, information technology tools in mobile teleradiology, and will include aspects of the iPad in this area.

Increased resolution and even smaller pixels, automated calibration, HTML5 viewers for multi-platform compatibility and integration of IS and access to priors via PACS, cloud storage and server-side processing capabilities for image manipulation and 3-D volume rendering.

When it comes to radiology – is the tablet computer a friend or foe?

‘Certainly a friend, if used correctly,’ Dr Ranschaert qualified.

Dr Ranschaert suggests the next step for tablet computers in radiology is the increased power and speed of tablets, increased bandwidth for mobile viewing (greater availability of 4G network, higher bandwidth).
Japanese vendor Totoku reports that more than 3,000 units of its new i2 series displays were delivered in the second half of 2012, with ‘very positive user feedback’. Although a rather high-priced model, Totoku sold the largest quantity of the greyscale display MS55i2. ‘With its extremely high resolution of 15 MP the monitor is optimised for use in mammogram diagnosis,’ the manufacturer explains.

This is the first model with the new LED backlighting. The successor of the CCFL technology is based on semiconductors and known from a variety of consumer products. ‘The benefits are both ecological as well as of a financial and qualitative nature,’ according to Marcel Herrmann, Marketing Manager at Totoku Medical displays. ‘Compared to CCFL monitors, LED displays, save up to 20% electricity and have about a 30% longer life span, affecting the user’s budget positively. Furthermore, the CO2 emissions decrease due to reduced energy production. Specifically, the MS55i2 display will use 15% less power than its predecessor. At the same time it almost doubles the lifetime and disposal is also much more environmentally friendly because LEDs do not contain critical elements, such as mercury.’

Because the CCFL is mounted horizontally behind the display, the LED provides a significantly higher number of light sources, which can be controlled individually, resulting in much better uniformity, the firm adds. ‘The contrast ratio also increases by a quarter to 1200:1. As usual, the new models also have a five-year warranty on the backlight,’ says Marcel Herrmann.

The MS55i2 also supports Independent Software Driving (ISD), raising the resolution by three, thus increasing detail and image quality. All new i2 models offer the new display port interface, enabling connection not only with DVI signals or video cards but also the latest Display Port cards from various vendors, e.g. Matrox, ATI and NVIDIA.

Display Port offers true 10-bit greyscales on a colour display and true 11-bit for greyscale products.

JiveX Mobile

Images and clinical data are on the move

Entering the world of apps with JiveX Mobile, Visus reports that it is offering image and clinical data based on HTML 5 and adds, ‘The solution runs on all mobile platforms and integrates seamlessly with HIS systems designed for mobile devices.’

While the mobile PACS viewer is currently receiving the final touches, Visus developers are confident that the solution will be well received and will prove a success, since products that give clinicians more flexibility and facilitate communication in everyday clinical work are highly sought after. Both tablet PCs and smartphones are excellently suited as a mobile desk if – and only if – the required data are quickly available, consistent throughout the hospital network and comply with the strict data privacy rules in healthcare. ‘A major challenge was the development of a platform-independent system that is compatible with all current operating systems,’ explained Guido Bötticher, Vice President for Sales at Visus. ‘Therefore we decided to use HTML 5 for the JiveX mobile viewer: it’s a programming language that all infrastructures understand well. To meet the data privacy requirements the image data are not stored locally on the device but on a web server. Working with a central data pool moreover ensures that the users access identical and up-to-date data anytime and from anywhere.’

The real-life success of a mobile viewer depends on the handling of different kinds of image and clinical data such as EEG or ultrasound images, the company points out. ‘Drawing on the Visus PACS II strategy with JiveX Integrated Imaging, the mobile version masters this challenge easily. For the Visus team it was particularly important that the mobile solution goes far beyond radiology and, with its tight links to the HIS, prepares the ground for mobile electronic patient records.

The open and flexible platform design allowed the creation of a HIS provider-independent solution that integrates seamlessly with HIS or ultrasound images, the company points out. ‘Drawing on the Visus PACS II strategy with JiveX Integrated Imaging, the mobile version masters this challenge easily. For the Visus team it was particularly important that the mobile solution goes far beyond radiology and, with its tight links to the HIS, prepares the ground for mobile electronic patient records. The open and flexible platform design allowed the creation of a HIS provider-independent solution that integrates seamlessly with HIS or ultrasound images.’

Guido Bötticher: ‘We wanted to create a mobile desk that offers pretty much the same benefits as a stationary desk: the user can access as many data as possible from one system. Therefore,’ he added, ‘we were eager to link our solution with other systems: The mobile version of JiveX – like all our products – is based on an open architecture that integrates easily, flexibly and neutrally in existing hospital and provider structures.’
New business ventures, new systems – and those include 3-D mammography

Since the Japanese firm Fujifilm, which had held a premier position worldwide for brilliant, high-resolution photographs and films, was transformed into Fujifilm Holdings Corporation, a multinational concern with almost 82,000 employees worldwide, the firm has evolved to cover a large range of technologies, ensuring the expansion of the existing business as well as formation of new business areas, such as the production of medical devices, high-functional materials and further high-tech applications.

With three core business sectors, imaging solutions, information solutions and document solutions, the corporation has achieved a constant worldwide turnover of more than €20 billion annually over the last three years. With above average R&D investments of 7.4% of group turnover, the company aims for leadership in technology in many business areas, as well as for diversification into new sectors. Over the past few years, Fujifilm has indeed demonstrated its ability to change impressively.

Medical systems

Fujifilm is a pioneer in digital diagnostics and is expanding into prevention and treatment areas. The current diverse product range within the medical systems sector offers imaging systems for diagnostics, image archiving and communication systems (PACS), imaging plate systems, digital radiography, flat panel detectors, digital mammography, dry imager, X-ray systems, X-ray film, endoscopy systems and ultrasound. The erstwhile classic revenue driver X-ray film is becoming less and less important as the trend towards digitisation is irreversible and driven particularly by cost-conscious healthcare systems that need to achieve optimum cost savings, explains Jan Döhring, who is Marketing Coordinator of Medical Systems Europe.

Branching into digital radiography and IT, the firm's business model has also changed from consumer goods to a more project-based business. Essentially, we don't need salespeople as such, but rather consultants and specialists who are aware of customers' medical equipment, are familiar with the highly complex technology and able to install and maintain it. Success can no longer be measured immediately but develops over time. This adjustment is the turning point that the company currently has to master,' he explains. However, Fuji set the course for this development at an early stage: it had one of the first web-based archiving systems when it came to dose output and readout speed and was therefore predestined for screening. Over the last few years ergonomics and workflow have been further improved with the Amulet F and Amulet S systems. With the FDR Amulet Innolyty the company is introducing a completely newly developed detector, which is also based on amorphous selenium (a-Se) but has a completely different structure compared to all other detectors available. We have a honeycomb structure that facilitates different readout procedures. This gives us variable resolution and allows us to use mammogram more efficiently for the normal range, the 3-D range and now also for tomosynthesis,' Jörg Müller points out.

The key is totally new geometry for the 24x30cm detector. Radiation absorption is improved significantly by the new geometry and effectiveness is increased by 20% compared to the previous model, the firm reports. The detector's structure was also optimised so that noise was reduced, and the signal was much clearer, further optimising the dose and display of details. Our new detector currently has the highest detail display and the largest modulation transfer frequency available.

New for mammography: FDR Amulet Innolyty

At the ECR in Vienna, Fujifilm is presenting FDR Amulet Innolyty, the third generation of the proven, fully-integrated mammography system, an X-ray machine connected to a detector.

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on the market. This means that the finest details can be sharply displayed without being affected by noise, and users can adapt an examination flexibly to each individual patient," he explains with enthusiasm.

In addition to the new system’s tomosynthesis performance the first studies in 3-D mammography in various countries have shown an up to 40% reduction in false positive results with a dose requirement comparable to that of 2-D mammography. Obviously this also cuts down the number of unnecessary biopsies, lowering patient worries.

‘FDR Amulet Innovation is currently the most sensitive system available and has 20% lower dose requirement for 2-D images,’ Jörg Müller confirms, ‘and ten percent lower for 2-D images,’ Jörg Müller and has 20% lower dose requirement for 2-D images, leading to calcifications over the long term. In 2-D there is sometimes no way of telling apart emerging oil cysts from carcinomas that form in scarred regions. In 3-D, physicians can differentiate cysts on the surface from carcinomas that are growing into surrounding tissue. And for breasts that have had surgery, 3-D also has significant advantages; in these cases, duct structures may be interwoven and highly complex, producing unclear results in ultrasound. MRI may be an option; but 3-D mammography can help resolve suspected recurrences conveniently.

How does this mammography compare with tomosynthesis? Dr Naymneh Eskyhi: ‘In 3-D mammography, the summation effect of 2-D images is resolved in 3-D, which makes dense tissue more transparent. 5-D serves for routine initial image acquisition. For subsequent diagnostic steps, or in follow-ups tomosynthesis is used for precise measurements. We should keep in mind that tomosynthesis comes with an exposure which is significantly higher compared with the dose from Amulet 5-D.’

**Fuji’s 3-D mammography in practice**

**Maria Hilf GmbH** operates two hospitals – Maria Hilf and St. Franziskus – in Mönchengladbach, north-west Germany. The healthcare company’s history dates back to the 1850s, when two Catholic nuns arrived in the city from the Netherlands to care for orphans and sick people. During 150 years, the hospital grew to become an organisation in the maximum care category, partly owned by the community and highly renowned for its commitment to high quality of care and holistic orientation towards patients. Advanced technology, such as Amulet 3-D, helps support this mission. European Hospital reporters asked the hospital’s leading physicians about their hospitals and experiences when working with Fuji’s 3-D mammography system.

With its 800 patient beds, Maria Hilf ranks among the major care providers in the region, explained Professor Christoph Müller-Leisse, MD. ‘We support rather rare disciplines, such as pulmonology and thoracic surgery, and have dedicated centres for continence and neurourology. Our radio-oncology department is outstanding in North Rhine-Westphalia. We have a large neurology department, with a service offering that includes, e.g., thrombus extractions. For cases such as acute strokes we cooperate with specialists in the field. We have general surgery, emergency surgery, and trauma departments.

In addition, we carry out a large number of interventions, many of them image guided with the support of CT. Quite a number of cases are referred to us from a visceral practice with which we collaborate. Percutaneous interventions are part of our portfolio. Interventional radiology is a focus of Maria Hilf.’

**What about working with the 3-D mammography equipment?**

Based on her work with the Amulet 3D from Fuji, Dr Mechthild Schulze-Hagen and I are currently carrying out an ROC – Receiver Operating Characteristic – analysis comparing 3-D to 2-D ... something that hasn’t been done yet. ROCs are diagnostic confidence rankings associated with the diagnostic categories of BI-RADS – the Breast Imaging-Reporting and Data System devised by the American College of Radiology. In this context, this new approach will compare 2-D and 3-D mammography regarding, for example, scar detection, which is not part of the ACR approach, as well as micro-calcifications.

Each year, I read about 12,000 mammographies with a screening background. In addition, we have worked on 500 patient cases from a curative, non-screening background, using Fuji’s Amulet 5-D since May 2012, and we detected 11 carcinomas. We analysed this non-screening group of patients, and have been able to demonstrate that there are a number of significant benefits of 3-D over 2-D. Carcinomas that form along laceration ducts are an illusion in point. These carcinomas manifest themselves through calcifications that are hard to discern in 2-D. Calculations formed alongside ducts are relevant indicators for malignity.

*Christoph Müller-Leisse, Director of the Interventional and Diagnostic Radiology Department at Maria Hilf*

*Dr Mechthild Schulze-Hagen, collaborating gynaecology and obstetrics specialist*
The European Congress of Radiology (ECR) at a glance

The European Congress of Radiology organisers want to strengthen interactivity with the audience, so is offering many chances for direct communication between attendees and the speakers as well as even longer discussions.

The second innovation in 2013 is the increasing importance of multidisciplinary cooperation in cancer diagnosis and treatment. Sharing their expertise, radiologists, surgeons, hepatologists and oncologists lead the sessions, selecting colorectal liver metastases, hepatocellular and cholangiocarcinoma as central themes.

Session Objectives:
1. To learn about the current management of HCC, as laid out in scientific guidelines.
2. To identify those areas of uncertainty, where multidisciplinary teams are needed most.
3. To understand the basis of personalized care for HCC patients and the need for multidisciplinary teams.

Saturday, 9 March, 16:00–17:30, Entrance Level, Room E2
MS 11: Cholangiocarcinoma

MS 3: Colorectal liver metastases
Session Objectives:
1. To learn about state-of-the-art intervention.
2. To identify the value of surgical and systemic strategies in therapy.
3. To appreciate image-guided interventional treatment.

Last year the mini-courses ‘The Beauty of Basic Knowledge’ were successfully introduced. Their number has doubled in 2013.

These events will cover themes in the field of head-and-neck radiology as well as musculoskeletal radiology.

Thursday, 7 March, 12:30–13:30, First Level
MC 25A: Musculoskeletal Imaging: Trauma. Room P
MC 24A: Head and Neck: A taste of the oral cavity and salivary glands. Room N/O

Friday, 8 March, 12:30–13:30, First Level
MC 26: Musculoskeletal Imaging: Degenerative disorders. Room P
MC 24D: Head and Neck: Main pipelines of the neck: pharynx and larynx. Room Q

Saturday, 9 March, 16:00–17:30, First Level
MC 2C: Musculoskeletal Imaging: Inflammatory/infectious disorders. Room P
MC 24C: Head and Neck: Main pipelines of the neck: pharynx and larynx. Room N/O

Sunday, 10 March, 12:30–13:30, First Level
MC 2D: Musculoskeletal Imaging: Neoplastic/neoplastic lesions. Room P
MC 24D: Head and Neck: The suprathyroid neck: anatomy and diagnostic algorithm of the neck mass. Room Q

Monday, 11 March, 12:30–13:30, First Level
MC 2E: Musculoskeletal Imaging: Metabolic/endocrine disease. Room MC 24 E: Head and Neck: Temporal bone: so beautiful, yet so complicated. Room N/O

Also worth mentioning is the Foundation course ‘Neuroimaging’. According to its theme ‘All you need to know about neuroimaging in 18 easy lessons’, this will answer most questions:

Friday, 8 March, 08:30–10:00, Entrance Level, Room E2
08:30 – 10:00 The orbit, the petrous bone and the sella.
10:30 – 12:00 Paediatric
14:00 – 15:30 Trauma and vascularity
16:00 – 17:30 Infection and inflammation

Saturday, 9 March, 16:00–17:30, Entrance Level, Room E2
08:30 – 10:00 Metabolic and neurodegenerative disorders
10:30 – 12:00 Tumours and phacomatosis

The scientific highlights of ECR at least will be the categorical courses, ‘Never without Arteries’, ‘Urogenital Imaging’ and ‘Oncologic Imaging’, all providing participants with the latest results and innovative techniques in the related areas.

The importance and exciting potential of cardiac imaging might be seen separately. One of the last sessions at ECR 2013, but surely one the highlights is the following:

Monday, 11 March, 14:00 – 15:30, Lower Level, Room D1
33 1803 Cardiac imaging: Into the future
Polytrauma imaging

To be effective, guidelines, protocols and algorithms are essential and improve outcomes for the most severely injured patients. Additionally, Professor Linsenmaier, who also presides over the European Society of Emergency Radiology (ESER), will focus specifically on polytrauma imaging, highlighting radiological diagnosis of polytrauma patients in his lecture covering logistics about radiologic management, scan protocols, imaging guidelines and patient care and follow-up imaging while being treated in intensive care units.

Speaking to European Hospital, ahead of the conference, he said there are a number of key factors to consider to successfully set up an emergency radiology department to treat polytrauma patients. The first step, he explained, is triaging patients for the emergency department treatment (ED), following Advanced Trauma Life Support (ATLS)-based entry criteria to secondly establish whether the patient has polytrauma. Next, you need clear algorithms for early clinical treatment in the emergency room with radiology being part of the ED team. Good communication between radiology, anaesthesiology, emergency medicine and surgery is essential.

A third step is to use ultrasound for Focused Abdominal Sonography for Trauma (FAST). Professor Linsenmaier and his team have defined a modified FAST version, they prefer to use – it also quickly views the heart and bilateral pleural spaces for haemorrhage. FAST is a critical step in how quickly a patient can undergo CT, and whether they are triaged directly from the emergency room to the operating theatre. He stressed that the radiologist on-site in the emergency room must have specific emergency radiology knowledge; the technologist running the CT scanner should be familiar with performing whole body scans in polytrauma; and there needs to be a pre-proto-col, specifically designated to whole body CT.

Of his firm belief in the VIB concept having particular value in this context, he further points out: ‘Today’s whole body CT produces a large number of images, with which it’s difficult to work, so my group recommends VIB – volume image reading – where we start reading the data right away when the data is available on the CT console. We don’t wait until every reformatted image is in the PACS, we instead start VIB reading the raw data immediately from the console and this speeds up the diagnosis.’

With a limited role for conventional radiography in this context, the professor recommends having the availability of a modern, very fast scanner, capable of handling large scan volumes and ensuring integration of all modalities for successful polytrauma imaging.

The key learning points from the ECR session, he said, will be how to apply modern emergency radiology in a clinical priority-oriented concept. Adopting such processes will speed up diagnosis, he added, reduce the complication rate and improve the outcome for the patient.

The professor’s Munich team has conducted research on the influence of whole body CT in polytrauma on patient outcomes. ‘We showed that applying whole body CT in patients with polytrauma, significantly improves survival,’ Professor Linsenmaier confirmed (The Lancet. 2008).

For quite some time, Germany’s five army hospitals have been treating civilians. Today, up to 70% of patients do not have a military background. This has helped these hospitals to function financially, and to ensure a broader portfolio of medical cases. Some 60 military physicians serve around 60,000 in-patients annually for disciplines such as traumatology and, for example issues such as severe haemorrhages and loss of hearing; he suggested. The Central Army Hospital, Koblenz, is driving these kinds of approaches.

With increased activities outside the country, acting in UN and NATO missions with international collaboration, the number of emergency surgery cases in the German army has expanded. This has lead to an increase in specialised knowledge, how which our combined visceral-trauma surgeons, for example, now wish to exchange with civil medics,’ said Dr Christoph Veit, President of DGWMP – the German Society of Military Medicine. In particular, we can provide highly specialised expertise regarding the practice of first-line trauma surgery in contexts where resources are limited … such as, for civil practice, in remote areas.

Until today, competence from the military side had been present in civil medical societies at the level of organs, Dr Zallet pointed out. During the congress DGWMP and DGAV, the German Society for Visceral Surgery, jointly founded a working group. CAMIN (Chirurgischer Arbeitskreis Militär- und Notfallchirurgie – Surgery Working Group in Military and Trauma Surgery) will provide a platform for know-how exchange in trauma surgery to foster outcomes both in military and civil medical routine. This creates cross-sectional visibility for military medicine concerns, and allows us to bring in our expertise, which is of great research interest to civil colleagues, e. g. in the case of post-traumatic stress disorders,’ the head surgeon said.

CAMIN is only the beginning of an expanded interchange of expertise between military and civil medicine, aiming at joint research activities,’ Dr Veit concluded. All surgeons are invited to participate; congresses such as ARCHIS and DGAV, as well as visiting physician schemes will provide platforms.
Implantable cardiac devices

Austria’s cardiovascular research

AIT’s device Mobil-O-Graph enables arterial stiffness measurements over a 24-hour period

- is mainly used in a scientific setting and only rarely used outside the hospital. However, an Austrian research institution has developed a mobile device that facilitates measurements of arterial stiffness over a 24-hour period.
- Measuring the stiffness of the vessels allows a better assessment of the cardiovascular risk and improves the ability to monitor the effects of treatment, explains Dr. Siegfried Wassertheurer, Deputy Head at the Department of Health & Environment at the Austrian Institute of Technology (AIT).
- In the current treatment guidelines both the European Society of Hypertension and Cardiology (ESH and ESC respectively) refer to the use of pulse wave analysis (PWA) to determine central hemodynamics. Pulse wave speed, pulse wave reflection and data on central blood pressure deliver information about the stiffness of the arteries because pathologies lead to characteristic changes in the dynamics of the pulse waves. When the vessels become stiff, meaning calcified, the speed at which the pulse waves spread through the body is significantly higher, Dr. Wassertheurer points out.
- For the measurement of arterial stiffness inside the body, conventional blood pressure measuring on the brachial artery alone does not suffice. Peripheral pulse curves differ in form, speed and amplitude very clearly from central pulse curves. The AIT has therefore developed mathematical algorithms that make it possible to determine the aortic pulse curve from the peripheral pulse curve measured on the upper arm. These were integrated into a conventional, mobile blood pressure measuring device, which continuously measures a patient’s blood pressure over a 24-hour period. This combination of measurement and algorithms facilitates a focused diagnosis of the state of the aortic vessels, he says.
- Via a cuff attached to the upper arm, the Mobil-O-Graph initially measures peripheral blood pressure in the lower extremity cycles and then, indirectly, measures the internal blood pressure and therefore the state of the aortic vessels. Developed in collaboration with the Department of Cardiology at Wels-Grieskirchen Hospital (Upper Austria) and the German blood pressure measuring equipment manufacturer I.E.M., the AIT device is already licensed in Europe, the USA, Canada and South America and a license for use in Japan is currently in the pipeline.
- More than 1,000 of these devices are currently used worldwide, mainly in hospitals and some surgeries. The cost of acquisition is currently around €5,000. "We are working on making the devices smaller and simpler still, so that costs will continue to fall, making mass production feasible in a few years’ time," Dr. Wassertheurer predicts.
- In the past, the thinking was that high blood pressure leads to stiff arteries. However, it seems to be the other way round, says Thomas Weber PD MD, head of the Hypertension Out-patient Clinic at Wels-Grieskirchen Hospital, explaining the medical importance of arterial stiffness. "With every heartbeat, the large vessels are stretched, which, over the years, causes enormous mechanical strain. The elastin in the media degenerates and is replaced by the stiffer collagen, which makes the large arteries stiffer. This increases strain on the heart, which has to pump harder to fill the circulations, and it also damages the small blood vessels in the brain and kidneys, he concludes. "Therefore it is very important to carry out screening at an early stage, to diagnose damage to the heart, brain and kidneys and take appropriate treatment, avoid anything worse.”

Radial access to the heart is favored

Report: John Brooky

Twenty years after introducing radial access for cardiac interventions, Eurointervention has published a consensus document favoring this shorter route to the heart when performed by experienced operators.

Compared to the more widely used femoral access to place coronary stents, radial access has been shown to cause fewer complications at the vascular access site, lower hospital stays and reduce costs. The consensus was developed by a panel appointed by the European Association of Percutaneous Cardiovascular Interventions (EAPCI) comprising interventional cardiologists and angioplasty experts nominated by the European Society of Cardiology.

For coronary angiography and percutaneous interventions (PCI) the consensus is that radial access is feasible as the default approach in routine practice, in stable and unstable patients, including for ST-elevation myocardial infarction (STEMI) patients. The study showed that centralised treatment, the company reports.

Clinical studies like TRUST (2010; Vurma et al., Circulation 2010 and Circ Arhythm Electrophysiol), COMPas (Mabou P et al., Eur Heart J 2012), REFORM and ECOST have proved that remote monitoring is a safe and effective tool in assessing the patient’s medical status. Studies have also demonstrated that satisfaction with remote monitoring is very high among both patients and physicians. Biotronik Home Monitoring is regarded as the most user-friendly system because it does not require any patient interaction in order to obtain data, the manufacturer reports. ‘Instead it delivers alerts to the clinic in an easy-to-assess traffic light system.’

The claim that Home Monitoring reduces in-office follow-ups is supported by several independent randomised controlled trials for both pacemakers and ICD’s (implantable cardioverter defibrillators) and has also been confirmed by observation-al study data. In 2009, the Biotronik Home Monitoring system received specific FDA and TüV approval for its ability to replace in-office visits safely, and to detect health issues and device-related issues earlier, allowing for timely medical inter-vention, the company reports.

Austria's cardiovascular research

Left: Modern remote cardiac monitoring

Implantable cardiac devices

Evaluting the efficiency of centralised cardiac monitoring

Patients with cardiac implantable electric devices (CIED) need ongoing and lifelong follow-ups. Due to the growing number of CIEDs, the demand for follow-up visits is increasing rapidly and already push-ing clinics to maximum capacities. Inconsequential, non-actionable vis-its are of particular nuisance to both physicians and patients. Today, follow-ups can be done remotely through remote cardiac monitoring, which eases clinical routine and allows patients to obtain treatment as soon as needed, further leading to safer and more efficient patient management.

© Krischanz & Zeiller

Top left: Modern remote cardiac monitoring
A new system might help to analyse unstructured clinical documentation, such as lab/pathology results, thus tapping a wealth of hidden information

Anna Rumshisky PhD studied Computer Science at Brandeis University until 2009. As an Assistant Professor at the Department of Computer Science at University of Massachusetts, Lowell and research affiliate at the Clinical Decision Making group at the Computer Science and Artificial Intelligence Laboratory (MIT) her primary research area is natural language processing (NLP), with applications in clinical informatics, computational In-silico semantics, as well as digital humanities and social science. Her work focuses on the development of data-informed unsupervised learning methods and on leveraging existing resources and information-harvesting techniques to overcome the knowledge acquisition bottleneck.

...summed up: Compared to the general domain, content, information extraction from unstructured clinical data has been lagging behind, and the main obstacle has been the absence of annotated training supervised machine learning systems. This situation is partly due to privacy restrictions on the clinical text.

...However, over the past six years several regional EHR systems and clinical records have been annotated for different linguistic information and several community-wide information extraction challenges have pushed the state of the art forward.

...These have been organised under the aegis of the Informatics for Integrating Biology and Bedside (i2b2) project and led in large part by the Clinical Decision Making group, with the principal investigator Dr Ozlem Uzuner, a research affiliate and former postdoctoral fellow in the Clinical Decision Making group, currently an assistant professor at SUNY Albany.

...Blocked structuring/stand- ardisation and potential applications

...The annotated data covers document-level diagnosis extraction, text-level annotations of clinical problems, tests, and treatments/interventions, as well as relations between them, extraction of medications, and dosages, and a few other information extraction tasks. Last year, we ran a challenge on extraction of temporal relations between clinically relevant events, and another annotation effort is under way this year. Importantly, we make the annotation data available to the community for training and testing the automated systems.

...Informatics for Integrating Biology and Bedside (i2b2) project is challenging for a number of reasons. Typically, clinical text is written for experts by experts, and uses shorthand characterised by highly non-standard syntax, which is, at the same time, associated with abbreviations and acronyms not well documented in any knowledge base resources. The most prominent semantic resource used for clinical text processing is the Unified Medical Language System (UMLS), which has not been designed with text processing in mind, and therefore is often not directly useful.

...'As far as disambiguation of undocumented acronyms is concerned, for example, creating annotated data would entail (1) devising a sense inventory and (2) annotating a corpus of text for every single ambiguous word. Since this is too labour intensive and therefore expensive, our goal has been to develop unsupervised learning methods to accomplish the same tasks.'

...Solution path 'We tried several disambiguation methods that do not involve supervised machine learning. The first set of results from UMLS to attempt to disambiguate words. For the reasons mentioned (UMLS is not structured in a linguistic resource) the results were not very impressive. We then decided to adopt a modification of an unsupervised bottom-up probabilistic modelling framework, called topic modelling, which has been used with some success in the general domain.

...Topic models – in particular, we used Latent Dirichlet Allocation (LDA) – can be used to infer the distribution of topics in document collections.

...The OpenInFSE project followed a similar approach, aiming at setting up of an operational infrastructure to support the interoperability of EHR in the context of Public Health System Connectivity. Three regions, namely Piedmont, Campania and Calabria, were involved in this project, which did not only worked at implementing and sharing InFSE components with EHR systems. In addition, technology also in integrating these components with regional EHR systems and it experimented with the interchange of healthcare documents between the three regions involved.

...The OpenInFSE project laid the groundwork for the IPSE project, which involved a greater number of regions and provinces in the Italian peninsula and experimented with the exchange of patient summaries by interoperability of regional EHR systems. Connected to the eCOP project (European Patient - Smart Open Services) this project allowed for both direct (region knowns) and federated (region unknowns) search of patient records and for document retrieval.

...The Italian e-health platform is still buzzing with activity with on-going and prospective projects co-financed by the Presidency and the National Research Council. One particular project presently underway involves the development of a set of software modules rendering them available as open source components to all stakeholders, among others.

...The ultimate aim of such information technology projects is to establish a cohesive system that can support healthcare integration at least on a national level. The water is there to drink. Let us hope the horse takes it in his or her reach.
**Epigenetic drugs**

Reprogramming to help correct Nature’s mistakes and possibly revolutionise cancer staging and therapy

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**Digital path**

UK labs face changes and challenges from new healthcare legislation

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Aspects of new healthcare legislation are causing concern among medical laboratories, especially in the United Kingdom – including the lack of future funding for innovation and development under a new reimbursement model, a little appetite to quantify the cost effectiveness of laboratory testing, reduced staffing and a shift in emphasis that will see the need to make profit over ride initiative and innovation – all issues highlighted during the Frontiers in Laboratory Medicine conference held in Birmingham in January.

Speaking to European Hospital in his capacity of President of the Association for Clinical Biochemistry, Hospital Leipizig, Germany, is all about regulating specific patterns in cells, which are propagated not by changes in the DNA sequence but by epigenetic mechanisms, such as DNA methylation and histone modifications. These mechanisms modulate gene expression by changing the state of the chromatome, not by changing the DNA sequence itself.

**Digital imaging**

Although evolving as a tool in medical pathology for years, several factors have hampered its widespread use in this field. Now, a Scientific American article asserts that the time has come for a digital imaging revolution

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**Plastic as Science**

At the end of Fifties, the plastics technological developments led naturally to the birth of the Labware Division, the Kartell section specifically dedicated to study and supply products for the laboratory market. The Division uses raw materials, such as Polytetrafluorethylene and Polyethylene to produce a wide range of lightweight, highly resistant and economic products, the natural alternative to the glass. That’s the reason why Kartell is today internationally known as a leader in high quality technical laboratory products.
Case Study

South African born Dr Liron Pantanowitz, a pathologist at the University of Pittsburgh Medical Center in McKeesport, Pennsylvania, has written more than 200 publications on all aspects of pathology. He presented his ideas on digital pathology and how it can shape medical diagnosis and treatment as keynote speaker at the Cambridge Healthtech Institute conference held in San Francisco in February this year. Dr Pantanowitz has been at the forefront of digital pathology development for over a decade, and his work has been instrumental in advancing the field.

Digital Pathology

Digital pathology is a rapidly evolving field that promises to revolutionize the way we diagnose and treat diseases. It involves the use of digital technology to capture, store, and analyze images of biological specimens. This allows for more efficient and accurate diagnosis, as well as improved patient care and drug development.

Digital pathology systems typically consist of a camera, a microscope, and software that can capture high-resolution images of tissue samples. These images can then be analyzed by experts or used to train artificial intelligence algorithms to assist in the diagnosis process.

One of the key advantages of digital pathology is the ability to store and share images electronically. This means that doctors and pathologists can access patient information from anywhere in the world, allowing for faster and more accurate diagnosis.

Another benefit of digital pathology is the ability to perform virtual biopsies. This involves using imaging techniques to diagnose diseases without the need for a physical biopsy, which can be painful and risky for patients.

In conclusion, digital pathology is a promising technology that promises to improve patient care and advance medical research. As technology continues to evolve, we can expect to see even more exciting applications of digital pathology in the future.
POC testing technology

Julian Baines, Group CEO of EKF Diagnostics Holdings plc, considers the present role of point-of-care tests and their potential value to health services.

By its very nature, Point of Care Testing (POCT) technology does not strictly sit within the hospital sector. Rather, the rationale behind POCT is to keep the patient out of the hospital and within the primary care setting. This is because lying at the heart of the concept of POCT is the principle that medical tests are convenient and immediate to the patient. Consequently, in countries that have fully embraced POCT, patients can visit a general practitioner (GP) or a nurse to provide a tiny blood sample and undertake a test for haemoglobin levels, lipid profile, glycaemic status, glycated haemoglobin (HbA1c), CRP, to name but a few, and receive a lab-accurate result before leaving the surgery.

By putting resources into POCT, governments can free up funds and resources that can then be invested in other critical hospital services. Therefore, rather than resist this inevitable drift towards POCT, hospitals should embrace technology that is focused on providing a better patient experience and reduces the total cost of basic patient care by enabling clinical decisions to be made at the earliest opportunity. Currently, the barriers to the wider use of POCT are so many, both technological, providing products are designed and manufactured with quality and ease of use at the forefront to rapidly deliver accurate results, but those of politics and acceptance.

Used in the United Kingdom as an example, the National Health Service (NHS) is a political hot potato and any change is deemed to be negative or, in the case of the current government, an attempt to privatise. This is an extreme point of view because POCT has the potential to save the NHS vast sums of money through earlier diagnosis and treatment, or even the reduction of unnecessary treatment. However, when the former Minister of Health, Andrew Lansley, tried to tweak the system to allow more POCT he was criticised. The UK has a highly structured and complex central laboratory system and making changes will not be easy due to the highly politicised nature of the NHS. It is a similar story in France, although there is a move there to radically reduce the number of central laboratories that might, in turn, make the French health authorities more open to the POCT concept.

Not surprisingly, there are varying degrees of POCT acceptance between countries and continents. In countries such as the USA and Germany, where health insurance pays for treatment, POCT is embraced because of the cost efficiencies it offers. In emerging markets the opportunity is even greater, as they do not have a pre-established dependence on central laboratory testing and therefore are often early adopters of diagnostic innovation that improves patient care. Without doubt, emerging markets are catching up with the western world regarding patient care, and the effective use of POCT is a key contributor to this.

Another key driver stimulating the growth in POCT uptake in emerging markets, such as Asia, is an increasing per capita GDP with subsequent escalation in incidence of western diseases, for instance diabetes. This has been evidenced by growing demand in these regions for our diabetes detection and management: Quo-Lab POCT analyser measures glycated haemoglobin (HbA1c).

Quo-Test and Quo-Lab analysers for easy and reliable measurement of glycated haemoglobin (HbA1c), which is used to detect and manage diabetes.

The on-going world economic downturn should further influence the greater adoption of POCT within countries not currently widely using such technology. This is because POCT offers excellent patient care and monitoring at a significantly lower cost to traditional laboratory and hospital based care. In times of austerity POCT offers an avenue for reducing the financial burden on health services.

That said, POCT is not without limitations. No GP would use POCT exclusively where a second opinion from hospital consultants and experienced biomedical scientists are critical, for example in oncology or HIV. However, POCT can play a key role in identifying early onset of conditions, such as diabetes and anaemia, which can then be investigated by further testing at a central laboratory.

Researchers have used genome sequencing to control an MRSA outbreak in a British hospital, and scientists from the University of Cambridge, the Wellcome Trust Sanger Institute and Cambridge University Hospitals believe the breakthrough could impact significantly on the way hospitals tackle the common disease termed ‘superbug’ threat in the future.

The team used advanced DNA sequencing technologies to confirm the presence of an on-going outbreak of methicillin-resistant Staphylococcus aureus (MRSA) in real time in a Special Care Baby Unit. By cracking the bacterium’s genetic code, they were able to end the outbreak at the Rosie Hospital on the outskirts of Cambridge and devise a new weapon in the continuing MRSA problem.

Identifying the carrier

Hospital staff became concerned after MRSA was detected in 12 babies during routine screening, but current tests could not tell if this represented a single on-going outbreak within the unit or whether these were unrelated cases.

The research team stepped in and, by comparing MRSA isolates from those 12 patients using DNA sequencing technology, they showed the pathogens were all closely related and part of the same outbreak.

The ward was deep cleaned, but when another MRSA positive infant was admitted and, after a gap of two months, the team used advanced DNA sequencing to show in real time that this strain was...
sequencing MRSA outbreaks

Digital lab results
Digital genomics is no longer a technology of the future – it is a technology of the here and now! Report: Mark Nicholls

also part of the outbreak, despite the lack of apparent links between this case and previous patients. The finding presented the possibility that a member of staff was carrying the pathogen.

Tests on 154 members of staff showed that one person was also carrying MRSA, which may have been the source for at least some babies in the unit. The healthcare workers were treated to eradicate the MRSA presence and thus remove the risk of further spread.

Essential distinguishing between the strains

This is believed to be the first time rapid genetic testing has been used to track and stop an outbreak, but the technique could soon become a regular way of stopping MRSA.

Professor Sharon Peacock from the University of Cambridge, said that current bacterial typing techniques lacked sufficient discrimination to distinguish between strains of MRSA that are most often isolated in hospitals. ‘In the event that two patients are either carrying or infected with a strain such as EMRSA-15 – the most common clone in the UK – it isn’t possible to distinguish between individuals with similar genotypes, there has been a transmission event from one patient to another, or whether both patients acquired their MRSA through independent acquisition events. So, a driver for evaluating whole genome sequencing of MRSA is to see whether this provided enough discrimination to tell apart strains of the same lineage.’

This was achieved by undertaking whole genome sequencing using a rapid high throughput bench-top sequencer, but the investigations took a decisive turn and became a real-time prospective study as the outbreak unfolded at the Rosie Hospital.

‘What we also wanted to achieve was to start the process of translating the technology from being a research tool where timing does not matter, to a real-time clinical tool – so we were using machines that could be used in the future in clinical practice,’ she explained, adding that the next step is to devise simple-to-use interpretation tools that will enable hospitals to analyse complicated sequence data.

‘Our study indicates the considerable potential of sequencing for the rapid identification of MRSA outbreaks. If we have a robust system of this type available for routine use in the future,’ Prof. Peacock pointed out, ‘we could use it to investigate putative outbreaks at their outset and, if confirmed, put in place infection control measures that bring them to a rapid close.’

The team is also building a database of MRSA genomes with 2,000 already collected from across the UK, which will provide an essential genetic framework with which to compare and interpret MRSA genomes in the future.

Cleaning remains essential

The researchers are currently studying all MRSA carriers and infected patients over the next year from a number of East of England hospitals and the community to understand transmission events with the aim of improving infection control management.

‘In the future, sequencing will be used for infection control surveil-

lance and outbreak investigation because it adds considerable value to the existing methods of infection control, and could act as an early warning system,’ Prof. Peacock predicted. ‘We should look at how traditional methods of combatting MRSA, such as hand-washing, hospital cleaning and care of intravenous lines, remain essential for the on-going prevention of MRSA bloodstream infections, but the introduction of technology to crack the MRSA genetic code will add an extra weapon in the fight against the pathogen.’

Sir Mark Walport, Director of the Wellcome Trust, said: ‘This is a dramatic demonstration that medical genomics is no longer a technology of the future – it is a technology of the here and now. By collaborating with NHS doctors, geneticists have shown that sequencing can provide a powerful tool in the fight to control the management of healthcare today, halting an outbreak of a potentially deadly disease.’

Electronic signatures are a necessity against fraud

GSK President Joaehn Thiery insisting that electronic signatures are necessary to combat any tampering with lab results (Photograph: MR)

Protecting results from manipulation

Now, whereas, in the past, fraudulent cases is that we can no longer simply and conventionally pro-

ceised by feeding values derived from a lab analysis directly into some HIS or EMM. The identity and authenticity of this type of data are at risk of manipulation. Thus, he adds, lab results – whether abnormal or normal – need to be turned into fixed electronic objects, or documents and they require a format, such as PDF, and an electronic signature of top safety level to be attached to them. The lab information typically includes reference values and recommendations in an accompanying letter. At the University Hospital Leipzig, lab results are turned into documents and automatically sent to the respective patient’s EMR.

Use electronic signatures

When mere values, or figures, are fed into systems, they are beyond the control of the lab physician. ‘To guarantee authenticity, we learned the hard way that this definitely must stop. Electronic signa-

tures are readily available, and they’ve been shown to work prop-

erly in everyday routine.’ Let’s start using them now –

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Germany

Telefon: +49 (0) 941/20 86 48-0
Telefax: +49 (0) 941/20 86 48-29
E-Mail info@kugel-medical.de
Scepticism increases among German in vitro diagnostics firms

The 2013 turnover expected by German in vitro diagnostics producers is significantly lower compared to last year, according to a survey of members carried out by the German Diagnostics Industry Association (VDGH) presented in January at the Diagnostica Forum in Berlin, whilst more than half of those surveyed expected improvements in 2012 only about a third forecast this for 2013.

Carried out in December 2012, the survey showed only 55.4% of members believe their economic situation will improve. At first glance this may look optimistic, says Dr Martin Walger, Managing Director of the German Diagnostics Industry Association. It is in fact thought provoking, considering that 56% of members expected a positive development for their company when surveyed the previous year. The number of members expressing satisfaction accordingly rose to more than half. However, only 10% of those surveyed are predicting deterioration of their situation, and this figure is only marginally higher than the prognosis for 2012. There are unlikely to be any effects on investment planning and expenditure on research and development, based on the information provided by the 48 in-vitro diagnostics companies surveyed by the association in December 2012 – to the contrary, the previous year’s values are even being exceeded – only the dynamics regarding the size of the workforce are expected to slow down. With around 10%, slightly more companies declared their intention to reduce their workforce than did so the previous year. Vae verso, at around 50%, slightly fewer companies announced that they would increase their workforce.

Asked about the greatest obstacles against development, almost half of all companies cited high price pressure in the German market. In second place was consolidation and market integration in the side, followed by the reimbursements level set out in the German statutory health insurers fee schedules, which companies consider to be too low.

Members companies also complained about cuts to reimbursements for medical laboratory services and about the drawn-out procedures for innovations before they receive approval and acceptance in terms of the range of services covered by the German statutory health insurers.

Test approvals are too slow

This last point in particular was criticised by Dr Karl-Heinz Bischler, Member of the VDGH Board and Head of the Central Lab Marketing Automation, of the MedAustron Healthcare Diagnostics, who said, ‘The acceptance of new laboratory tests into statutory medical care in Germany takes far too long and has almost come to a standstill in the last few years. Since 2010, more than 50% of companies surveyed also considered personalised medicine to be a very promising area, although currently more than half of those surveyed are convinced that personalised medicine does not have any relevance for their companies.

Having discussed the outlook for 2013, the forum considered the 2012 business year. Based on the first three quarters sales statistics, the German market showed negative growth in in-vitro diagnostics of 1.5%. ‘We have a twofold picture here,’ explained Dr Martin Walger. Laboratory diagnostics had an upward trend of just under 5%, but there was an almost 8% decrease for the fast tests sector. He believes the reason for this decrease to be the large drop in tests for self-monitoring of blood glucose. ‘The health insurers have stopped reimbursing self-tests for blood glucose monitoring for Type 2 diabetics who are not insulin dependent,’ he said, and the budget for the test strips generally has been tightened a lot by the health insurers and the Association of Statutory Health Insurers.

Market crash effects

With this negative balance, Germany is in line with the European trend as a look at growth in Europe is also sobering, Dr Walger said. Only three of the larger European markets (Belgium, Switzerland and Great Britain) still show positive growth based on preliminary sales statistics – in 2011, however, all eight larger European markets still showed positive growth. ‘The crash in the Southern European markets, which already loomed in 2011, is dramatic,’ he said. Greece is in first place with a minus of 10.7%, followed by Portugal with a minus of 9%. Italy, which in 2011 still had a turnover of €1.7 billion, putting it in third place behind Germany and France within the European market, has a negative growth of 5.6% based on preliminary figures.

The EU-wide growth rate of almost 1% seen in 2011 is unlikely to have been achieved in 2012, Dr Walger pointed out.

Professor Joachim Thiery MD, President of the German Joint Association for Clinical Chemistry and Laboratory Medicine and Director of the Institute for Laboratory Medicine, Clinical Chemistry and Molecular Diagnostics (ILM) at the Leipzig University Hospital, pointed to the future of diagnostic procedures. The automation and networking of statutory processes, in the shape of highly standardised methods, has almost been achieved in Germany. Around 80% of diagnostics is now being performed by so-called high-throughput platforms, which have continued to revolutionise laboratory diagnostics worldwide since the 1950s. But, the professor said, ‘We are going through a saturation phase regarding automation: Instead, new approaches, such as metabolomic and protein analysis will become much more important in the future.

Bio-agent-free instruments, such as mass spectrometry, are increasingly used in the context of multi-parameter analysis, Prof. Thiery said, and sees this sector’s future in the development of systems medicine laboratory diagnostics that takes into account the increasing density of information and which further develops laboratory-focused bioinformatics. Even if he added, medicalexternal demand is not quite keeping up with existing technological developments, such as seen in metabolic and protein analysis, sooner or later it will become an important growth area for diagnostics companies.