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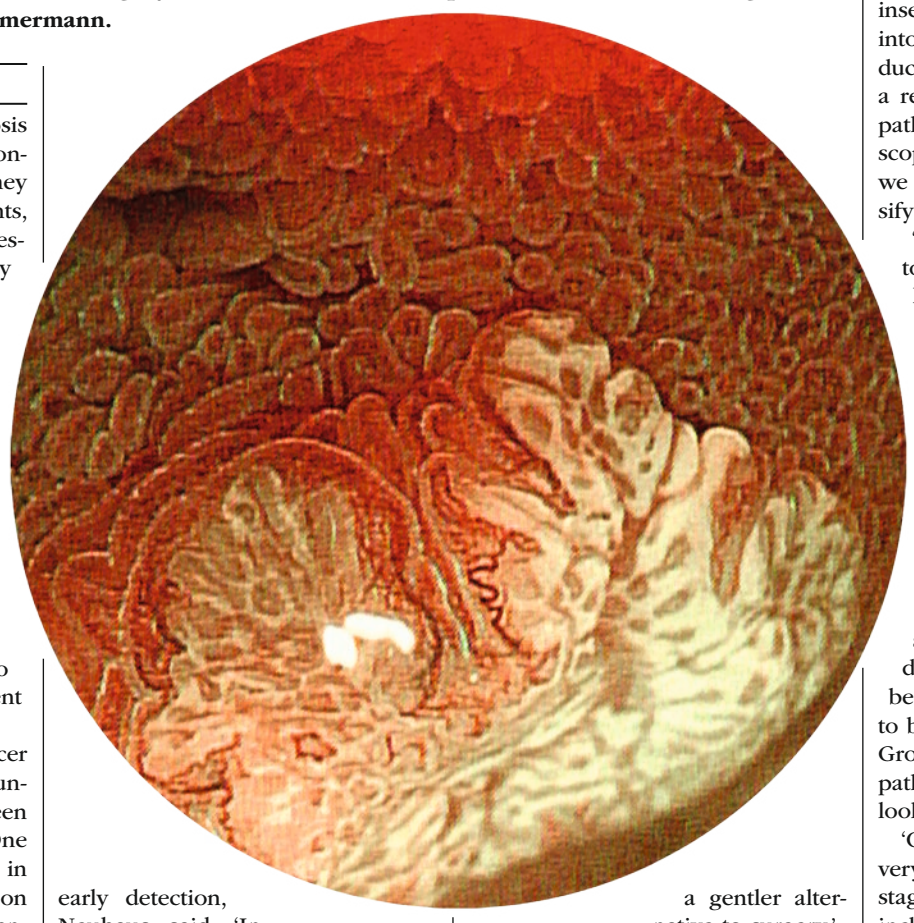
Endoscopy jumps the boundaries

'Health insurers should keep a tighter rein on the quality of endoscopic interventions because, mostly, they represent a gentler alternative to surgery,' asserts international expert Horst Neuhaus, during an EH interview with Daniela Zimmermann.

Report: Juliane Dannert



For many people a cancer diagnosis means little chance of a cure and considerable limitations to life, as they know it. However, many patients, particularly those with gastro-intestinal cancers, can be helped by early detection. In the future, this will possibly also apply to Type 2 diabetics, of which there are more than seven million in Germany alone.

During our interview with internationally renowned endoscopist Professor Horst Neuhaus, Senior Consultant for Internal Medicine at the Evangelical Hospital in Dusseldorf, he spoke of innovations in digital endoscopic imaging technology that are used to improve diagnosis and treatment for patients.

Figures from the German Cancer Research Centre show that the country's cancer mortality rate has been decreasing over recent years. One reason for this are improvements in early detection, for instance of colon cancer. Almost one in three screenings reveals patient polyps, Neuhaus explained. 'The more thoroughly a doctor examines, the more he will find and the lower the risk of the patient developing cancer, despite a colonoscopy.

'One quality criterion for the examination procedure is the adenoma detection rate. It quantifies the frequency with which a doctor discovers an adenoma during an endoscopic examination. For people aged 50 and over, this, as confirmed by studies, should be over 15% for women and more than 25% for men.'

Quality reflects experience

Modern and innovative endoscopes, as well as the endoscopist's experience, are critical for successful early detection, Neuhaus said. 'In my view, the quality of the endoscopist is one of the most important criteria. A high resolution endoscope is necessary but cannot compensate for a bad endoscopist.'

The adenoma detection rate is a good quality criterion to assess a doctor's work in colon cancer prevention. 'In other areas, such as endoscopic interventions in the oesophagus, things become more complex. In Germany, any doctor, even those who have only limited experience with therapeutic endoscopy are at liberty to do advanced procedures,' he said. 'It would definitely be in the interest of patients and health insurers to keep a tighter rein on the quality of these interventions because, mostly, they represent a gentler alternative to surgery.'

Neuhaus believes that the increasing use of the latest endoscopic procedures clearly improves the prognosis for patients along with the quality of treatment. At the same time, however, the respective responsibilities in medicine shift. One example of this is microscopic endoscopy: 'If you carry out an MRI scan in a 60- to 70-year-old patient you will discover cysts in the pancreas in about 10% of the cases. Not all of these will be malignant of course, but it is not always possible to determine this with certainty in individual cases. The risk however can be assessed with modern endosonographic procedures, such as contrast-enhanced ultrasound, or a cyst puncture to analyse the content. In selected cases in the context of studies this latter technique involves insertion of an ultra-thin catheter into the cyst. This allows us to produce endomicroscopic images with a resolution equivalent to what the pathologist sees under the microscope, i.e. current data indicate that we can diagnose safely and can classify our findings as malignant or not.

'However, it doesn't always have to be endomicroscopy.' The new, high-resolution endoscopes are helpful in the early detection of cancer of the digestive tract because we have long-standing training in the recognition of changes to the structure of mucosa and vessels; the key word here being neo-angiogenesis.'

For Neuhaus and team the endoscope offers a gentle method to complement biopsies with interventional imaging diagnostics. 'When the image has been produced it obviously needs to be assessed. Studies and Working Groups that classify the images, and pathology colleagues who take a look at the images, are helpful here.

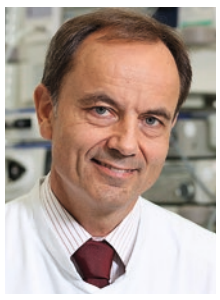
'Cooperation with colleagues is very important because, in early stages of cancer in different organs, including the oesophagus, stomach, pancreas and others, there's always a certain percentage of patients who will have to undergo surgery. The patient benefits from the fact that we can offer everything in one location.'

Diabetes – a new area for endoscopy

The teamwork also continues with diabetologists, with whom Neuhaus, in partnership with the medical technology industry and in the context of international multi-centre trials, is working on a new procedure to treat Type 2 diabetics.

"Half of all diabetic patients have a raised HbA1c level. We know that patients with a gastric bypass, where the surgeon connects the remaining part of the stomach with the small intestine and therefore disconnects the duodenum, not only lose weight but also that their diabetes improves. One of the reasons for this appears

Continued on page 8



Senior Consultant of the Medical Clinical at the Evangelical Hospital Dusseldorf since 1995, Professor **Horst Neuhaus MD** has his scientific and clinical focus set on diagnosis and treatment of particularly early cancer stages of the intestinal tract, diseases of the biliary tract and pancreas, as well as diagnostic and therapeutic endoscopy. He is involved in several international studies in close cooperation with German and international centres and hospitals. He also hosts the International Endoscopy Symposium in Dusseldorf, considered one of the world's largest and most important congresses within the discipline.

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Errors are unavoidable but rare in thoracic surgery

Stringent medical risk management

Report: Anja Behringer

The precise number of adverse clinical events is difficult to ascertain. Several international studies estimate that medical errors happen in 3-5% of all hospital treatments and that around 30-50% of these could have been avoided. A hospital-acquired infection (HAI) is also considered a medical error. For the past few years, the relevant commissions and mediation bodies in Germany reported stable figures: around 25% of 8,000 alleged medical errors investigated were indeed classified as such. However, the number of alleged medical errors has risen significantly every year during the last decade, with a current estimation of more than 40,000 per year. According to the most recent figures 1,380 patients suffered irreversible health damage, 150 died.

In view of this situation, in 2013 the health objectives working group (Gesundheitsziele) declared patient safety to be the new national health objective. Moreover, safe patient care was included in the Patient Rights Act in 2013. Since 2014 the Federal Joint Committee, (Gemeinsamer Bundesausschuss), the highest decision-making body in German healthcare self-governance, has mandated that hospitals implement more and significant measures regarding patient safety. Modern error management is mostly based on a system-oriented approach, i.e. the entire process landscape is taken into account when prevention and continuous improvement measures are designed. An anonymous error register has been demanded for a long time, to support an error culture that promotes insights rather than punishment.

However, risks must be clearly identified so as to influence the system towards damage prevention. The German Society for Thoracic Surgery (DGT) established a Working Group Patient Safety and Risk Management. While data analysis reported by more than 100 pneumology departments, from all over Germany, indicated that in thoracic surgery the number of medical errors is rather low, the data did show that adverse events can be classified with regard to their risk management requirements

- damage prevention (P)
- compliance (Patient Rights Act, statutory quality management requirements) (C)
- insurance-related requirements (I)

Most medical errors were not caused by surgeon's poor skills but by shortcomings in documentation or communication, or by lack of standards, e.g. regarding wound management. DGT certifies so-called 'Thoracic centres – Competence centres for Thoracic surgery'. Hospitals that wish to obtain this voluntary certification must meet defined quality standards. Based on findings by the Working Group Risk Management, the requirements P, C and I were integrated into the certification specs as of 1 January 2015, with a special focus on prevention.

This very methodical professional prevention may well serve as a blueprint for the insurer-initiated evaluation of hospital-related risks.

At the surgeons' congress DGT last year a model project for risk mitigation in lung surgery was presented. Meanwhile, the Working Group Patient Safety and Risk Management – in collaboration with an insurance broker – published initial findings. 'The total number of alleged medical errors is 23, an extremely low risk range,' said Dr Christian Kugler, President of DGT and Medical Director at the Department of Thoracic Surgery, Lungen Clinic, Grosshansdorf.

'In the lung clinics wound infections were the major issue, accounting for 34%,' he added. The second important issue was pain, mostly caused by nerve damage in the thorax. 'These damages can occur when the rib cage is opened – a well-know surgery risk that's routinely included in the pre-surgery patient information process,' Kugler explained. The same holds true for vocal cord paralysis, which accounted for 9% of all reported alleged medical errors. Kugler: 'Another possible adverse event in thoracic surgery is when tissue has to be removed in the vocal cord area.'

Devices that are left within the patient are a completely different problem. In four of the cases analysed swaps, gauze pads or small haemostats had remained in the body after wound closure. 'This is an obvious medical error.' Kugler concedes and recommends loud enumeration of all objects that are being inserted in the patient body, applying the four-eye principle. 'Two people in the operating room (OR) call out the number of objects being used loudly and clearly.' Moreover, he adds, it is advisable to keep material taken from the patient body after the intervention in a separate container for control purposes. 'When there is profuse bleeding and a lot of material is needed, it's very possible that the OR team lose track, or the surgeon overlooks a blood-soaked gauze pad.' To avoid such incidents, many years ago the German Surgery Society demanded the introduction of the WHO checklists to increase patient safety in the OR. As far as wound infections are concerned, wound management and hygiene standards might go a long way. 'Fixed rituals help, for example using the same wash and cover procedures in the OR can automatically turn into a standard,' Kugler advised.

Experts estimate between 30-50% of all hospital medical errors could be avoided. The DGT responded to the error analysis: risk management has been integrated into the certificate 'Thoracic Centre (DGT)'.

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President of the German Society for Thoracic Surgery (since 2009), **Christian Kugler** is also Medical Director of the Department of Thoracic Surgery at Lungen Clinic, Grosshansdorf, near Hamburg. With medical studies and dissertation at Ludwig Maximilian University Munich (LMU) behind him, Kugler became a junior physician at the Department of Cardiac Surgery, München-Grosshadern University Hospital, and later at Ulm University Hospital. He trained in thoracic surgery at the Heidelberg Thorax Clinic. Up to 2009 he was senior consultant at the Department of Thoracic Surgery, Hamburg Thorax Centre, Harburg General Hospital (currently Asklepios).

Curbing agency

Report: Mark Nicholls

New figures for the UK's key National Health Service (NHS) Trusts have revealed their total deficit of more than €1.1 billion for the year 2014-15. This rise on the previous year's deficit of €160m comes against a backdrop of health authorities being required to find 'efficiency savings' of almost €1.4bn over the last five years. The NHS was also a major issue in the recent UK general election, which saw David Cameron's Conservative Party win an outright majority following the previous coalition administration with the Liberal-Democrat party.

Figures from health regulator Monitor show that Foundation Trusts (FTs) – which run hospitals, ambulance and mental health services and are not controlled by central government – have a deficit of €500m, compared to the planned deficit of €14m – while other trusts were €665m in the red and it fears those amounts could become even worse. The Department of Health believes trusts need to become better at balancing the books, and said the government had already invested around €11.3bn in the future of the NHS.

However, health managers say staffing issues were a key factor, with trusts spending over €2.5 on contract and agency staff - more than double the amount planned.

Monitor, which assesses NHS Trusts before they can become FTs, expressed concern at 'over-reliance' on agency staff.

Scanning and printing patient d

Comprehensive la

In German hospitals, medical treatment errors account for 19,000 patient deaths every year, according to the 2014 Health Insurance Scheme Hospital Report. Mistaken patient identity is cited among the errors, which also include interchanged drugs or incorrect drug dosages.

'Scan2Print solutions ensure greater patient safety, far fewer mistakes and less organisational effort,' according to Mediaform Informationssysteme GmbH, which provides applications, developed specifically for healthcare. The firm's solutions are based on scanners made by the US company Code, which are particularly small, compactly constructed devices. Sales manager Steffen Marienfeld explained: 'They're no bigger than a mobile phone and fit easily into any coat pocket. The long-life battery lasts several days without recharging. A special advantage is that we supply each unit with a JavaScript license and a selection of pre-installed applications.' Code scanners are usable via Bluetooth or WLAN. 'For safe, quick working, the reader provides feedback about a successful scan. For this the user can choose between an LED, audio sound or a vibration signal. It is also possible to switch off the acoustic signal and to activate it only if the data is non-compliant, thus significantly reducing the background noise in everyday hospital life,' the firm reports.

The application can be used during surgical discharge, after Xray exams or when admitting in-patients

Source: Honeywell

UK hospitals face funding black hole

g the use of nurses

The firm's report found that, of the 152 FTs (around two-thirds of trusts in England), half ended the year in deficit, with 70% of them acute trusts.

In addition, the waiting list for operations at FTs grew by 8.3% to nearly 1.8 million.

Dr David Bennett, Monitor's chief executive, observed: 'The last financial year was exceptionally challenging for the Foundation Trust sector, and it's clear the current one is following the same pattern… The sector can no longer afford to operate on a business as usual basis, and we all need to redouble our efforts to deliver substantial efficiency gains in order to ensure patients get the services they need.'

Whilst that could lead to changes at some hospitals, Monitor believes this can be carried out 'without compromising patient care'.

Amongst concerned reaction to the deficit from analysts and organisations across the health sector, Richard Murray, director of policy at The King's Fund think tank, said the fact that deficits had occurred despite extra money being provided by the government was disappointing. 'Plugging the growing black hole in NHS finances must now be an urgent priority for the government,' he added.

NHS Providers' CEO Chris Hopson said: 'Despite providers' best efforts, accident and emergency, referral to treatment, diagnostic wait and a range of other targets have also been missed, representing a rapid and widespread deterioration in NHS performance and finances.'

BMA council chair Dr Mark Porter expressed extreme concern regarding the extent of the dire financial pressure many hospitals are under. 'The prices paid to hospitals for work done are being cut year on year to drive "efficiency savings", but the effect is that hospitals are being pushed into deficit. This is no way to run a health service …' On behalf of the BMA, he added: 'We call on government to move away from the current approach to one of investment in health.'

Rob Webster, CEO of the NHS Confederation (representing some 500 organisations that commission and provide NHS services) said the report provided a clear indication of the pressures faced by the NHS but welcomed the Prime Minister's commitment to find at least €11bn extra investment in the NHS by 2019-20 following the debate around the health service during the general election.

However, he stressed: 'We now need to change the way care is delivered in many parts of the NHS, with new models of care, backed by strong support from national bodies and politicians. This looks within our grasp if we align behind the Five Year Forward View, secure sufficient funding and back the NHS to deliver.'

Mark Porter MD, BMA council chairman

Rob Webster, CEO of the NHS Confederation

ata

abelling

to a war. Marienfeld explains: 'The existing patient label is scanned with the Code Scanner and after transfer of the data sets that have been read out they are sent to the Armilla TTP printer via a Wi-Fi/Bluetooth adapter. This prints the new patient wristband quickly and easily, without any user intervention.' For sample and medication labels a patient's ID can be scanned directly from his/her wristband, e.g. during a ward round, and used for laboratory requests or prescriptions. After specifying the desired number of labels, additional personalised patient labels are then printed on the TSC Primas 300 Healthcare printer.

Marienfeld says another application involves scanning the patient ID directly from the patient's wristband, transferring the stored core data set to the PraxiKett Designer medication software and printing the personalised medication label. After corresponding medications have been identified, the medication is again matched by Cross-Check with the patient ID on the his/her wristband. 'This reliably avoids incorrect administration. Bedside scanning applications such as these operate without complex integration into existing IT infrastructures, therefore they promise direct benefit quickly,' the firm adds.

Country profile: Fighting infectious diseases

Romania: Land of hope

Interview: Daniela Zimmermann.
Report: Brenda Marsh

Although Romania joined the EU in 2007, only recently has its macroeconomic increases influenced a rise in a middle class and dented the country's widespread poverty. However, development is still hampered by corruption and red tape in its commercial world.

Through the post-communist years and EU involvement, various IMF, EU and other financial agreements have been made to encourage structural reform and strengthen the financial sector's stability.

In 2013 Romania's economic growth rose due to strong industrial exports and an excellent agricultural harvest, and the country's current account deficit was substantially reduced.

At the end of 2014, the economy showed a 2.8% growth – lower than the 3.5% posted in 2013. Industry output came top in revenues with exports (70% to the EU) still behind economic growth. In that year the Romanian government had met its annual target for the budget deficit, the external deficit remained low, and inflation was lowest since 1989.

Thus, in 2014, there was a gradual loosening of the monetary policy – but reports indicate that progress on structural reforms has been uneven and the economy is still vulnerable to adverse external events. Internally, its tax evasion, weak domestic demand, ageing population and insufficient healthcare represent top liabilities.

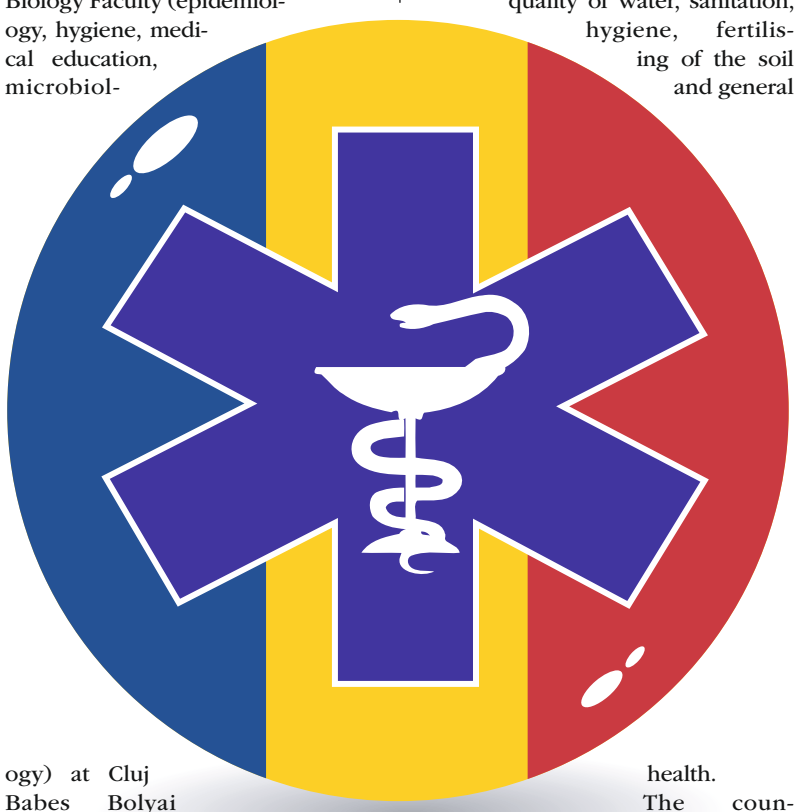
Acknowledging her considerable skills in public and global health issues, clinical research, medical education, programme evaluation, international health policy, the epidemiology of infections and emerging and re-emerging infectious diseases, Daniela Zimmermann of European Hospital asked Monica Deac MD PhD for a brief overview of Romania's healthcare delivery.

A little background

With medical studies at Cluj University in Romania behind her, Deac worked as a general practitioner from 1979-1982, and took on the role of epidemiology and infectious diseases resident for the Medicine and Pharmacy department at the university in 1983. 'I began my research activity in the Cluj Hygiene Institute and even today I work in this branch as a first degree researcher,' Deac explained, adding that she became an infectious diseases specialist in 1987 and gained her doctorate in 1995.

In 1996 the expert gained the title First Degree Scientist and Researcher and, a year later, produced her first book. In all, Deac has notched up more than 20 years as a teacher and over 32 years at the university.

Qualifying in laboratory medicine in 2004, she became involved in several infectious diseases projects, including nosocomial, streptococcal, staphylococcal infections and others related to children and adults, as well as urinary tract infection (UTI) in the elderly. Now a senior epidemiologist and associate university professor in the Biology Faculty (epidemiology, hygiene, medical education, microbiology) at Cluj Babes Bolyai University, Deac says: 'I'm coordinating some infectious disease prevention from Transylvania/Romania, while working in the Public Heath Centre in Cluj, and also doing morbidity and mortality studies for them.'



Leading causes of death

'As everywhere else, cardio-vascular diseases are in first place for us. In recent years even the incidence of cancers is higher than 10 years ago. Concerning infectious diseases, the situation is also growing, but in normal limits and winter, especially for respiratory viruses, we have less reported influenza cases.

'CC (cervical cancer) continues to be at a high level in females before 50 years of age. In the rest, all diseases in Europe are also present in Romania. Maybe in seasonal limits (summer time) a morbidity concerning diarrhoea in all ages in the population, caused by lower rural hygiene conditions, is remarkable.'

She has worked on a study of diarrhoea in the population and, relating to this, it is noted that only around 28% of the rural population is connected to a proper central water supply. Most families use private or public wells, with little or no pollution control – and seven million people use pit latrines.

Information regarding the quality of drinking water in Romania's rural areas is unavailable to the population. Often, they are also unaware of the interconnections between the quality of water, sanitation, hygiene, fertilising of the soil and general health.

The country has until 2018 to implement EU regulations within the EU Water Framework Directive.)

Disease notifications

'There are less internal data to compare with other countries,' Deac points out. 'Romania transmits all illness data to the WHO. In some studies about antibiotics use in Europe, Romania's practices are increasingly included. The country is monitoring some diseases and especially looking for infectious diseases caused by someone arriving from abroad, for example importing malaria, etc. Our data are sent to CDC/WHO, which makes the general statistic data for several illnesses.

Government prevention measures

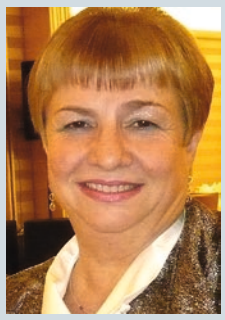
'There are immunisation programmes for several infectious diseases (dates for age grouped children) up to the CDC and OMS demands, education carried out by several medical clinicians, in the clinic or by the family doctor in the practice and, of course, by doctors from Public Health institution branches.'

EU healthcare support

'Up to now there hasn't been much European Union healthcare support. More is obtained from ideas than from direct financial help.'

Medics' migrations

'This is a difficult situation because we continue to lose more and more doctors and have received some from Moldova and India. Two thousand five hundred Romanian doctors have left already – in the last two to three years. The cause is the bad salary we continue to have in our country.'



With native language Romanian, and fluent German and Hungarian, plus English and French, the internationally recognised epidemiology and hygiene expert Dr Monica Deac is active in many international disease-related societies.

Romania provides 1.9 physicians per 1,000 people and has 6.6 hospital beds for the same number. Life expectancy is 71 years for males and 78 for females. The probability of not reaching age 60 is 21.6%.

However, life for Romanians is slowly improving and a change in the public's satisfaction with it should show signs of improvement in the future – if the world and its economies can remain stable.

UK will c

Following up on European Hospital's page one report (Issue 2: Cut prescriptions… Choose treatments wisely!) Mark Nicholls reports that the United Kingdom has also launched the campaign to help.

The Academy of Medical Royal Colleges (AMRC), which represents all medical royal colleges in the UK, has unveiled the USA-inspired 'Choosing Wisely' programme in partnership with specialty organisations in an attempt to reduce harm caused by using too much medicine or interventions that have no benefit to patients.

The AMRC states that unnecessary care occurs when people are diagnosed and treated for conditions that will never cause them harm. There is also growing evidence that many people are over-diagnosed and over-treated for a wide range of conditions, such as prostate and thyroid cancers, asthma, and chronic kidney disease.

As a first step, organisations participating in the initiative are being asked to identify five tests or procedures commonly used in their field, whose necessity should be questioned and whose risks and benefits should be discussed with patients before using them. These might include tablets for mild depression, too many routine and unnecessary blood tests or medicines for mildly raised blood pressure.

Results from the systematic review will be assessed, analysed and com-

Chinese products gain quality and soph

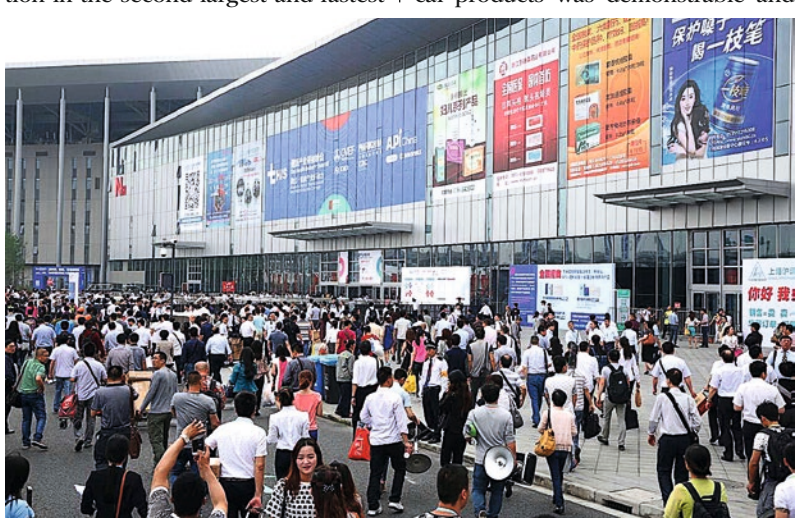
Shanghai hosts th world's largest me

Report: Nat Whitney

This spring, the China Medical Equipment Fair (CMEF), which outgrew available space in Shenzhen, was held at Shanghai's newly built, massive, National Convention and Exhibitions Centre, with Reed-Sinopharm premiering a combined CMEF, PharmChina and API (pharma ingredients) event. The organisation was touting that this is now the largest healthcare show in the world – evidenced outside, inside and all around the Shanghai exhibition area.

While there were some pre- and post-show transportation challenges, with the venue only beginning expansion to accommodate such large crowds, those who persevered were rewarded with a unique experience in seeing the world's premier medical products displayed in one location in the second largest and fastest growing medical products market in the world. Providing almost 300,000 sq.m. of exhibition space for 6,500 exhibitors, the first of the 210,000 visitors stood shoulder to shoulder as the opening bell sounded. What they found were several new twists to the 2015 exhibition: more concentration on education and 107 separate professional conferences held during the four-day show.

Exhibit space in the international hall increased by 50% compared to the previous event held in Shenzhen. Several country pavilions and the IVD pavilion grew, and first time pavilions came from India, Netherlands as well as Germany's Schleswig-Holstein. The French Pavilion hosted a group of 16 French companies, 50% of them first timers at the event. Progress made in quality and sophistication of the latest Chinese medical products was demonstrable and



cut non-essential medical care

piled into lists, and in the autumn the top five interventions for each specialty that should not be used routinely, or at all, will be published.

An AMRC paper published in the British Medical Journal has indicated that a culture of more is better, where the onus is on doctors to 'do something' at each consultation, has bred unbalanced decision making. The authors added: 'This has resulted in patients sometimes being offered treatments that have only minor benefit and minimal evidence despite the potential for substantial harm and expense.'

Cardiologist Dr Aseem Malhotra, from the AMRC, points out that this culture stems from defensive medicine, patient pressures, biased reporting in medical journals, commercial conflicts of interest, and lack of understanding of health statistics and risk. 'Over-diagnosis and over-treatment are the products of a broken system. For the sake of our patients there needs to be a radical overhaul in culture.'

Rather than focusing on a system of payment by results – which encourages doctors and hospitals to do more – the AMRC report suggests that guideline committees 'should increasingly turn their efforts towards the production of tools that help clinicians to understand and share decisions on the basis of best evidence'.

They say it is time for action 'to translate the evidence into clinical practice and truly wind back the harms of too much medicine'.

The AMRC hopes the campaign will change the way medicine and medical treatments are prescribed and believe it could potentially have far-reaching implications for the nature of healthcare in the UK. as it has in the USA, Canada and Australia. In Canada, for example, the Choosing Wisely project has already identified treatments whose value should be questioned with patients. They include exercising restraint when ordering X-rays for lower back pain; avoiding the use of antipsychotics as a first choice to treat behavioural and psychological symptoms of dementia; and not prescribing antibiotics for patients with upper-respiratory infections that are likely to be viral in origin.

'This requires a culture change within the NHS but it is a real opportunity to truly put patients first,' Malhotra believes. 'I also believe it has the potential to improve health outcomes for our patients in a relatively short space of time. But it is an opportunity for us as medical professionals to really make an impact to improve health and reduce demand on the service.'

AMRC chair, Professor Dame Sue Bailey: 'The whole point of Choosing Wisely is to encourage doctors to have conversations with their patients and explain honestly what the value of a treatment is. It's not, and will never be, about refusing treatment or in any way jeopardising safety. It's just about taking a grown-up approach to healthcare and being good stewards of the resources we have."

Dr Aseem Malhotra trained in interventional cardiology at Harefield Hospital, the Royal Free Hospital and Croydon University Hospital, London, and is a consultant clinical associate of the Academy of Medical Royal Colleges

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many foreign companies showed interest in partnerships.

Part of the rationale for combining the three events was the interest by pharma distributors, with hospital presidents in tow, in branching out beyond pharma and big ticket imaging products (CT and MRI). Competitive pricing and controls over abuse of prescriptions and exams are having an impact on sales, and new opportunities are opening for IVD and some other equipment. Many manufacturers used the venue to hold distributor meetings with their partners from China, Southeast Asia and the Middle East.

Raphael Ravet, sales manager for Cefaly Technology, maker of migraine headache relief headgear, found many attendees eager to take a break on the relaxation chairs.

The autumn CMEF – 18-21 October, Wuhan International Expo Centre – will focus solely on medical equipment, accessories and reagents, and include the International Component Manufacturing and Design show.

In spring, the 2016 CMEF will be in Shanghai again, and the organisers are considering staggering days for pharma and devices to relieve transportation issues to this, the world's largest medical product show. Meanwhile, the Shanghai government will continue to extend the infrastructure to ease coming and going, as well as to find lodging and entertainment nearby. For any medical device company considering entry into the Chinese market, this is where it happens.

Methicillin-resistant Staphylococcus aureus

Austria's notable national action plan

Surveillance, hygiene and infection prevention, antimicrobial stewardship, diagnosis of infectious diseases, use of antimicrobial medicines as well as reporting and information – Michael Krassnitzer reports.

In Europe, Austria statistically ranks in the midfield for antibiotics resistance. In 2013, for example, the country's Methicillin-resistant Staphylococcus aureus (MRSA) rate was 9.1%. In the same year the rate in Sweden was 0% and in Greece around 50%. 'The issue of antimicrobial resistance is very complex. Therefore we need a concerted strategy to fight this resistance,' says tropical medicine and hygiene specialist Professor Petra Apfalter DTMH, who heads the Austrian National Reference Centre for Nosocomial Infections and Antibiotics Resistances.

In her country that strategy is known as the National Action Plan for Antibiotics Resistance (NAP-AMR). Surveillance, hygiene and infection prevention, antimicrobial stewardship, diagnosis of infectious diseases, use of antimicrobial medicines as well as reporting and information are the main elements of the plan for human medicine. An additional range of measures covers veterinary medicine and the environment.

In surveillance and reporting Austria fares well. The country's Federal Ministry of Health has been publishing an annual report on antibiotics resistance and antibiotics usage (AURES) since 2005. Additionally, for a decade this country has been involved in the European networks for the collection of data on resistance, EARS-Net (European Antimicrobial Resistance Surveillance Network) and ESAC-Net (European Surveillance of Antimicrobial Consumption Network). The NAP-AMR has also uncovered improvement potential here. It contains objectives to capture the most comprehensive data on antibiotics use, to promote feedback systems for surveillance data and to develop information media for the general public. Whilst AURES is well established in specialist readership, the level of general public knowledge is pitiful. According to a Eurobarometer survey around 73% of Austrians believe that antibiotics are also effective against viruses.

In respect of hygiene and infection prevention and control the objective, according to the NAP-AMR, is to further develop the existing strategy to consolidate hospital hygiene structures (PROHYG 2.0). This describes the organisational framework for important measures of infection prevention and control in hospitals, such as hand washing and hand disinfection. Based on this, a draft quality standard was compiled last year that will be published towards the end of 2015.

A further important component of the NAP-AMR is the antimicrobial stewardship programme (ASP). This concerns the optimised use of antimicrobial substances to reduce the development of multi-resistant pathogens. The key strategies comprise an audit with intervention and feedback, as well as limitations to the prescription of antibiotics.

'Without microbiological diagnostics, that is without knowledge of the type of pathogen and resistance profile, neither surveillance nor infection prevention and control can be done in a meaningful way,' the national action plan points out – of course because antibiotics only work against bacteria and not against viral infections. In Austria there are 40 laboratories that make their bacteriological findings available – not everywhere with high quality because currently no binding standards are in place. The NAP-AMR therefore campaigns for a centralisation of microbiological diagnostics. Sweden, where just a few facilities are responsible for large catchment areas of the population, is considered as a role model.

'The topic of antimicrobial resistance is global, and measures against it cannot be limited to national activities, Apfalter emphasises. 'When people and goods can travel to the other side of the world within a day then we need to develop regulations that apply worldwide.' However, this is a difficult task – considering that, even within the European Union, there are countries that do not even comply with the most basic rules on the containment of resistance. 'In Austria, and many other EU countries, antibiotics can only be obtained through prescriptions. In Spain, however, everyone can buy antibiotics in the supermarket.'

Professor Apfalter would like to see the World Health Organisation take over the reins to control antibiotics resistance.

Petra Apfalter heads the Institute for Hygiene, Microbiology and Tropical Medicine at the Elisabethinen Hospital in Linz, Austria. A specialist in hygiene and microbiology, she also heads the National Reference Centre for Nosocomial Infections and Antibiotics Resistance as well as f the Austrian AMR Focal Point for the European Centre for Disease Prevention and Control (ECDC). In addition, Professor Apfalter, who studied Medicine and completed her specialist training at the University of Vienna, heads the National Antimicrobial Susceptibility Testing Committee Austria (NAC-AT) and a member of the Steering Committee at EUCAST (European Committee on Antimicrobial Susceptibility Testing).

Antibiotic resistance: The biggest single threat to global health

Within 15 years effective antibiotics will run out and, far from being an apocalyptic fantasy, a world in which common infections and minor injuries can kill is a very real possibility for the 21st Century. One of the world's foremost wound experts has warned that antibiotic resistance is posing the biggest single threat to global health, Mark Nicholls reports

Professor Geoff Sussman is concerned at over-prescribing and misuse of antibiotics in clinical practice as well how they seep into the food chain through inappropriate use – to protect against disease and stimulate growth in animal husbandry and breeding.

Unless vigorous controls and restrictions are implemented in antibiotics use, he fears the consequences will be disastrous, with drugs that will no longer be effective against infections.

Outlining his concerns to the annual meeting of the International Wound Infection Institute in London, Professor Sussman said: 'Within the next 15 years we will run out of effective antibiotics and reach a situation where millions of people will die from simple infections because there is nothing to treat them. If action is not taken now, we will soon be back in pre-penicillin era.'

As Associate Professor in the Faculty of Medicine, Nursing and Health Science at Monash University in Melbourne, he highlighted the example of tuberculosis (TB), a disease thought to be under control a few years ago but which is now appearing as multi-resistant TB, which will not respond to any antibiotics. Over-use and misuse of antibiotics is driving the resistance, added Professor Sussman, who is also a senior clinician in wound clinic at Melbourne's Austin Hospital.

'We have misuse of low strength antibiotics on what are not really real infections,' he said. 'Here, bacteria can cope with low strengths and gain resistance to high strengths.

'Also, in surgery, it is not uncommon to use prophylaxis before an operation. That's acceptable but some doctors continue using the antibiotic for another five days. That is no longer prophylactic, that is therapeutic and the overuse of the antibiotic.'

Bring in stricter controls

Overuse is common in General Practice with patients demanding antibiotics for colds and sore throats that are virus based and in this area of medicine he believes governments must implement stricter controls on where and who can prescribe some of these more potent antibiotics. 'A bigger problem,' he pointed out, 'is in parts of the world like Asia where you do not need to see a doctor or get a prescription for antibiotics. You just walk into a store and buy them with no restriction at all.'

Geoff Sussman, who established the Wound Foundation of Australia, has been involved in research, clinical practice and teaching in the area of wound management for over 30 years. The inaugural Secretary of the World Union of Wound Healing Societies 2000-2004, he is also associate editor of the International Wound Journal and was awarded an OAM (Medal of the Order of Australia) in the Queen's Birthday Honours in 2006 for his wound care work as a researcher, educator and clinician.

To help counter antibiotic resistance, Professor Sussman believes hospitals must work harder to control hospital-acquired infections, curb nosocomial infections with improved cleaning regimes and restrict strong antibiotics for use on only very serious infections.

Few new antibiotics have been seen in 40 years because it is not economically viable for industry to develop drugs that patients will only use for a matter of days and he believes it should fall to governments to look at ways of funding research and developing new antibiotics.

Sussman also favoured a plan unveiled in a report by a UK government-appointed review team in May calling on the global pharmaceutical industry to pay for a £1.3 billion innovation fund to revitalise research into antibiotics. In return, guaranteed payments would be paid to companies that produce vitally needed new antibiotics.

The move was devised in response to so few new antibiotics in development amid a global spread of resistant bacteria.

The professor also wants to see science develop innovative ways of attacking the bacterium other than antibiotics. 'There are mechanisms that can attack bacterial cells and do not involve antibiotics. Those methods are then less likely to run into the problems of resistance.'

The urgency of the situation is dramatically underlined in the World Health Organisation document Antimicrobial resistance: global report on surveillance 2014.

It states: 'Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. An increasing number of governments around the world are devoting efforts to a problem so serious that it threatens the achievements of modern medicine.

'A post-antibiotic era – in which common infections and minor injuries can kill – far from being an apocalyptic fantasy, is instead a very real possibility for the 21st Century.'

Areas taking a pro-active stance are Scandinavia and Australia, which has had therapeutic guidelines of antibiotic use for some years though many countries do not have them in place, he said. 'But, there has to be concerted effort from the very top.

'The World Health Organisation is already sending out the signals of how important it is and now governments, medical associations and agricultural organisations have to come together to fight this problem in a unified manner.'

Antimicrobial stewardship strategies

A diagnostic marker reduces antibiotics use

Kordo Saeed is Consultant Clinical Microbiologist and the Director of Infection Prevention and Control at Hampshire Hospitals NHS Foundation Trust and also an Honorary Senior Lecturer Southampton University Medical School. His specific areas of interest are clinical microbiology and infection prevention; biomarkers and antimicrobial stewardship; management of orthopaedic-related infections; education, research and clinical evaluations; and health promotion and education in developing countries.

Report: Mark Nicholls

Since 2009, as part of diagnostic and antimicrobial stewardship strategies, Hampshire Hospitals National Health Service (NHS) Trust has used serum procalcitonin (PCT) – an innovative and highly specific marker to diagnose clinically relevant bacterial infections and sepsis.

Consultant Clinical Microbiologist and the Director of Infection Prevention and Control, Dr Kordo Saeed, explained: 'In our experience, the integration of the PCT assay to our clinical practice, has not only led to safe reduction in unnecessary antibiotic usage and costs in our Trust, but has also potentially resulted in reduction of selective pressure on antibiotics and on hospital beds.'

In early June, Dr Saeed outlined his hospital's success in 'rapid procalcitonin assay in diagnosis and monitoring of sepsis' during the national meeting of the Association for Clinical Chemistry and Laboratory Medicine in Cardiff, Wales. There he examined the 'potential impact and the usefulness of a rapid "quantitative" point of care (POCT) testing' in the context of reconfigurations and mergers of diagnostic laboratories.

Procalcitonin has been around since mid-1980s and is interests clinicians because it appears to be more specific for bacterial infection, particularly when there are systemic features or sepsis.

This has proved advantageous because it enables clinicians and hospitals to make more informed decisions on treatment, particularly when clinical presentations of some viral infections, inflammatory conditions and bacterial infections can be similar, making a clinical diagnosis and appropriate treatment of infection challenging.

'Additionally,' Dr Saeed said, 'clinical signs and laboratory findings may be subtle in the early stages of infection. There is a tendency among many clinicians to treat for potential infection if they have doubts, just in case the cause is infective. This in turn leads to inappropriate antibiotic use and higher costs.' PCT also has other advantages because, apart from being more specific for bacterial infections than other biomarkers, it is quicker, stable and relatively easy to measure. 'Anything that can complement our clinical findings in a timely manner and support differentiating bacterial infection from non-infection can help to improve not only patient management, but also the appropriate use of antibiotics. In this context and in our experience PCT appears to be an effective marker,' he said.

Research published by Dr Saeed and colleagues has suggested that in about 50% of those 'just in case' cases, PCT has resulted in either withholding and/or stopping antibiotics without adverse effect in those patients, whilst continuing antibiotics in cases of patients who need antibiotics. 'Overall by introducing PCT, there were around 17% reductions in antibiotic use and, based on British National Formulary prices, this has resulted in direct savings in antibiotic usage of around £14,450 (€20,000) for every six months,' he added. There are additional savings from hidden costs associated with giving antibiotics such as IV sets, pharmacy time, nursing time and storage. PCT has helped the clinicians to make clearer decisions on giving antibiotics to patients who need them, but also preventing patients unnecessarily receiving antibiotics or suffering adverse effects of antibiotics.

In the case of sepsis, PCT has been a major benefit.

Dr Saeed concluded: 'Diagnosis of Sepsis can be challenging and we need biomarkers that can assist doctors to diagnose sepsis in a timely manner in order to achieve the best outcome for patients. Real life evaluations of the newer and more rapid point of care PCT test in Emergency Departments, General Practice and/or inside ambulances may provide us with additional armaments to achieve this.

However, he stressed procalcitonin is NOT a magic bullet and, like other clinical tests, PCT results must not be acted upon as an individual marker or without considering full history, physical exam and other investigational findings. 'It is,' he said, 'part of a jigsaw and can be used to complement clinical judgments and physical examinations.'

Antibiotics tend to be given too often and used for too long

Carrying home a nosocomial infection

Juan Pablo Horcajada heads the Department of Infectious Diseases at Hospital del Mar in Barcelona, Spain

About 6-8% of Spanish patients will develop an infection during or after a hospital stay. Can these infections be avoided? How is Spain facing up to the challenge? Dr Juan Pablo Horcajada, Head of the Department of Infectious Diseases at Hospital del Mar, Barcelona, and spokesperson of the Spanish Society of Infectious Diseases and Clinical Microbiology (SEIMC), assessed the situation and insisted on the creation of a dedicated specialty in an exclusive interview for EH by Mélisande Rouger.

As the trend for ambulatory care grows, patients may acquire an infection during their hospital stay but will actually develop a nosocomial infection when back home. For instance, chemotherapy patients, who tend not to be hospitalised any more, may develop an infection a few days after receiving treatment.

'The number of ambulatory patients in healthcare is increasing. Therefore we prefer to use the term healthcare-associated rather than nosocomial infections, as the latter only refers to hospitalised patients,' said Dr Juan Pablo Horcajada, Head of the Department of Infectious Diseases at Hospital del Mar, Barcelona.

Two of the most frequent healthcare associated-infections (HAIs) are urinary infections and pneumonia. Surgery patients, who are increasingly send home a few hours after the procedure, may also develop post surgery infections. Another area doctors are particularly vigilant with is bacteraemia, i.e. the presence of bacteria in the blood, which can develop after placing catheters in the circulatory system as part of treatment.

Dedicated commissions regrouping doctors from every specialty are put in place at every hospital across Spain to monitor infection development within the structure.

The Spanish Ministry of Health is pushing for homogenisation through the National Hospital Infections Vigilance Plan, with the goal of gathering the data acquired at every site. However, in a country torn between distinct autonomous regions, systems differ hugely and collecting information on the national scale remains a challenge. Steps must be taken accordingly, Horcajada believes. 'We need to unify our approach. Some communities have excellent initiatives to recompile infection data, but others don't. If vigilance systems are not the same, you can't have a global and rapid overview of what's going on in the country; instead, you lose time trying to collect the data in every region, and sometimes their systems and codifications differ greatly,' he said.

Infections decline

However complex their extraction, national data show a decline in the occurrence of HAIs. The proportion of patients suffering from these infections dropped from 11-12% to 6-8% in just a few years, thanks to improved vigilance and greater respect of preventive steps, such as systematic medical and patient hand washing, as well as better equipment hygiene.

However, Horcajada believes more could be done in this regard, starting with more appropriate antibiotics use. 'This is really an open question in Spain; antibiotics tend to be used too often and too long, both in hospitals and primary assistance centres. As a result, bacteria are increasingly drug-resistant. This is one of the most serious problems in infection management nowadays and we really have to deal with it.'

The SEIMC is addressing the issue, notably with a nationwide strategic plan to reduce the risk of selection and dissemination of antibiotics resistance.

Despite all their efforts, however, healthcare providers will never be able to prevent all patients from developing HAIs, especially as people are not as healthy as they used to be. 'HAIs will always be around; they are a normal part of healthcare,' he observed. 'Modern healthcare solved many problems and patients increasingly survive, but they are weaker and their immune defences are down. As a result, some infections are more common than they used to be.'

In Spain, the number of legal actions taken against doctors for HAI cases is rising, a phenomenon spreading from the USA. Instead, patients should acknowledge that every procedure carries a risk, which doctors can only try to minimise, Horcajada believes. 'Maybe our problem is lack of communication. If patients were well informed about the risks and took greater part in their treatment, they would not think of suing their doctors. Somehow, the doctor-patient relationship was lost and we need to get it back. The moment it's back, I don't think we'll have a problem anymore.'

Horcajada deplores the short time doctors can spend with patients under the current scheme, and warned against the impact of money-saving policies on healthcare quality.

His wish is for the establishment of a proper infectious diseases specialty in Spain. 'Currently infectious diseases are a subspecialisation of internal medicine, whilst they are a proper specialty in many other countries. If this were the same in Spain, HAIs management would certainly improve.'

Genetic alterations

Professor Christine Mannhalter highlights the impact changes have on the occurrence and severity of diseases and their influence on therapy response.

Many different genetic alterations (mutations) influence the clinical phenotypes of monogenetic and polygenetic inherited but also somatic diseases. Germ line mutations that confer a severe impact on the phenotype are usually found in rare diseases (orphan diseases). In contrast, common germ line mutations (polymorphisms) with little negative selection pressure occur frequently in the gene pools of populations (e.g. the factor V Leiden mutation, associated with venous thrombosis, has a frequency of about 5% in Caucasians). It is important to be aware that mutation carriers do not always develop the disease. Furthermore, mutations do not necessarily lead to the same phenotype in every mutation carrier, which is due to endogenous and exogenous modulators.

Up to now the influences of modulators are not well known, and it is often difficult to predict the consequences of a mutation for individual patients. Despite these limitations, genetic tests are very valuable because they allow the early detection of mutations and are important for diagnosis, prognosis, prediction of relapses, selection of therapies, monitoring of therapy responses and family studies (identification of carrier relatives).

This article discusses examples of applications of genetic analyses in coagulation disorders and haematological and oncological diseases.

Molecular genetic analyses in coagulation disorders

Most proteins involved in blood coagulation are well characterised, their functions are known and their genes have been cloned and sequenced around 30 years ago. Despite that, we still do not have international guidelines on molecular genetic diagnostics of coagulation disorders. This is partly due to the heterogeneity of the disorders of the haemostatic system. For example, in haemophilia A, a disease caused by a deficiency of coagulation factor VIII, we can differentiate severe and mild forms. Most patients with factor VIII levels below 1% exhibit a severe bleeding phenotype. However, about 10-15% of patients with extremely low or undetectable factor VIII levels show a milder disease phenotype with reduced frequencies of spontaneous bleeding. Furthermore, in some patients the same missense mutations lead to a severe phenotype, while they cause a mild form in other patients. The disease-modifying causes are unclear and are currently under investigation.

Surprisingly, even in this monogenic disease no mutation can be found with conventional molecular methods in approximately 2% of severe patients. Novel technologies, such as next generation sequencing, quantitative RNA analysis or methylation studies, offer options to identify the underlying causes for the disease in these patients. It has been shown that molecular genetic analyses allow the identification of patient subgroups and the selection of customised, personalised treatments in haemophilia A. Patients with a high risk to develop therapy-induced inhibitors, who need specific treatment regimes, can be found by mutation analysis.

As has been presented above, imbalances within the haemostatic system lead to bleeds but they may also cause thrombosis in arteries or veins. Despite successful research, our understanding of the disease pathogenesis of thrombotic disorders is still incomplete.

While for venous thrombosis the role of mutations is well established, genetic risk factors for arterial thrombosis are less well defined. Although many single nucleotide polymorphisms (SNPs) in candidate genes have been associated with plasma concentrations of the respective proteins and a risk of ischaemic stroke or myocardial infarction, published results for individual polymorphisms and genes are inconclusive and often controversial.

Risk genotypes and risk profiles are associated with these diseases in large patient collectives (>10,000 cases), but the relevance for individual patients is frequently unclear. Nevertheless, it can be expected that genetic, genomic, and epigenetic discoveries will enhance the diagnostic capability and improve the treatment options for these common diseases.

Molecular genetic analyses in haematology-oncology

The finding that every gene has a specific position in the genome is of central importance. The loss of the appropriate position by e.g. translocations or inversions usually leads to significant changes in gene expression and subsequently to severe disease. Chronic myeloid leukaemia (CML) is a stem cell neoplasm caused by the reciprocal translocation t(9;22). The translocation generates the fusion gene BCR-ABL1, which is found in leukaemic cells of more than 95% of human CML patients and about 30% of adult patients suffering from ALL. BCR-ABL1 is a constitutively active tyrosine kinase activating several signalling pathways. The constitutively active tyrosine kinase is responsible for impaired apoptosis and uncontrolled proliferation of cells, and the initiation and manifestation of the disease.

The identification and understanding of the molecular lesion led to the development of a targeted therapy. The first BCR-ABL1 kinase inhibitor was imatinib, a small molecule, which produces major and stable cytogenetic responses in a majority of patients in chronic phase of CML.

Although a large percentage of patients show complete cytogenetic response to imatinib, drug resistance may occur, which is usually due to mutations in the BCR-ABL1 fusion gene. Monitoring of minimal residual disease with molecular genetic tests during imatinib-therapy is of high importance. If BCR-ABL1 is detectable, sequence analysis has to be performed to identify the mutation. The type of the mutation is relevant for treatment switch to other tyrosine kinase inhibitors

In addition to translocations, point mutations can be disease relevant in hematologic leukaemias. Until about a decade ago, no molecular abnormalities were known for polycythaemia vera (PV), essential thrombocythemia (ET) or myelofibrosis (PMF). The discovery of a point mutation in codon 617 (valin to phenylalanine) of the JAK2 gene in a large percentage of these myeloproliferative neoplasms increased our understanding of these diseases and improved their diagnosis. The JAK2 V617F mutation results in the constitutive activation of the JAK-STAT pathway. In PV, approximately 95% of patients have a JAK2 mutation, in ET or PMF the frequency is approximately 50–60%.

Point mutations are also found in solid tumours (e.g. mutations in the p53 gene, the retinoblastoma gene or the *KRAS* gene). Mutations in the *KRAS* gene are early events in tumorigenesis. The detection of the mutations supports diagnosis, prognosis and also therapy selection.

New publications have shown that colon carcinoma patients with metastases can only be treated successfully with monoclonal antibodies if they have no *KRAS* mutations in the tumour cells. Therefore, genetic analysis of the *KRAS* gene is the state of the art diagnosis for colon carcinoma.

Methodological aspects

Even today, relatively few molecular tests are certified for *in vitro* diagnostic use. Thus, every laboratory is responsible for the validation of the methods and reagents used for diagnoses.

Source: MedUniWien

After gaining her doctorate at Vienna University Medical School, **Dr Christine Mannhalter** received a post-doctoral fellowship at the University of Southern California (USC) School of Medicine in Los Angeles. From 1985-2000 she was first Assistant Professor in the internal medicine clinic at Vienna School of Medicine and then Associate Professor in the Laboratory Medicine Department. Since 2000, she is full Professor of Molecular Diagnostics in Clinical Chemistry in the same unit. With major research interests in biochemistry, physiology and pathology of oncology etc., with awards and research funding bestowed for her work – currently on myeloproliferative neoplasms as well as cell communication in health and disease – and with her strong links to ethics groups, (she currently is President of the Austrian Agency of Scientific Integrity) Dr Mannhalter is a much welcomed lecturer.

Endoscopy jumps the boundaries

Continued from page 1

to be the "switching off" of the duodenum. Its mucosa produces metabolic hormones, incretins, which are believed to stimulate insulin secretion and to play a crucial role in the development of Type 2 diabetes. Details of the pathogenesis are currently being investigated. If we relate this finding to Type 2 diabetics it seems likely that we can help these patients through a "reset" of the mucosa in the duodenum which re-regulates the production of metabolic substances,' the professor explained.

'This is where the endoscope comes into play – by helping the doctor to insert a special balloon in to the duodenum, heating it and ablating the mucosa. The duodenal mucosa regenerates, but then appears to have different characteristics from the original one,' he said, summarising the result of a pilot study in a Chilean hospital.

In Europe this new procedure is currently being tested in several clinical centres including, in Germany, the Evangelical Hospital in Dusseldorf. Two other German hospitals will also participate.

The basis for this advance in intervention is the continuous technology development. 'It's not only about the camera but also about the control and mobility of the endoscope, which has to be thin enough to enter the smallest channels. In addition, without a very good flushing function we cannot carry out any surgical interventions,' Neuhaus said, mindful of the interest in cooperation with the industry. 'The devices need to be tested and developed further, and engineers regularly visit to watch us at work. With them we discuss future technologies based on clinical need.'

To promote the international exchange on procedures and technologies, many years ago Neuhaus founded the International Endoscopy Symposium, held annually in Dusseldorf.

What's on the 2016 agenda? 'Our work increasingly revolves around treatment and intervention, but also good diagnostics must not be neglected. The new possibilities offered by interventions under endoscopic ultrasound guidance are particularly exciting. In one endoscopy session they allow examining several organs and positioning stents to create anastomoses, for example between stomach and small intestine. Moreover, new opportunities to carry out endoscopies of the entire small intestine, or to position medication in a targeted fashion in certain organ sections or tumours certainly will be on the 2016 agenda.'

The 'safety envelope' enabling new models to develop for out-patient care

Evolutionary POCT

Report: Mark Nicholls

A growing number of clinical tests are being delivered in community hospitals with more patients receiving quicker, accurate diagnoses closer to home, without stays in acute hospital beds. Professor Daniel Lasserson, an Associate Professor in the Nuffield Department of Primary Care Health Sciences at Oxford University, shares the opinion that using point-of-care-testing (POCT) to facilitate high quality ambulatory care is a critical step towards defining hospital care in the future. As a senior interface general practitioner (GP) within the Oxford University Hospitals NHS Trust, he is part of the medical team working on the Emergency Multidisciplinary Unit (EMU) at Abingdon Community Hospital and sees patients referred from GPs, community nurses or paramedics. Supported by nursing, physiotherapy, occupational therapy and social work teams, and with access to X-ray, the availability of POCT enables a comprehensive geriatric assessment for frail older patients with acute illness, picking up acute kidney injury or infections more quickly, as well as delivering and monitoring intravenous treatments on an ambulatory basis. 'Patients do not need to have an acute hospital bed, because of point of care testing,' he said. 'I see POCT as a new safety envelope for out-of-hospital care.'

Making informed decisions through POCT in a community setting – and delivering acute therapies – can avoid admission to acute hospitals. 'You can assess risk and treat the patient in a more precise way and much earlier than you would if you had to wait until they were transferred to hospital and had laboratory testing in the standard way.'

Dr Lasserson outlined the value of POCT, as an enabler of new care models, during the national meeting of the Association for Clinical Chemistry and Laboratory Medicine in Cardiff, Wales this June. He pointed out that it is still hospital practitioners conducting the assessment, but added: 'They are practising in a different way; they have an acute ambulatory function, and POCT is enabling us to safely assess, treat and monitor response to treatment for patients with acute illness but without them going anywhere near a traditional acute hospital.

'They are patients with acute medical needs, so we need to provide a credible alternative to the acute hospital pathway, but they can be managed out of hospital provided you have the backup of the diagnostics and multidisciplinary team. Our experience is that you can deliver that out of hospital, although the only way to do that with any accuracy and safety is by using POCTs.'

Nonetheless, patients with acute coronary syndrome, stroke and other serious conditions will still be admitted to the acute hospital for the onward treatment. Carried out by healthcare assistants, with results available within minutes and assessed by senior clinicians, such tests include clinical chemistry, sodium potassium, urea, creatinine, glucose, ketones, INR and troponin, blood gases and lactate, and haemoglobin.

The Abingdon service, established in 2010, has evolved and been refined, moving from a five- to seven-day service, with the scope of POCT also increasing '…because you can start delivering treatment in the acute care pathway without transferring patients to hospitals,' Lasserson underlined.

The evolution of this style of treatment sits with the Royal College of Physicians' Future Hospital Commission vision of future hospital care within the NHS.

POCT benefits

Lasserson: 'For hospitals POCT means they can manage more of their acute medical patients without using hospital beds and have patients treated at centres closer to their homes. For clinicians, it's fantastic to see a patient and have all that information rapidly at your fingertips, to make a much earlier decision, start treatment earlier, and see an improvement before you send someone home. It means patients are not in hospital waiting for results.' Patients get a 'holistic assessment', are seen in one visit and can clearly see how technology is working for them. 'That reduces anxiety and, by seeing such great diagnostic back-up, they have more confidence in the service.' He believes that units such as this, 'as they evolve around the country, will make a contribution to defining what a future hospital will be'.

Daniel Lasserson is an Associate Professor in the Nuffield Department of Primary Care Health Sciences, University of Oxford; co-lead in Prevention and Population Care, NIHR Oxford Biomedical Research Centre; co-chair of the Measurement Workstream in NHS England's Acute Kidney Injury Programme 'Think Kidneys'; theme lead in the NIHR Oxford Diagnostic Evidence Collaborative, and Senior Trust General Practitioner in the Department of Geratology, Oxford University Hospitals NHS Trust. With research projects in acute ambulatory care and systems re-design, he aims to identify the optimal sustainable models for acute ambulatory care.

Inferior blood sampling results in late treatments, wasted lab resources – and even bad blood between doctors and nurses

Haemolysis must be avoided

Blood sampling via intravenous catheters frequently occurs because patients in intensive care already have intravenous catheters in place, and patients admitted to accident and emergency units are immediately set up with intravenous catheters – providing easy access to blood.

However, studies have identified this route as a cause of haemolysis (rupture of erythrocytes causing haemoglobin release into the plasma or serum), as well as meaningful biases in blood/gas analyses.

Poor blood sampling will not only delay treatment, waste lab time, result in incremental material costs for re-testing and, potentially, cause discord between doctors and nurses – usually responsible for blood collection. Therefore, understanding why samples can become useless is vital for better healthcare.

They found the risk is even greater in blood collection when intravenous catheters are used combined with primary evacuated blood collection tubes, and less with blood collection tubes with manual aspiration.

An essential part of the clinical decision-making is laboratory diagnostics, given that the total testing process goes along with a high degree of quality. Several lines of evidence attest that the manually intensive activities of the pre-analytical phase are more prone to uncertainties and errors than those belonging to the analytical and post-analytical phases. This inherent vulnerability is mostly attributable to inappropriate, incorrect or mishandled procedures used for obtaining blood specimens (Lippi et al ClinBiochem 46 (2013) 561-564).

The researchers pointed out that among various pre-analytical nonconformances that can be encountered in routine laboratory practices, sample haemolysis represents the primary source of problems, in terms of prevalence and likelihood of sample rejection. The in vitro haemolysis is occurring during, or after sample collection, once potential sources of haemolytic anaemia have been ruled out.

Although artefactual (in vitro) haemolysis recognises several patient- and operator-dependent causes that have been comprehensively reviewed elsewhere, several lines of evidence consistently attest that collection of blood tubes using intravenous catheters may be associated with a high likelihood to generate erythrocyte injury. Nevertheless intravenous catheters are used regularly in A&E departments and even at other procedural units or shorter stay. Nurses frequently draw blood from newly established intravenous lines, which is. faster and more convenient than searching for another venipuncture site.

Although the observed frequency of haemolysed samples varies widely throughout different healthcare settings, it can be estimated that these are around ~3% of all serum or plasma samples referred to central laboratories for routine or stat testing. In a recent critical review of the literature, Halm and Gleaves reported that haemolysis occurs in 3.3 to 77% of blood samples obtained through intravenous catheters, whereas the frequency is nearly 20 times lower when blood specimens are drawn by direct venipuncture. When combining intravenous catheters and vacuum tubes, artifactual haemolysis can be as high as 77%, while the use of syringe draw is effective to decrease the rate of haemolysed specimens by nearly half. Regardless of the specific cause, the generation of catheter-related haemolysis generates a variety of clinical, organisational and economical issues, which are mainly attributable to specimen rejection and / or recollection, suppression of those tests most sensitive to artifactual haemolysis, delayed diagnosis and overcrowding due to increasing length of stay of patients in A&E, as well as frequent inquiring between the A&E and laboratory personnel.

The greatest number of haemolysed specimens is taken in A&E where the relative prevalence can be as high as 10-30% (Lippi et al ClinBiochem 46 (2013) 561-564, cited literature 4-6).

The reasons for poor sampling include difficult venipuncture(s), use of unsuitable blood collection devices, poor handling (i.e. vigorous mixing) and transportation (freezing or trauma) of blood tubes.

Regardless of specific causes, the receipt of haemolysed specimens is always a problem, wherein test results of some analytes, such as potassium, lactate dehydrogenase (LD), aspartate aminotransferase (AST) or cardio-specific troponins, among others, should be suppressed, reported with comments, corrected or recalculated or even provided with semi-quantitative comments indicating likely range of results.

Source: Sarstedt

The S-Monovette blood collection system combines two blood collection techniques – aspiration and vacuum – and presents advantages in collection from intravenous catheters or cannulae.

The results of the meta-analysis – which is limited to published data and the A&E setting – attest that sample collection through intravenous catheters is associated with significantly higher risk of haemolysis as compared to standard blood drawn by straight needles, and that this risk is further amplified when intravenous catheters are associated with primary evacuated blood collection tubes, as compared with blood collection tubes S-Monovette (Sarstedt AG & Co., Numbrecht, Germany) used in the aspiration mode.

Blood collection is the most vulnerable step throughout the testing process. Although sample collection via venipuncture rather than through intravenous catheters should be considered as a standard of care throughout healthcare [17], the latter procedure is virtually unavoidable in procedural or short-stay units such as A&E or cardiac intensive care units.

A potential option to reduce the chance of collecting unsuitable samples entails work in the aspiration mode rather than using vacuum force for drawing blood from intravenous catheters, since the former practice causes a larger shear stress due to the negative pressure when blood is collected by the vacuum technique, as well as turbulence due to difference of pressures between veins, catheter needles, valves and evacuated collection tubes.

Results show that the S-Monovette collecting blood by the aspiration technique may be effective to dramatically reduce the likelihood of erythrocyte injury when drawing blood from intravenous catheters. The frequency of samples with a haemolysis degree equal or greater than 0.5 g/L has been reduced by more than 10-fold using S-Monovette in aspiration mode.

In conclusion, the use of S-Monovette presents several advantages, especially for drawing blood from intravenous catheters or cannulae. The device can be used with either vacuum or aspiration principle of collection, thus virtually mirroring the functioning of a syringe.

This latter approach allows blood aspiration with limited shear stress, whereas the closed connection for line draws is effective to abolish the hazardous blood transfer from syringe to blood collection tube.

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Future haemo

EFK Diagnostics is to show, for the first tim Control point-of-care haemoglobin analyser with Katja Lemburg, Global Product Manag explained how this new analyser aims to m connectivity of point-of-care (POC) devices.

'With our latest generation of Hemo Control analyser we strengthen its position as a premium product in POC haemoglobin testing,' Katja Lemburg of EKF Diagnostics points out. 'We have enhanced data management and connectivity functions to enable simple direct integration with customers' existing IT environment, an increasingly common request from the POC market. Uniquely, the next generation device offers a high degree of flexibility to meet our customers' connectivity demands as they develop; meaning they can upgrade their data management functionality at a later date after initial purchase of the analyser.'

Principal applications

'Hemo Control is used for POC testing of haemoglobin and haematocrit in primary care settings, blood banks and hospitals. Haemoglobin and haematocrit are key parameters in the diagnosis of anaemia, the most common blood disorder affecting about 25% of the global population, and Hemo Control is used worldwide in anaemia screening programmes. In blood banks, the level of haemoglobin is tested before donation to ensure the safety of the donor. Often blood banks are directly integrated in hospitals and perform haemoglobin testing routinely.

'Also within hospitals, anaemia can be caused by blood loss, e.g. after trauma or major operations. Here the decision for a blood transfusion must be taken quickly and the effect of the treatment monitored closely. POC haemoglobin devices, such as Hemo Control, deliver fast laboratory quality results directly in emergency rooms or operating theatres.'

Very little training

'Since it is generally used at the POC by routine medical staff, such as nurses, Hemo Control's user friendly features ensure that very little training is required. Step-by-step instructions on-screen, and a user-selectable language menu, guide the user through the test procedure.'

Integration

POC analysers provide results that directly influence patients' treatments. To ensure the correct usage and performance of the device, as well as traceability of results, in most cases POC devices are supervised by the Central Laboratory. For this, bi-directional connectivity with

e proofing POC oglobin analysis

he in Europe, its next generation Hemo at EuroMedLab 2015. During our talk er for Haematology, EKF Diagnostics, she eet the need for flexible and bi-directional

password protection is key. This allows the control of multiple POC devices in the hospital from a central unit and ensures that only trained personnel can use the device. Using bi-directional interfaces, the central unit can remotely update and configure POC devices, and test results can automatically be downloaded into electronic patient records.'

The importance of flexible connectivity

'When analysing the market situation we found that our customers are in very different stages with their connectivity requirements; ranging from a single computer in a doctor's office to full, direct integration into lab information systems (LIS) in hospitals, or web-based solutions for disease screening programmes.

'There are numerous vendors for software solutions in healthcare and each have their specific interfaces. The new generation of Hemo Control devices use a public standard communication protocol (LIS2-A2) and a bi-directional interface. This enables direct integration of the device with third party software.

'The new Data Management "add pack" is used to upgrade a basic Hemo Control device with data management functions at a later stage. This is ideal for customers who are planning future connection of POC devices to electronic patient records or LIS, but have not yet decided, or who would like to split the costs of investment. It helps them to keep their options open for upcoming connectivity requirements. In some countries electronic patient data management will become a general requirement in 2017.'

Data management functionality

'Hemo Control devices with data management functionality can be configured to capture all information around the analytical result by using simple barcode scans. In the most basic case, this would be a direct link of the test result with the patient ID, which is a mandatory requirement at many sites now.

'Other available functions include operator identification to ensure that only trained personnel are using the device and tracking of the materials used to perform a test. A fixed QC scheme can be programmed into the device to request and validate a control measurement at certain points of time. Modern data management of POC devices, such as Hemo Control, increases patient safety and simplifies the documentation process.'

Katja Lemburg, Global Product Manager for Haematology, EKF Diagnostics

Further details: www.ekfdiagnostics.com

Date for the diary
21-25 June. Paris, France
EuroMedLab 2015
Visit EKF – Level 1. Stand G005

EKF Diagnostics' next generation Hemo Control

Matrix Assisted Laser Desorption Ionisation – Time of Flight

Identifying a single isolate in minutes

When trialled in Swansea, Wales, Matrix Assisted Laser Desorption Ionisation – Time of Flight (MALDI-TOF) demonstrated sufficient advantages over conventional methods to be introduced into routine practice.

Report: Mark Nicholls

Dr Angharad Davies, Clinical Associate Professor and Honorary Consultant Microbiologist at Swansea University Medical School, highlighted the benefits and advantages for microbiology from this particular mass spectrometry during the national meeting of the Association for Clinical Chemistry and Laboratory Medicine, in Cardiff this June. She outlined the clinical evaluation of the Bruker MALDI-TOF and Biotyper software system carried out by Public Health Wales (PHW) Swansea and Swansea University Medical School, when the system was first introduced. PHW Wales Microbiology Swansea was the first clinical microbiology laboratory in the UK to test the system in 2009. Following its success, the system was introduced into routine practice in PHW microbiology across Wales.

In addition to a diagnostic evaluation, the Swansea team looked at MALDI-TOF's ability to distinguish between strains of the same bacterial species, with promising results. There have been a number of advances in this area since.

The system has enhanced microbiology in a number of ways. 'MALDI-TOF, used with the software packages now available, allows very rapid and accurate identification of most bacterial species,' she said. 'It is much faster than methods that rely on an overnight culture step – a single isolate can be identified in minutes. The hardware is costly but the day-to-day consumable costs are very small compared to other methods.' In use, a laser beam is directed at a bacterial isolate suspended in a chemical matrix, Davies explained. The matrix lyses the cell wall and extracts the proteins, which become separated, and embedded in the dried crystal matrix. In practice, this means the bacterial colony is suspended in matrix solution and then spotted onto a credit-card-size metal target plate, which accommodates 96 such spots.

The matrix absorbs the laser energy and desorption results - a rapid explosive evaporation that carries the proteins into the gaseous phase.

'As the matrix is acidic it ionises the proteins giving them a positive charge. The resulting stream of ionised proteins is detected by the equipment, which generates a species-specific spectrum based on mass/charge ratio of its proteins,' she said. 'Clinicians can get a reliable same-day identification of a cultured isolate instead of waiting for 24 hours. This can be very helpful in clinical management as it helps to indicate the likely clinical significance of the isolate, and antibiotic susceptibilities are much more predictable once the bacterial species is known.'

In terms of cost and efficiency for hospitals it allows better empirical antibiotic choices and, in the lab, reduces consumable costs considerably once the initial outlay has been made.

'It has aided clinical decision-making which should result in better antibiotic choice for the patient,' she said. 'This leads to more effective treatment more quickly.

In Wales, all PHW microbiology labs now have access to MALDI-TOF. However, Davies stressed: 'We need to bear in mind that the cost of the equipment means it is not present on every site – isolates now have to be transported in a timely fashion to a lab with MALDI-TOF, meaning that reliable and efficient transport arrangements need to be in place, and a reliable reporting system for results.

Dr Angharad Davies is Clinical Associate Professor and Honorary Consultant Microbiologist at Swansea University Medical School, where she leads the infection and immunology group teaching for graduate entry students. Her key research interests include Cryptosporidium and mycobacterial infection.

'In addition, antibiotic susceptibility testing has to be performed separately, meaning there is still another overnight culture step before definitive susceptibility results are available.'

However, there is one other advantage, through the introduction of the All-Wales LIMS (Laboratory Information Management System), results entered in one site are accessible at all PHW lab sites.

How a UK NHS trust became one in the top 100 'Best Places to Work'

A laboratory fit for a future decade

Fostering a collaborative way of working won the UK's Dartford and Gravesham NHS Trust recognition as an elite public sector healthcare employer, recently judged one of the top 100 'Best Places to Work'. The trust, led by chief executive Susan Acott, has created an energy-driven, patient-focused culture within the hospital, reflected by staff at all levels. This has been the driving force behind the creation of its new pathology service, led by pathology service general manager Chris Gunn and team.

The hospital's long-term vision has been to deliver an improved, cost effective and expanded diagnostic service to the UK's South East for at least the next 10 years. This involves a developing role as a trauma unit, alongside the increasingly diverse and complex demands from GPs, with their multicultural and aging local population. The hospital required a long-term, cost efficient and automated solution, which had to be fully operational from the start. The team chose Beckman Coulter UK as its managed service partner.

The main blood sciences section has been refurbished, and equipped with some of the latest instruments from Beckman Coulter as well as third party suppliers. 'Together we are determined to create a substantially enhanced service in the region,' said Chris Gunn. 'Our 10-year plan is to drive ahead with increased turnaround time (TAT) efficiencies for existing customers, such as A&E and our local GPs, as well as competing for more external work.'

Automation drives expansion

Currently, the lab processes 1.2 million biochemistry and 446,000 haematology tests a year, of which over 550,000 alone are from the Emergency Department (biochemistry and haematology in total). Handling 2,000 tubes daily, the lab expects this to reach 7,000 by the end of the decade. Gunn also predicts GP test demands will account for 50% of the lab's total workloads. The lab currently handles 152,000 GP biochemistry requests annually. Even so, more than 92% of full blood count requests are completed in less than two hours. 'And,' he added, 'we'll be partnering with outside organisations to win further business.'

Within a newly built laboratory interior and an overall workflow design reflecting lean working practices, Beckman Coulter installed its Power Processor, dynamic inlet and automated sample handling track. 'We increasingly see the difference the new system makes to working patterns and overall efficiency,' Gunn noted.

The automated track links chemistry and immunoassay. Two AU5800 chemistry systems provide a total throughput of 6,700 tests per hour. This matches the track throughput and provides extra resilience for the electrolytes. The two Beckman Coulter DxI 800 immunoassay systems are each able to run up to 400 tests an hour. Their speed and ability to load reagents with the system running, without interrupting sample processing, adds to productivity and efficiency. Samples are stored in the 3,060-capacity refrigerated storage unit.

The Beckman Coulter REMISOL Advance data management system consolidates all the analysers and track into one standardised environment for technical validation, providing visibility and traceability of patient samples. Pre-analytic sample sorting is carried out by the company's high-speed Auto*Mate* 2500, handling up to 1,200 samples per hour. From a single point of entry, it manages all tubes, from sample receipt to archiving.

Workcell connectivity

Beckman Coulter enhanced the lab's haematology workflow efficiencies by connecting three UniCel DxH 800 analysers and a DxH Slidemaker Stainer (SMS) into an integrated workcell, the UniCel DxH 2401, with a single entry point for samples and compact, integral sample tracking system. With the latest version of the DxH software, it consolidates information for order entry, results review and quality control management.

Performance, low review rates and first past accuracy in results reporting are all driven by the company's Automated Intelligent Morphology (AIM) technology, a multidimensional, high-definition flow cytometric technology that improves analysis of abnormal specimens.

The UniCel DxH 2401 configuration can analyse up to 300 samples an hour with a slide production rate of up to 140 smears per hour. The DxH workcell's unique bi-directional sample transport system, automatically distributes samples between the analysers, reducing potential delays in the testing and reporting of results. The system also allows for critical STAT samples or body fluids to be added while the system is running, without interrupting routine sample testing. 'With connectivity, workloads are automatically distributed more evenly between the modules,' Gunn explained.

Haematology Workcell - UniCel DxH 2401

Full integration is key to the future of LC-MS/MS

Connected components are not enough

Bringing liquid chromatography and tandem mass spectrometry (LC-MS/MS) testing into clinical laboratories has been a slow process but continues to show promise to help improve patient care. The medical device industry is on the edge of fundamental breakthroughs that can help drive the adoption into more mainstream clinical laboratories. We recently sat down with Dr Bori Shushan, Mass Spectrometry expert, to ask about LC-MS/MS adoption by clinical labs and what could leverage the technology to benefit more patients.

Explaining the importance of liquid chromatography/tandem mass spectrometry (LC-MS/MS) in the clinical lab, Dr Bori Shushan, of Clinical Mass Spec Consultants, pointed out that spectrometry's ability to be very specific to the target analyte can enable clinicians to make more informed decisions.

'Select immunoassay based methods have known interferences due to cross reactivity that can produce a less accurate result, especially in the areas of endocrinology, therapeutic drug monitoring and drugs of abuse testing.'

Why, then, aren't labs rapidly adopting LC/MS-MS technology?

Shushan: 'First, the customer is faced with many choices in the market to piece together a comprehensive solution. It can be overwhelming to decide which LC or MS to use plus a wide range of calibrators, controls, etc. Second, labs need the expertise by which to develop and validate their own methods, and set up and run the instruments on a daily basis. Third is cost, especially when considering automation components to help reduce high labour requirements for sample preparation, finance options are typically limited.

What is changing to take LC-MS/MS into a greater number of clinical laboratories?

'I think the basic needs of the routine clinical lab are quite clear. This includes systems that are easy to use, reliable, connected to the laboratory information system, and complete solutions including diagnostic kits that are regulatory compliant.

'In Europe, many suppliers have pursued the creation of internal quality systems and product controls to enable them to affix the CE-IVD mark. There also have been recent efforts to package compatible technologies to help labs be more productive. We see this in the provision of compatible but previously stand-alone elements, such as automated sample handlers, LC-MS/MS reagent kits, and software provided together to better manage workflow. I like to think of this emerging category of LC-MS/MS systems as 'connected components'. It does simplify the number of decisions to be made by the lab, because these components are provided together. It's a step in the right direction, but there's still more that can be done.

The clinical lab is accustomed to highly automated easy-to-use clinical chemistry analysers along with the convenience of walk away operations. Random access workflow enables samples processing as quickly as possible.

'I think what is ultimately needed is a system that is built for purpose – a fully integrated LC-MS/MS clinical analyser. This turnkey solution would mean that it's ready to install, validate, and operate in weeks versus many months. It simplifies the decision process and includes everything necessary to produce a high quality result. These results would be consistent and standardised between labs because the system would include test kits that are fully validated for use on the analyser. 'Ideally everything, including automated sample preparation and handling, would be done in a single instrument which could be serviced and supported by a single manufacturer.

'Most importantly it would allow the lab operator to be confident in the results they are producing. It would bring LC-MS/MS into the mainstream lab and help healthcare systems to operate more efficiently.'

In 1980, **Bori Shushan** received his doctorate from the Guelph-Waterloo Centre for Graduate Work in Chemistry in Analytical Chemistry when specialising in Tandem Mass Spectrometry. He joined MDS Sciex that same year to work in R&D of inlet technology and applications for the group's novel atmospheric-pressure ionisation tandem mass spectrometer system. In his 25-year career at MDS Sciex, Dr Shushan held key positions in Application Research and Development, Marketing and Sales, Technical Marketing and Sales Support and in the Development of the Clinical Mass Spectrometry market. He is Founder and President of Clinical Mass Spec Consultants, a consulting firm specialising in the use of mass spectrometry in clinical diagnostics. With over 18 years' experience in clinical mass spectrometry, his present clients include large and medium-size instrument companies as well as government and private laboratories. He is a consultant for Thermo Fisher Scientific.

Thermo Scientific Orbitrap Fusion Tribrid LC-MS (I) with Thermo Scientific Dionex UltiMate 3000 Series UHPLC

Sample tracking at Darent Valley

The DxH SMS is easy to configure, requiring little maintenance, the company reports. 'It provides a more reliable and consistent smear quality regardless of the blood consistency, reducing the number of films needing manual review. The workcell's user-defined rules intelligently drive its automatic slide preparation and staining, without the need for manual intervention.'

Effective turnkey solution

The solution had to deliver immediate workflow efficiencies with IT automated solutions, as well as provide the capacity for long-term expansion as the pathology service grew external business.

Darent Valley is already a streamlined and efficient laboratory service, capable of handling thousands of samples every day. The framework has been laid for the development of a laboratory service able to compete successfully within the modern NHS over the next 10 years, Beckman Coulter reports.

The new Forensic and Postmortem Microbiology Study

Seeking to identify what causes death

A new study group that aims to establish guidelines on forensic microbiology sampling and encourage increased communications between European and global organisations, has been launched by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID).

Named the Forensic and Postmortem Microbiology Study Group (ESGFOR) the aim is to create a new network of microbiologists, virologists, anthropologists and archaeologists working in the field of forensic medicine.Professor Amparo Fernandez-Rodriguez, from the National Institute of Toxicology and Forensic Sciences, Madrid, and head of ESGFOR, stresses the importance of this group in facilitating cooperation between (forensic) pathologists and (forensic) microbiologists.

Microbiology, she explains, is a new area of involvement for forensics and it is important that these two areas can work together to detect and defeat diseases. Speaking on behalf of ESGFOR, she said: 'We are trying to convince medical examiners and judicial authorities of the importance of performing postmortem microbiology studies to learn from how people have died and prevent future occurrences.'

Identifying the causes behind a person's death can help trigger a prevention plan. In discovering the bacteria involved, correct treatment strategies can be implemented and, in some cases, vaccines can be administered. Fernandez-Rodriguez spoke at the ECCMID 2015 conference in Copenhagen on the group's goal to establish European guidance for standardised microbiological sampling in forensic cases.

Another focus for the new group is to instigate increased cooperation between different societies and networks. ESGFOR, for example, is working to establish collaboration with the European Network of Forensic Science Institutes (ENFSI).

Further details: https://www.escmid.org/research_projects/study_groups/forensic-postmortem_microbio/

The ESCMID study group

The need for WHO reforms and secure global research

The S4 laboratory

Health always has a political dimension, as seen at two recent international events - the World Health Summit in Geneva in May and the G7 Summit in the Bavarian Alps near Garmisch at the beginning of June, Anja Behringer reports.

In Geneva, German Chancellor Angela Merkel canvassed for reforms in the World Health Organisation (WHO) and for a global disaster management plan amongst the representatives of the 194 WHO member states, alleging that mistakes were made in the management of the Ebola outbreak in West Africa and that reaction and actions were too hesitant. This insight obviously comes too late, but there is hope that future disasters will be managed in a better way. As the pathogens spread worldwide they should be fought on a global level.

Presently, Germany, which holds the current presidency amongst the seven most important developed nations (G7), wants to address the topic at the June summit. The development of new antibiotics, diagnostic tests and alternative methods of treatment are also to be promoted. This is a longstanding postulation as the German Law on Infection Prevention and Control was revised four years ago and the German federal states passed new directives for infection prevention and control in hospitals and tightened existing regulations.

To ensure no pathogens escape, all outgoing air from the high security laboratory is treated with a multi-level filter system with highly efficient filters (HEPA filters). The outgoing air flow rate is more than 20,000 m³ per hour.

Reaching security level 4

However, the federal German government now has another ace up its sleeve: the high security laboratory at the Robert-Koch-Institute (RKI) at the Virchow Clinic of Charité University Hospital in Berlin, which opened in February and has security level 4. This is the only federal medical institute with an S4-laboratory.

This facility will allow safe research into the most risky pathogens, such as Ebola, Marburg and Lassa viruses, along with the Crimean-Congo haemorrhagic fever virus that occurs in Greece. The lab has its own air, electricity and water supply, and multi-level security systems prevent the escape of pathogens.

The RKI is a regional WHO reference laboratory for polio, measles and mumps and, as a central facility for infection prevention in Germany, carries out numerous diagnostic and experimental procedures. Imported, highly contagious diseases call for a fast diagnosis so that quarantine and treatment options can be decided.

Furthermore, the lab also enables scientists to research highly pathogenic bacteria and combat them. Laboratory capacities are also made available to external scientists and for training. (The installation of mirrors also facilitates effective training.) The laboratory's location close to the Charité isolation ward is also ideal.

Before the S4-laboratory can be used, all security measures, functions and processes must be checked as to their effectiveness and reliability in a long test phase, without the presence of pathogens. No complications are anticipated during this phase; thus the laboratory should be ready at the beginning of 2016.

Working safely with life-threatening pathogens in an S4-laboratory without endangering staff and the general public means the building must be separate from surrounding buildings both spatially and organisationally. Electricity supply and ventilation system are independent and are safeguarded against technical outages. Access to the high security laboratory is only possible for qualified experts in safe, full body protective suits with external air supply and takes place in the same way as exiting the laboratory, i.e. after disinfection in a special shower via several air locks.

All materials used, specifically wastewater and laboratory waste, are deactivated, which means the complete destruction of all possibly remaining viruses. Incoming and outgoing air is sterilised through a multi-level HEPA filter system. These measures have proved effective in other, comparable high security laboratories over the decades.

International Licensing Bodies have discussed whether pathogens should be grouped into higher biosafety levels, especially those pathogens where worldwide eradication is within reach, such as polio. Over the last few years a number of new viruses, such as SARS, MERS-CoV (Middle East Respiratory Syndrome Coronavirus) and also new types of influenza viruses have been detected that, according to the WHO, can also develop into a global health threat. These viruses include viruses in the highest risk level four, such as the Lujo virus in 2009 or the Hendra virus and the Nipah virus, which were detected in the 1990s. Over the past decades a new pathogen that can cause clinically relevant disease in humans has been discovered almost every year. Global warming, increased travel, close contact with wildlife and globalisation may well increase these risks in the future.

In cases of suspected bioterrorist attacks, with haemorrhagic fever or pox virus for instance, fast and safe diagnosis under high security conditions is also vital. The Robert-Koch-Institute is responsible for suspected cases in federal governmental institutions and for foreign embassies and consulates in Berlin. The Robert-Koch-Institute also has to carry out confirmatory analyses nationwide.

Construction of the high security laboratory is part of a large building project aimed at modernising the laboratories, offices and other technical facilities of the Robert-Koch-Institute in its Seestrasse and Nordufer locations.

Building costs for the Seestrasse location are estimated to be €170 million, with €166 million coming from the Federal Ministry of Health and €4 million out of a special budget for the implementation of energy saving measures from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety.

Those measures should ensure that the Robert-Koch-Institute, which has the only professorship for Infectiology in Germany, would be able to cope with increasing demand. The current laboratories, which were almost 40 years old, were beyond modernisation.

From alcohol to cancer detection

Clinical trials are under way at two NHS hospitals in England to assess breathalyser technology to detect lung cancer.

Report: Mark Nicholls

Phase I clinical trials of a diagnostic breathalyser developed by Cambridge-based Owlstone Ltd have shown accurate identification of 12 lung cancer biomarkers in breath specimens. A Phase II trial is now targeting development of a small, handheld device that can be used in GP surgeries, clinics and the hospital bedside.

The latest trials are under way at University Hospitals of Leicester and Cambridge's Papworth Hospital on the nanotechnology device that employs Field Asymmetric Ion Mobility Spectrometry (FAIMS) to detect chemicals at the very low quantities found in breath. Originally invented to detect explosives in airports, the technology has now been developed for medical use.

Data from Cancer research UK shows that lung cancer survival is 75% in Stage 1 patients but only 5% in Stage 4 patients.

A goal of this project is to detect lung cancer earlier and save 10,000 lives by 2020 and £254 million in NHS healthcare costs.

Billy Boyle, co-founder and President of Operations at Owlstone Ltd, said: 'If you could change only one thing in the fight against cancer, it would be to detect the disease earlier, where existing treatments are already proven to save lives. FAIMS technology has the potential to bring a quick and easy-to-use breath test to the GP's office. 'The human body makes chemicals: a lot of them are just normal, everyday chemicals, but with cancer and other diseases the cells start to make chemicals differently. By programming the chips in software to look for these different characteristic signatures and chemical markers, you can programme it to look for a range of different diseases.'

Breath test technology is a growing area and has the advantage of being convenient and non-invasive, avoiding the cost and discomfort of biopsies.

Dr Salman Siddiqui, a clinical senior lecturer and adult chest physician at the University of Leicester and Glenfield Hospital lead the Leicester study; trial results are expected in early 2016. 'This project will seek to identify and evaluate biomarkers in order to improve the accuracy and reliability of breath diagnostic methods,' Siddiqui explained. 'We will also be aiming to establish FAIMS as a faster, less expensive and more portable alternative to gas chromatography-mass spectrometry (GC-MS) for breath diagnosis applications.'

In a separate breakthrough, researchers in Israel are using nano-array analysis to identify key volatile organic compounds, which could be used to screen for early detection of stomach cancer.

The technology senses minute changes in the levels of particular compounds in exhaled breath and accurately identifies high-risk changes that herald the development of stomach cancer.

The research, led by Professor Hossam Haick from the Department of Chemical Engineering and Russell Berrie Nanotechnology Institute in Haifa, also suggests that the technology could be used not only to test for the presence of stomach cancer, but also to monitor those at high risk of subsequently developing the disease. Gastric cancer develops in a series of well-defined steps, but there is currently no effective, reliable, and non-invasive screening test for picking up these changes early on.

Nano-array analysis is accurate, highly sensitive and cost-effective and its ability to accurately differentiate between low and high-risk changes would avoid unnecessary endoscopies and enable any progression to cancer or signs of disease recurrence to be monitored.

A large trial, involving thousands of patients, is now underway in Europe to test the technology's suitability as a screening method.

Hossam Haick is a professor in the Department of Chemical Engineering and Russell Berrie Nanotechnology Institute in Haifa, Israel.

GERMANY'S APPRO

Unanimous: The country urgently needs a national diabetes plan

Diagnostics manufacturers declare support

This year's German medical diagnostics manufacturers association (Verband der deutschen Diagnostica-Hersteller = VDGH) congress, focused on diabetes. The panel discussion that closed the evening session revealed unanimous support for the adoption of a German national diabetes plan, Bettina Döbereiner reports

Estimates suggest there are 387 million diabetics worldwide, a figure expected to rise by almost 35% to reach 592 million by 2035, according to the 2014 Diabetes Atlas published by the International Diabetes Federation (IDF). This prognosis is probably not far off the mark: the Robert Koch Institute reports that, between 1998 and 2011, the number of diagnosed diabetes cases in Germany rose by 38% to a currently estimated six million.

These recent figures support an idea bandied about for decades: the development of national diabetes strategies to complement supra-regional approaches. In the so-called St Vincent Declaration of 1989 a group of experts, convened by WHO Europe and the International Diabetes Federation (IDF) Europe, demanded national diabetes plans (NDPs). Since then, several institutions have endorsed this demand and, in 2012, the European Parliament asked all member States to initiate NDPs according to the 'Addressing the EU diabetes epidemic' resolution.

For the highest number of diabetics, Germany ranks number eight in the top 10 countries; and the incidence of type 2 diabetes is among the highest in Europe (Diabetes Atlas & Diabet Med. 2009 Dec; 26 (12):1212-19), so it's not surprising that the country's experts have long been calling for a German NDP. However, although 17 out of 28 EU Member States have officially adopted an NDP (Library of National Diabetes Plans, as of December 2013) in Germany the call has gone unheeded .

Source: VDGH, photographer: Henning Schacht

At the VDGH congress event 'Challenge Diabetes – Are we prepared?' panellists included Professor Oliver Schnell (diabetes researcher), Dietrich Monstadt (healthcare policy expert and Member of Germany's Parliament), Susanne Kluge (organiser and TV host), Dr Günther Jonitz (President of the Physicians' Association Berlin) and Matthias Borst (VDGH Chairman of the Board).

It may well be that finally the time has come: last year, the German Federal Assembly called on the government to adopt a Prevention Act and a national diabetes plan and, in January 2015, the German daily FAZ reported that the Christian Democratic Party (CDU) confirmed being in the process of drafting an NDP (FAZ, 02.01.2015).

In view of these developments in the political arena, the focus on diabetes at the annual VDGH congress is no coincidence: the medical diagnostics manufacturers want to contribute to the current public health debate and to encourage dialogue between politics, healthcare institutions, research and industry. Above all, however, the players in the medical diagnostics industry want to be part of the NDP development project. 'We favour a round table which brings together all disciplines – and I consider industry a discipline in this context – to jointly develop a national diabetes strategy,' said Matthias Borst of Becton Dickinson and VDGH Chairman of the Board, during the panel discussion.

The medical diagnostics industry offers a wide variety of highly sensitive tools for the early detection of diabetes and of disease management devices that allow diabetes patients to measure glucose levels thus helping them to lead a 'normal' life.

Finally yet importantly medical diagnostics firms invest in new technologies to improve early detection and treatment of diabetes.

The evening session began with a personal account of type 2 diabetic Udo Walz, a society hair stylist, followed by an update on diabetes research from Professor Oliver Schnell, Executive Manager of Forschergruppe Diabetes e. V. am Helmholtz Zentrum München (see information on diabetes research from the Diabetes Congress, also reported here). The highlight of the evening was the closing panel discussion with Professor Schnell, VDGH Member of the Board Matthias Borst, Dietrich Monstadt (Member of the German Parliament, CDU) and Dr Günther Jonitz, President of the Physicians' Association Berlin.

During this discussion, organised by TV host Susanne Kluge, Dietrich Monstadt, himself an insulin-dependent diabetic and among the initiators of the NDP draft to be presented by the Christian Democratic Party, summarised the state of affairs. The draft is currently being discussed with the Social Democratic Party, the CDU's coalition partner in the German government, aiming to submit it for consideration by the German parliament.

Monstadt proposes a comprehensive diabetes strategy that not only integrates federal, state and municipal levels but, above all, follows a multi-ministry approach: diabetes prevention, in this strategy, is not limited to the department of health but requires the cooperation of inter alia the ministry of education (e.g. regarding physical education in schools), agriculture (healthy food and diet) and urban development (no fast-food restaurants next to schools).

There was unanimous agreement among panel members unanimously agreed about the need for an NDP and a diabetes strategy that integrates the different stakeholders, including the patients. Moreover, they agreed 'the sooner, the better' – maybe even within 2015. However, it remains to be seen whether Borst's wish to have the industry, represented by VDGH, which was invited to participate in the NDP process, will be fulfilled.

In 2013, the Library of National Diabetes Plans in Europe compared the European NDPs and noticed: 'None of the NDPs mention industry involvement.'

THE epid

According to the International Diabetes Federation (IDF) in recent decades the development of diabetes mellitus (DM) warrants the conclusion that this is among the most important global epidemics, Walter Depner reports.

Figures illustrate the dramatic situation: in 2014, diabetes mellitus prevalence in Europe in the 20-79 years age bracket ranged between 15% (highest valuation) in Turkey to 5.5% in the UK (lowest value). Between these end points of the scale are Germany (11.5%), Spain (10.5%) and Austria (9%), Italy (close to 8%), Switzerland, the Netherlands, France and Poland (slightly above 7%) and Belgium and Sweden (around 6%).

In 1994, when an estimated 110 million people suffered from diabetes, the prognosis for 2010 was 239 million patients. However, in 2010 more than 285 million diabetes cases were reported. Three years on, in 2013, the number had risen by almost 100 million to 380 million – a figure epidemiologists expected for 2025. IDF points out that the projections had to be repeatedly revised up; estimates from 2014 expect as many as 600 million diabetes cases by 2035. Ninety to 95% of all diabetes patients have type II diabetes.

A look at Germany illustrates the financial dimensions of this epidemic. Today, an estimated 20% of total expenses of statutory health insurers are incurred for diabetes treatment and its concomitant and secondary diseases: €40 bln yearly – and counting. The root cause of this development is not the list of 'usual suspects' – wrong or malnutrition, unhealthy lifestyle, e.g. lack of exercise, overweight, or environmental effects – but the fact that most patients find it far easier to 'manage' the disease with medication instead of changing their lives in a controlled and sus-

Germany's 2015 Diabetes Congress

Diabetology news

The focus of the 2015 Diabetes Congress held in Berlin this May was 'Personalised diabetes treatment: innovative – individual – sustained'. Bettina Döbereiner reports on points aired during the supporting press briefing.

Sustainability of diabetes treatment –To date, scientific studies have adequately proved that early protection and thus ideally the supply of insulin-producing beta cells can, in some cases, avoid the manifestation of diabetes in patients with pre-diabetes or the first manifestation of Type 2 diabetes, said Professor Norbert Stefan, President of the Diabetes Congress, but, he added, 'above all it can significantly improve the course of the disease over a period of ten years. Reason? The body's own insulin production is maintained for longer.'

Thus he puts forward the case for early treatment and aggressive blood glucose reduction. Stefan recommends a target blood glucose level of around 100 mg/dl (HbA1c 5.6%), which he achieves with the help of the drug metformin. He decidedly advises against the use of so-called sulphonylureas, because 'They "squeeze" the pancreatic cells dry, making them produce ad infinitum and this eventually leads to a long term loss of function, which is therefore not sustainable.'

This preventive strategy is only suitable for non-obese patients. Bariatric surgery to treat obese patients, particularly if they do not respond to other treatments, has been hotly debated recently. Several studies have shown that, within two years, 60-80% of obese diabetics who have undergone this surgery experience a diabetes remission. However, the probability of remission after ten years is only 35%, according to Professor Dirk Müller-Wieland, press officer at the German Diabetes Association (DDG) and Senior Consultant at the Department of General Internal Medicine at the Asklepios Clinic St. Georg in Hamburg. He emphasised that results also suggest that, particularly in cases that are very difficult to treat, the diabetes remission rate after ten years is only 10-15%.

Müller Wieland therefore demands that this option as a secondary indication for obese diabetics should only be considered after careful, individual clarification and that, in view of possible side effects such as changes in gastrointestinal motility and long-term consequences (key word increased suicidal tendencies), should only be carried out with appropriate, structured preparation and aftercare. Independent of this gastric surgery, where organs are partially and irreversibly removed, there are currently three further treatment concepts that try to utilise the same mode of action – which is still not understood – but which are less invasive than the surgical reduction of stomach size. Up to now, all studies show that probably the upper part of the small intestine and the duodenum are responsible.

Müller-Wieland mentioned three different, promising treatment concepts. In the first, an impermeable sleeve, also called 'gastric condom', is inserted, preventing food coming into direct contact with the intestinal wall when passing through.

The second concept consists of a selective ablation of the mucosa to partially disable it (see EH article on page 1 – duodenum ablation).

With the third concept, gastrointestinal motility is changed via electric modulation through interaction with the vegetative nervous system. Initial experimental data for these three approaches confirm their success and, said Müller-Wieland, point toward the development of 'Interventional Diabetology'. However, we must first wait for the results of larger, more meaningful studies.

Soon, the so-called closed-loop-systems may help to further customise treatment, particularly for Type 1 diabetics, and notably to avoid the often underestimated hypoglycaemias, which frequently occur during the night.

Photographer: Dirk Deckbar, © DDG

Professors participating in the press conference, fro Dirk Müller-Wieland, Norbert Stefan and Thomas For

For this procedure, the currently available continuous blood glucose monitoring systems, which are implanted subcutaneously into the adipose tissue where they measure the glucose in the interstitial fluid (and transmit data to a mobile telephone), are to be combined with insulin pumps – also already available – through a complex algorithm in such a way that the system automatically and continuously calculates and dispenses the amount of insulin required.

'We believe that the first closed-loop blood glucose monitoring systems will be available within the next two, maximally three years,' said Professor Thomas Forst, Director at

DACH TO DIABETES

Diabetes mellitus affects millions of people worldwide

emic of the 21st century

Constantine the African, a doctor in the Berber Zirid era in the 11th century, examines patients' urine

tainable way. The situation is exacerbated by the fact that, within the past one or two decades, the number of child and adolescent diabetics has risen sharply. IDF estimates that, in Germany in 2007, 15,000 to 20,000 children under 15 had type II diabetes. Since then 2,500 new cases were reported every year, with an annual rate of increase of 4%. IDF assumes a global prevalence among children 0.02 percent, which translates into 450,000 children globally, with an annual increase of about 3%.

Some European figures illustrate the problem: the highest incidence of type I diabetes in children under 15 years of age is found in Finland, with close to 58 cases per 100,000 inhabitants. The lowest figures were reported in Romania with 5.5 cases. Further countries reporting high incidence rates are Sweden (approx. 43 cases), Norway (32 cases), UK (29 cases), Germany (22 cases) and Spain (20.5 cases). Switzerland, France and Italy reported between 12 and 13 cases per 100,000 inhabitants. While DM diagnostics is ever more efficient and precise, and applied at an earlier age, it can and has to be the basis for intensive research of all relevant causes and issues that surround the disease, accompanied by better, more effective and earlier prevention covering a broad range of leverage points from physical education in schools to nutrition.

An initiative by a group of scientists who want to explore basic health research questions in a national cohort is a step in the right direction. They will, for example, question the effect of lifestyle on diabetes risk. The team plan to examine 200,000 people between 20 and 69 years in 18 centres all over the country, and collect data on their lifestyle. The aim is to improve prevention, early detection and treatment of chronic diseases such as diabetes, cancer, pulmonary and cardio-vascular diseases.

Every fifth participant will be administered an oral glucose tolerance test (OGTT) for early detection of diabetes. Experts assume that, despite all the well-known data, by far not all people suffering diabetes mellitus are diagnosed. A significant number of unreported and/or undetected cases is expected.

m left: Andrey Zeyfang, rst

the Department of Medical Science at the Profil Institute for Metabolic Research in Neuss, Germany. Clinical studies, but also tests under daily life conditions in adults and children with diabetes type 1, have shown that the utilisation of these systems can reduce both hyper and hypoglycaemias considerably, particularly at night, he said.

Forst went one step further: 'We're already on the brink of the availability of hormonal closed loop systems,' he said. The first systems of this kind are currently being trialled. They would make it possible not only to activate insulin supply when blood glucose levels are too high, but also to stop the supply of insulin if hypoglycaemia is imminent, activating the supply of glucagon instead.

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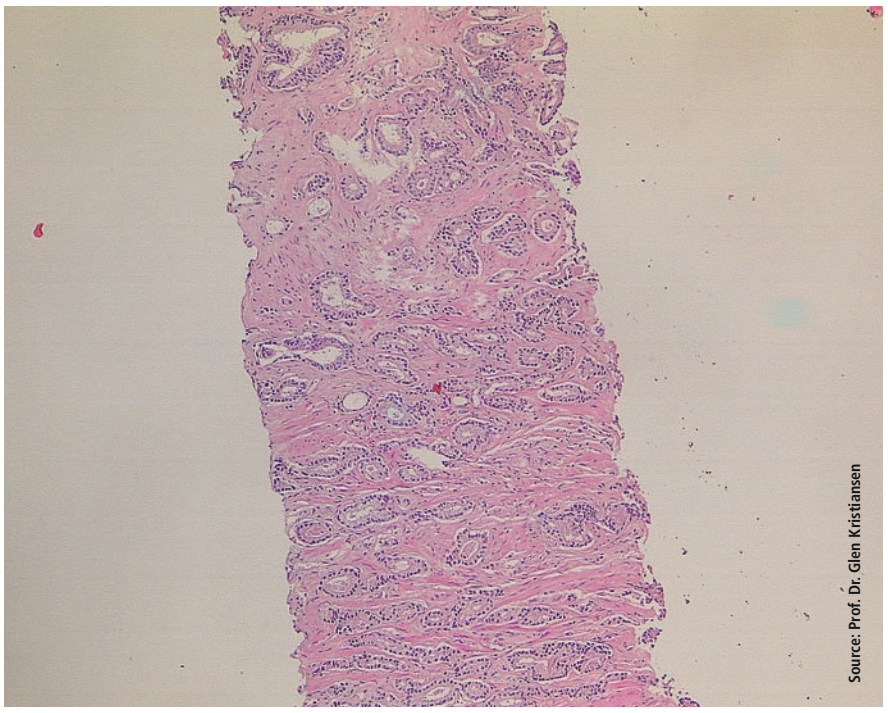
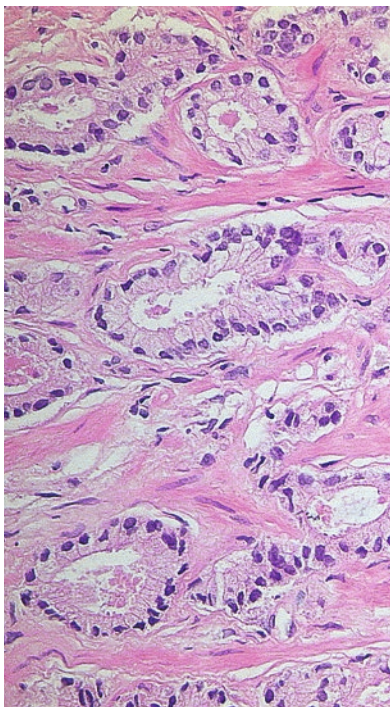
EH 3/15

'Carrying out biopsies without imaging is like playing Battlesh

A pathologist's v of prostate diagn





Well-differentiated prostate cancer with a Gleason-Score of 3+3=6

Report: Karoline Laarmann

Pathology is the gold standard of prostate diagnostics. Whilst the radiologist makes interpretations based on shadows and grey scale values visible on an image, the pathologist has the 'fait accompli' under the microscope. Professor Glen Kristiansen, Director at the Institute for Pathology at the University Hospital Bonn, explains why image-guided biopsies also make sense from the pathologist's point of view and why the prognosis for prostate cancer is a special case.

No pathologist in Germany has published as many scientific works on the topic of prostate cancer as Glen Kristiansen. He believes that a qualified specialisation in specific organs, as is common in the USA, makes sense, but that it cannot be realised in Germany: 'There is an increasing lack of qualified staff in pathology. When we look at how many pathologists per residents Germany has, we're in third place from the bottom, ahead only of Turkey and Poland. The situation is bound to get worse over the next few years as our field suffers from aging, recruitment problems and, to make matters worse, from requirements planning.'

Kristiansen specifically welcomes advances in imaging because these developments also lead to reduced workloads in pathology. He approves of the demand for image-guided prostate biopsies: 'In every other case seen by pathologists the tissue sample is negative. However, we obviously never know whether the patient really is free of cancer or whether the biopsy was taken "blind" from the wrong area. This is like playing *Battleship*.'

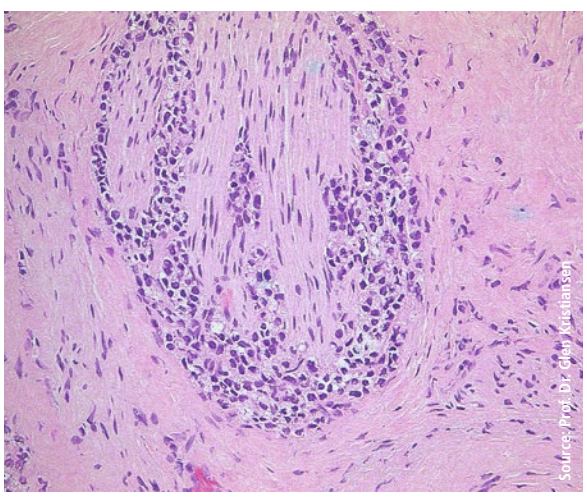
The International Society of Urological Pathology introduced one important advance, from the pathologist's viewpoint, in November 2014. The Gleason-Score, i.e. information about the growth pattern, and therefore aggressiveness of a prostate cancer, was divided into five prognostic groups. Kristiansen explains why this is so important: 'Most patients with prostate cancer are already of an advanced age. At the same time this cancer grows very slowly. So, the question is: Will the patient actually be alive for long enough to benefit from treatment or not?' This group division helps to advise patients in a forward-looking manner.

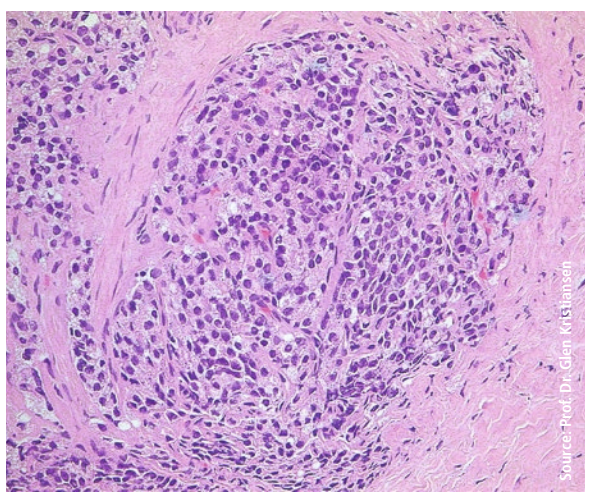
Over the last decades there have already been several shifts in paradigm regarding the prostate cancer treatment, the pathologist notes. 'In the 1980s prostate cancer was still treated as some form of 'senile wart' occurring in men. The motto was: You die with prostate cancer but not because of prostate cancer. Therefore, it mostly wasn't even treated. However, the available data has shown that there definitely are patients who die from this cancer. The pendulum swing then changed direction and the strategy was to find and treat as many cases of prostate cancer as possible.'

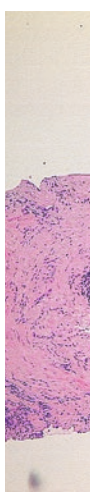
Although surgery and radiotherapy are treatment options, they are not without risks and side effects. A prostatectomy for instance can lead to incontinence and problems with potency and can therefore limit a patient's quality of life significantly.

The high prognostic significance of the Gleason-Score has turned it into an important parameter for treatment planning, but the problem of tumour heterogeneity remains – despite multiple, blind biopsies, as the aggressiveness of a cancer can be very different in different parts of a tumour. In this context the pathologist emphasises once more: 'If we had image-guided prostate biopsies we could hold better, pre-therapeutic case conferences, where radiologists can present the

Poorly differentiated prostate cancer with a Gleason-Score of 5+5=10. The poorly differentiated prostate carcinoma in the centre of this overview image, as well as on another image with higher magnification, shows a perineural invasion frequently occurring with all prostate cancers







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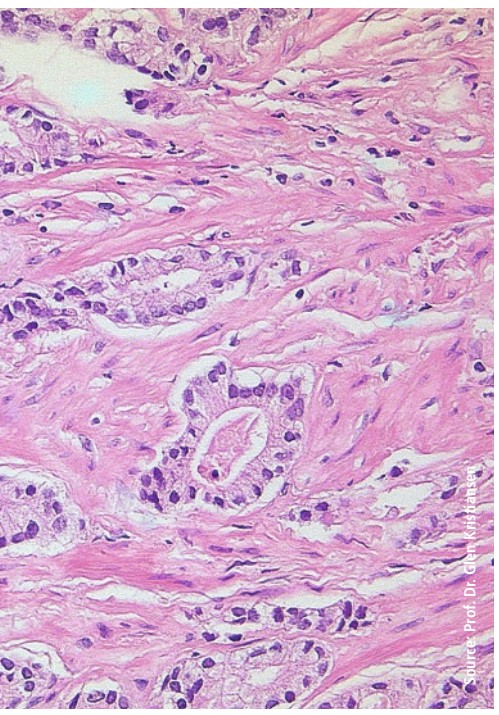
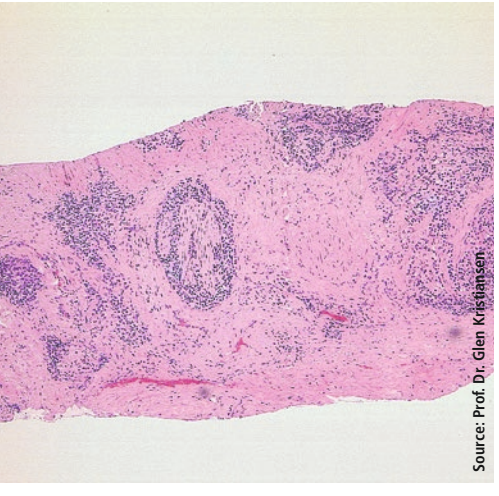

Source: Prof. Dr. Glen Kristiansen

Glen Kristiansen was Professor for Molecular Tumour Pathology and Senior Consultant of the Pathology Department, University of Zurich for four years before he took over the directorship of the Institute for Pathology at Bonn University Hospital in May 2011. The pathologist is a Member of the Board and European Representative of the International Society of Urological Pathology (ISUP) and of the Advisory Board at the European Network for Uropathology (ENUP). He is also a member of the WHO Panel of Experts on Urological Pathology and of numerous other national and international specialist pathology- and cancer research associations.

information gained from images and pathologists could present their diagnostic findings gained from tissue analyses.

'Both disciplines would benefit from this, but most importantly so would the patient.'


Source: Prof. Dr. Glen Kristiansen

MRI versus pathology

'We need more feedback'

Report: Karoline Laarmann

What you see is what you get - unfortunately, this doesn't always apply in cancer imaging. Why is it that something which looks conspicuous on an image later turns out not to be a tumour? Why, on the other hand, are things overlooked that later turn out to be cancer? Pathological findings are extremely important to help improve diagnostic precision in radiology. Both disciplines therefore engage in an intensive dialogue at German Congress of Radiology in May.

One focus of this interdisciplinary exchange was the diagnosis of prostate cancer. In this field, Dr Matthias C Röthke, Senior Consultant at the Department of Radiology at the German Cancer Research Centre, in Heidelberg, is among the leading imaging experts.

Currently, the procedure of choice for prostate imaging is multiparametric MRI, which supplements morphological image data with functional parameters. 'The term functional basically refers to the diffusion behaviour in the tissue,' Röthke explains. 'Tumours are characterised by a high cell division rate. When you look at them under the microscope you see that the tissue consists of many large cell nuclei and little cytoplasm.

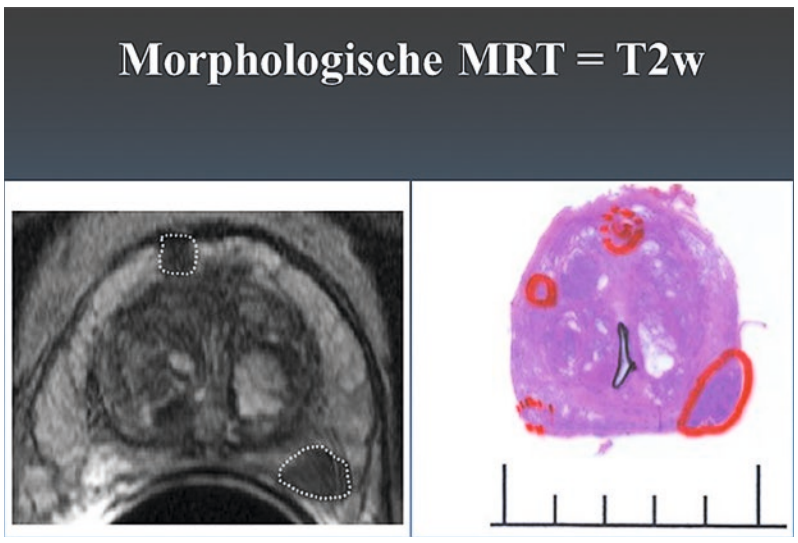
'Accordingly, measurements carried out with diffusion weighted MRI show that the water molecules move around less freely in this type of tissue.' A further, functional criterion, which is examined with the help of contrast media dynamics, is perfusion behaviour, because the perfusion patterns of tumours differ from those in healthy tissue.

If all available radiological measuring procedures are combined, this results in a sensitivity of 90%. 'The diagnostic precision obviously also depends on the examiner,' the radiologist admits. 'If a procedure is carried out by an expert, the rate is higher than that achieved by a less experienced examiner. Unfortunately, there are as yet no certified radiologists who are specifically trained in prostate imaging, unlike those specialising in mammography. The referring urologists are making increasingly frequent demands for this further training because they are looking for reliable quality standards for prostate MRI procedures carried out by radiologists.'

Dr Röthke believes that organisational structures similar to those in place for the diagnosis of breast cancer are absolutely essential. This starts with the biopsy. The prostate is the only organ from which tissue samples are taken at random – with the help of transrectal ultrasound to assist with orientation – as part of the primary diagnosis. With all other organs, suspected lesions are precisely targeted under image guidance these days. 'A prostate MRI should at least be carried out in patients whose primary, ultrasound-guided ten or twelve stent biopsy was negative, but whose PSA level continues to rise so that a possible lesion can be precisely targeted with a repeat biopsy,' Röthke says.

His demands go beyond that. 'What we need for prostate cancer are interdisciplinary case conferences as we know them from the field of breast cancer diagnostics. This would give us a quality forum where radiologists, urologists, radiotherapists and pathologists could exchange and update their knowledge. Such feedback discussions are currently usually carried out on an occasional and informal basis, whenever it fits into clinical routine. However, we need an official framework to achieve comprehensive and competent care for the imaging of prostate cancer.'

Comparison MRI - Pathology: On the left morphological T2-weighted MRI and on the right the corresponding histological specimen. The areas with prostate cancer are framed on both sides. On the left two additional microlesions < 1mm are marked that cannot be detected with morphological imaging, but which can be classified as clinically not relevant cancer



Senior consultant **Matthias C Röthke** MD, Dipl.-Kfm. is primarily responsible for Urogenital Imaging within the Radiology Department at the German Cancer Research Centre (DKFZ) in Heidelberg. He studied medicine in Erlangen and Freiburg, completed his specialist training in Diagnostic Radiology at the University Hospital Tübingen and, in 2010, became a consultant at the DKFZ. Along with his membership of the Working Group for Uroradiology and Urogenital Diagnostics in the DRG, he is also a member of the Working Group for Prostate Imaging at the European Society of Urogenital Radiology (ESUR).

Researchers deliver progress in scanning capabilities

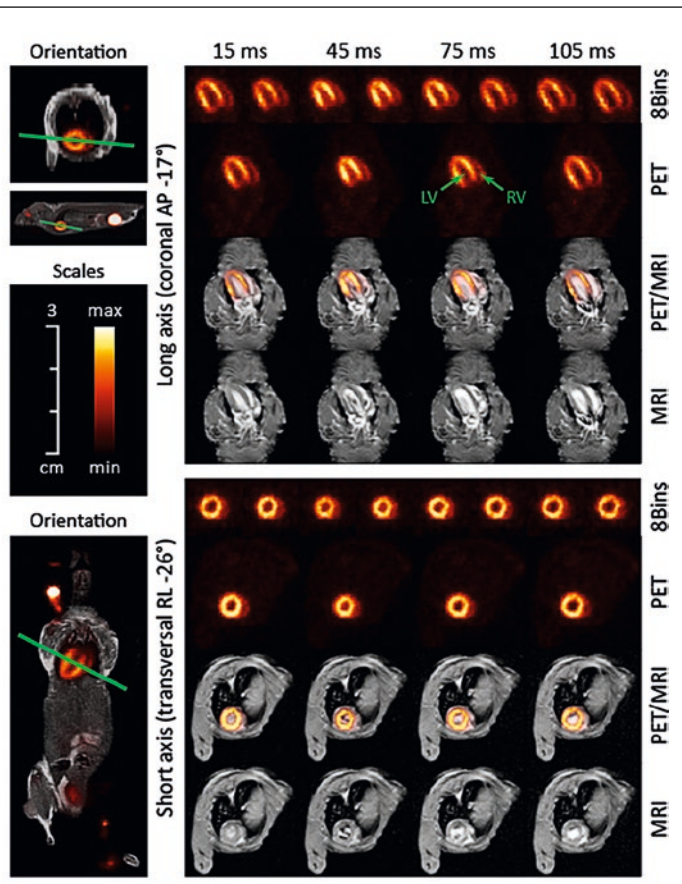
Molecular imaging mines deeper

Report: Brigitte Dinkloh

The view across the Atlantic – it fills Professor Fabian Kiessling, Chair of Experimental Molecular Imaging at the RWTH Aachen (Rhine-Westphalia Institute of Technology Aachen), with optimism. The USA offers more opportunities for molecular imaging. Only recently, new tracers for Alzheimer's were accepted as reimbursable in some centres, whilst the development of new diagnostics in Europe continues to be rather sluggish by comparison. 'But this will change,' Professor Fabian Kiessling is sure, 'at the very point when we realise that many new therapies will not work without sufficient staffing, and that the use of molecular imaging will help to keep down costs and resources.'

PET – gentler, faster and used intraoperatively

Molecular Imaging is no longer the playing field of individual researchers. To the contrary: We are now pretty certain what actually works, and there are intensive efforts to bring these applications into clinical routine. One good example of this is PET, and in particular hybrid imaging with MRI: 'For a long time it was thought that PET has reached the zenith of its capabilities but, thanks to the new detector technology with fully digitised sensor arrays, the tracers can be detected with even more sensitivity and their spatial attribution has improved. 'The procedure is further advanced through new geometries, such as whole-body scanners and the development of new calculation procedures. 'This will further enhance the sensitivity of the procedure,' Kiessling foresees. In future we will not only require significantly smaller amounts of radioactive substances but scanning will also become much faster and therefore considerably cheaper. He believes that, in the long term, MRI/PET will become fully established at least at university hospitals because of its clearly improved soft tissue contrast.



Double gated (breathing and ECG) simultaneous PET/MR measurement of a mouse heart (four time bins). MRI gradient echo cine sequence with 3002 µm 2 pixels size and 1 mm slice thickness; both, left ventricle (LV) and right ventricle (RV) are visible in the PET images.

Source: Weissler, Schulz, et al. A digital PET/RF insert for preclinical PET/MRI applications, IEEE Trans. on Med. Im. DOI: 10.1109/TMI.2015.2427993

Next to PET, Kiessling also sees a big potential in Cherenkov Imaging. The idea behind this is initially to localise a tumorous lesion, or the lymph nodes, with PET imaging. During the operation a camera then enables detection of the area in vivo through light emission during the radioactive decay of the tracers. The procedure has now been developed to such an extent that the first patient examinations are being planned in New York.

Magnetic particle imaging (MPI)

The professor is particularly proud of the first ever presentation of an image from a hybrid MRI-MPI scanner. Since Bernhard Gleich first publicised the magnetic particle imaging procedure about 10 years ago there has been intensive research in this field. The principle behind it is that, in a magnetic gradient field, small iron oxides display harmonic distortions through periodic stimulation, which can be measured and which can then be utilised to carry out fast, highly sensitive imaging.

'The Hybrid MRI-MPI scanner also allows switching between MRI and MPI. This enables visualisation of small iron oxide particles in the body with high sensitivity, which can then be hybridised into morphological MRI images. The areas of application for the hybrid scanner are still subjects of research. The first clinical MPI is located in Hamburg and will be used for cardiovascular imaging, and in particular for the fast acquisition of lung- and myocardial perfusion.'

The determination of the oxygen content in tissue, dynamically and without any additional contrast media, is a particularly interesting application of photoacoustic imaging. Kiessling: 'It allows the detection and characterisation of tissue that is poorly supplied with oxygen, and the observation of the effects of treatment. The procedure is used in oncology, for cardiovascular disease, muscle perfusion studies and inflammatory diseases.'

The user can also inject a fluorescent dye to measure the tissue perfusion and permeability of the tissue or to detect sentinel lymph nodes. It is specifically these simple applications that should be tested a lot more because they can be quickly, clinically implemented with existing technology.

Molecular ultrasound

Kiessling is working on the discovery of new indications for the first molecular contrast medium with target-specific microbubbles. He has also achieved early measurements of perfusion and relative blood volume following the administration of only one dose of contrast medium, later obtaining molecular information on

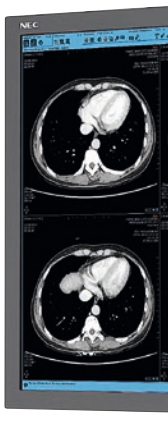
Screens that show m

High-res e megapixels

Medical imaging technology has shown tremendous innovation in recent years, with devices such as CT and MRI scanners yielding ever-higher resolution to gain great image detail and therefore better diagnostics. Monitors need to be of similarly high standards. Recently produced and soon established as standard in many medical imaging areas, monitor devices can deliver eight-megapixel resolution. For example, NEC Display Solutions, which produces 10-bit grey scale diagnostic and review monitors, reports: 'From our medical imaging display range the current top of the line monitor is the MD322C8, a 31.5-inch screen offers a generously wide-format workspace with remarkable eight megapixel resolution.

'The MD322C8 display works seamlessly with NEC's hospital-wide Quality Assurance Solution GammaCompMD QA. This specialised medical quality assurance software meets all challenges and demands head on by providing either an entry-level QA solution for small practices and clinics or a comprehensive solution for a larger hospital environment.'

The GammaCompMD QA ensures that all the hospital monitors conform to the DICOM standard and the display also follows all other quality control routines, including AAPM TG-18, IEC62563-1 and the latest German DIN 6868-157 for Fluoroscopy and Computer Tomography.



'The high quality eight megapixel image is further enhanced with the Digital Uniformity Control (DUC) function, which optimises colour and luminance uniformity throughout the entire

In 2008, **Dr Fabian Kiessling** became W3-Professor for Experimental Molecular Imaging at the RWTH Aachen. A recognised speaker from the Working Group on Methodology and Research at the German Röntgen Society (DRG) he has been a member of the European Society for Radiology (ESR) Research Board since 2011. In 2015 chaired the ESR Molecular Imaging Subcommittee. In 2014 and 2015 he also co-chaired the European Society for Molecular Imaging (ESMI) Congress and he will be Chairman of the World Molecular Imaging Congress (WMIC) in 2016.

the VEGFR-2-Receptor with a further measurement. 'In the differentiation of breast cancer we could show that molecular information is clearly superior to functional information. This is very promising and we are working very hard on the development of the clinical implementation of this procedure.'

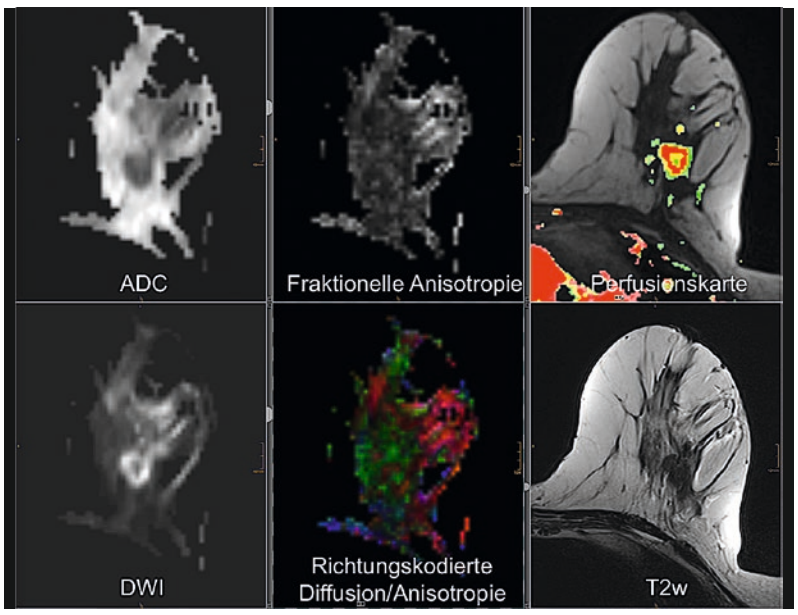
Big data in breast diagnostics

Multiparametric imaging

Report: Karoline Laarmann

The vast amounts of data accumulating in breast diagnostics require new methods to extract clinical information in a practical way. When dealing with large amounts of data that is too big or too complex to be analysed with traditional data processing applications, the talk today is of 'Big Data'. The data volume accumulating in breast diagnostics has become increasingly complex over recent years: multiparametric MRI including diffusion imaging and MRI spectography, positron emission tomography (PET) and tomosynthesis (3-D mammography) along with the various ultrasound procedures, generate such vast amounts of data that its evaluation is turning into a Herculean task. 'It's becoming ever more difficult to view and sort all the data and finally to make a diagnosis for the individual radiologist,' according to Associate Professor Dr Pascal Baltzer, at the Clinic for Radiology and Nuclear Medicine, Medical University of Vienna, who lectured on *Big Data in Breast Diagnostics* at the 96th German Radiology Congress.

Multiparametric MRI for instance – Baltzer's specialist area of research – delivers a multitude of results. Based on blood pressure measurements alone, through signal changes caused by contrast media injected, different distribution volumes and perfusion parameters can be calculated with pharmacokinetic models (such as perfusion rate of tissue, extracellular distribution volume). 'If you then add the other technologies, all of which show different functional aspects of a tumour – be it biochemistry, microanatomy or perfusion – you obtain a very comprehensive but also very complex image of the tumour,' Baltzer explains. However, this also raises a number of questions: What does the parameter measured mean in an individual case? How should individual parameters be combined? Could a parameter that proved meaningful in a study also extract usable information under clinical conditions and with other devices?



Multiparametric examination of the breast in a breast cancer patient; the tumour becomes visible on the diffusion image (ADC – Apparent Diffusion Coefficient, DWI – Diffusion Weighted Imaging) with low signal intensity and high signal intensity respectively, due to its changed microstructure compared to healthy tissue. The direction coded diffusion images (DTI – Diffusion Tumour Imaging, here fractional anisotropy, direction of diffusion as well as colour coded visualisation of the diffusion direction in green = diffusion in the direction of the nipple) show the destruction of the normal microanatomy of the breast caused by the tumour. The perfusion map shows the increased perfusion typical of tumours. The conventional T-2-weighted (T-2w) image on the other hand provides little functional information.

'There is significant demand for empirical data acquisition that not only validates the above mentioned technologies multicentrically, but also examines them as to which data is required and which isn't,' he points out, turning to a dilemma that arises. On the one hand we'd like to visualise the tumour in any possible biochemical and molecular way but, on the other, the images obtained also need to be converted into a practical concept. Radiologists in practices outside academic settings obviously need to be able to use the data,' he emphasises. Therefore he believes that the order of the day is data mining. 'This means disposing of the data 'waste' within the 'mine' of data whilst extracting the diamonds.' By using methods of machine learning and multivariate statistical models, the flood of data is reduced and patterns are recognised. This obviously requires a correspondingly large database – containing many hundred or even thousands of multiparametric sets of data. 'This is only available in very few facilities,' Baltzer regrets. The Medical University of Vienna, where she carries out her research, is one of those facilities. The point of this undertaking is solid: Whilst the approach with other organs, such as the prostate, can be described as 'active surveillance' in breast cancer diagnostics there is a heated debate involving the terms 'over diagnosis' followed by 'over therapy'. Baltzer emphasises: 'We know from studies that a not insignificant number of tumours, and particularly precancerous conditions, grow so slowly – or do not develop at all – so it would be better to leave them be or to just actively monitor them.'

Multiparametric imaging makes it potentially possible to differentiate between aggressive and less aggressive tumours without a needle biopsy. The detailed information about the type of tumour is, of course, not only of great importance for diagnosis but also for treatment planning and monitoring. 'As with all these procedures, a lot of ground work is needed,' warns Baltzer. 'You have to identify these procedures, test them, check their reliability and then validate them.'

Associate Professor Dr Pascal Baltzer, from the Clinic for Radiology and Nuclear Medicine, Medical University of Vienna, Austria

more essential details

ight s monitors

screen. Additionally, the screen offers the latest anti-glare coating, minimising distracting ambient light reflections, and providing the highest level of ergonomic comfort,' NEC Medical Solutions adds.

Connectivity

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Radial artery catheter failure

High-res ultrasound study reveals cause

2.5 million radial arterial catheters (RAC) are used annually in Europe (USA: 8 million), commonly to monitor arterial blood pressure and take blood samples in surgical, A&E and ICU units. They can fail.

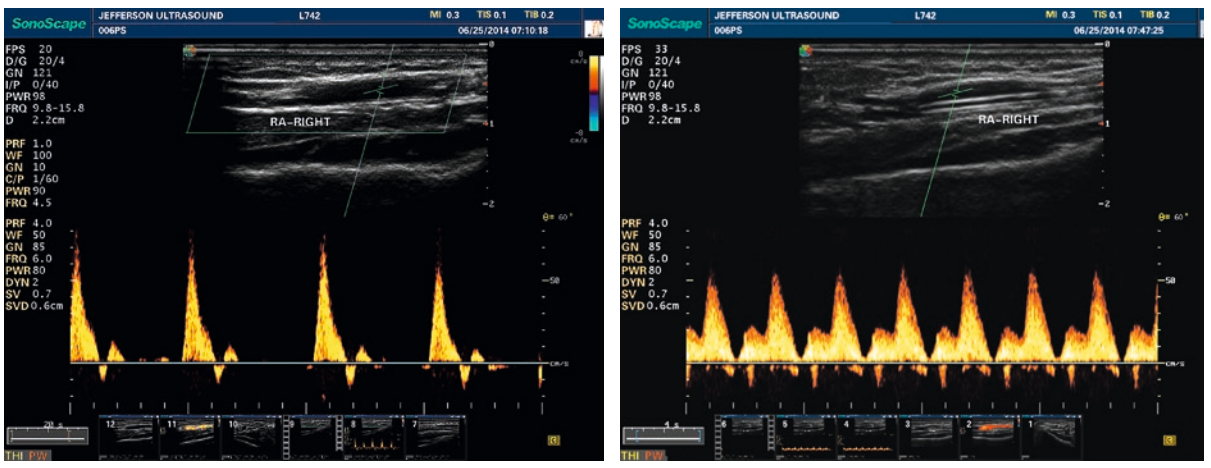
For a study of mechanisms that might lie behind premature RAC failure and complications related to RAC in clinical use*, at team at the Radiology/Ultrasound and Anaesthesiology Department, Sidney Kimmel Medical College of Thomas Jefferson University, Philadelphia, USA, used SonoScape's S9 hand carry ultrasound system.

The clinical trial aimed to determine the causes of RAC failure and confirm whether a low artery diameter to catheter diameter ratio leads to decreased local blood flow and thrombosis.

Using the S9 ultrasound system with a 12 MHz linear array probe to evaluate and monitor the RAC insertions as well as blood flow dynamics in the radial and ulnar arteries, the 25 enrolled patients were scanned before RAC insertion, immediately after, and intermittently every two to four hours during the day and every four to six hours during the night (for 24 to 36 hours). By using the S9 ultrasound, the researchers could literally see what was happening in the ulnar and radial arteries of the patients, Sonoscape reports.

'Using the S9's greyscale and Doppler technology, measurements were taken of blood flow and the diameters of both the ulnar and radial arteries. Assessments of RAC insertion factors also allowed for measurements for the composite vessel trauma score for respective arteries after insertion. To analyse the data, a paired Student t-test and a Wilcoxon Rank-Sum test were used to compare results.'

For the study, RAC initial failure and final failure were classified as difficulty/inability to aspirate blood through the RAC or a dampening/loss of the blood pressure waveform.



Pre and post insertion of RAC peak blood flow velocity doppler ultrasound

211 ultrasound scans were obtained from 25 patients. 21 had experienced a RAC initial failure; four experienced RAC final failure. 'With the S9's high image clarity, the reasons for RAC failure were easily revealed,' SonoScape reports. 'Each failed for a different reason: ranging from the catheter being outside the vessel and in the subcutaneous tissue, the RA catheter tip against the arterial wall, thrombus on the catheter tip partially/completely obstructed the RA catheter lumen, and thrombus within the RA lumen partially/completely obstructed RA blood flow.'

Soon after RA catheter insertion, the RA and UA inner diameters increased from 2.21±0.4 mm to 2.54±0.45 mm and from 1.91±0.44 mm to 2.23±0.48 mm respectively (no significant differences in RA and UA diameters), the study showed.

For the 24 RACs that did not have a final failure, the median number of cannulation attempts was nine and the median CVTS was 8.5. Comparatively, the CVTS for the four RACS that developed a final failure was 8.3 and the mean number of blood draws was 5±3.3. Median time to initial dampening of the RA waveform was 5.9 hours in 22 cases.

'Using the S9's colour Doppler the team could measure the velocities in the RA and UA arteries after RAC insertion. In the RA artery, the peak velocity decreased from 56.2±18.7 to 36.6 cm/s after the RAC was inserted. Peak velocity in the UA, however, increased from 53.7±19.3 to 63.4±20.5 cm/s after insertion of the RAC. Ultrasound scans also did not indicate a difference in vessel diameter or blood flow velocity when comparing successful RACs to that of the four that developed a final failure; however, this may be attributed to the limited number of final failures that were observed.'

There was also no difference in velocity patterns or in diameter in the RACs that failed compared to those that did not fail.

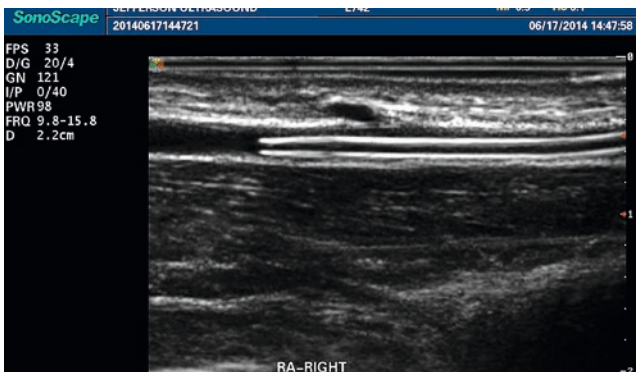
A threefold conclusion

Both the RA and UA experienced significant dilation after RAC insertion. The data suggested that vasodilation and increased blood flow around the catheter might help to prevent thrombosis and protect the function of the arterial catheter. In some patients the peak blood flow velocity significantly decreased after insertion of a 20g catheter, especially in the RA with a small inner diameter.

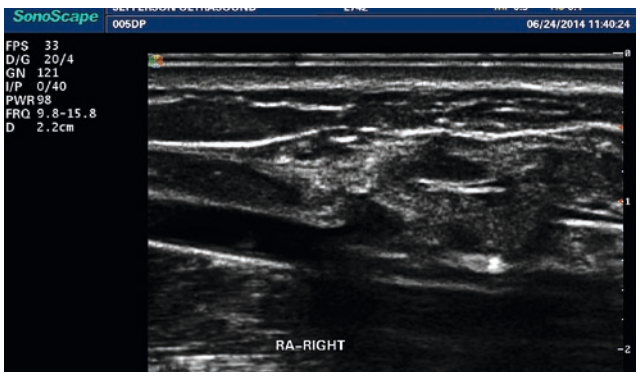
With the S9's high-resolution ultrasound imaging abilities, in vivo observations were possible to reveal what caused RAC failure during the patient's clinical course. Failures consisted primarily of torturous vascular anatomy and RAC tip obstruction, thrombus formation on the RAC tip, and partial/complete thrombosis of the RA lumen.

* Study presented at the World Federation for Ultrasound in Medicine and Biology (WFUMB) Annual Convention and Preconvention Programme in October.

Source: SonoScape Medical Corporation

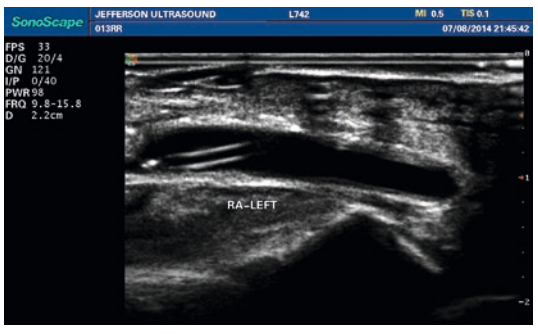


Ultrasound cross section of catheter post insertion in the radial artery

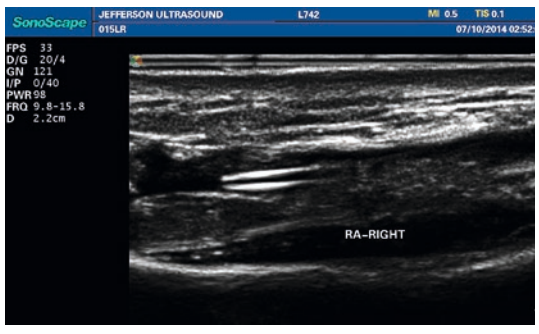


Scan taken over the RA shortly after blood could not be drawn revealed the catheter was no longer in the vessel lumen but in the subcutaneous tissue, adjacent to the artery

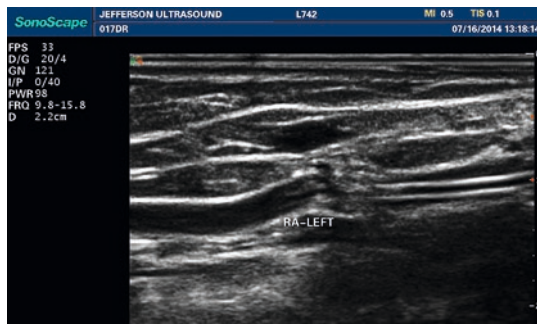
When dampening of the BP waveform, the US image showed catheter tip to be positioned against the vessel wall – an intermittent event. Waveform normalised when catheter tip was more centred



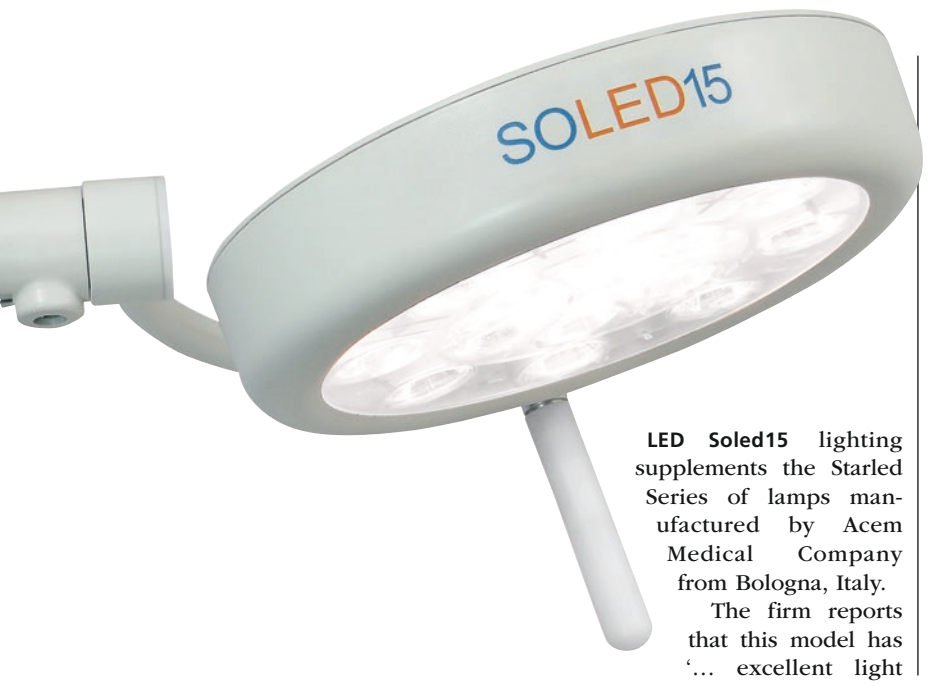
Thrombus with reversal blood flow on Doppler image taken in front of catheter when blood could no longer be drawn through. US showed two valve-like echogenic areas in front of catheter tip



Dampening of the BP waveform with the catheter tip resting against superior wall of RA. Compared to pre-insertion image, this vessel appeared tortuous with thickening intima post-insertion



Light up your exams and minor ops



LED Soled15 lighting supplements the Starled Series of lamps manufactured by Acem Medical Company from Bologna, Italy.

The firm reports that this model has '… excellent light intensity; IR-free light beam; colour temperature (CCT) of 4.500 °K; a colour rendering index (CRI) of 95; long life and low power consumption. '

The high technological level combined with the use of high-powered LEDs allow Soled15 to have a very linear yield and a negligible performance decay for its entire life duration,' Acem adds. 'Thanks to the high efficiency achieved, Soled15 has a light intensity of 65.000 Lux (80.000 Lux with "Boost" function) and a low power consumption (16W).

'The LEDs layout gives visual comfort and produces a uniform, homogeneous and shadowless light.'

Soled15's roundness contributes to its easy movement and suitability for diagnostics and test labs and the easy-to-grip, removable, autoclavable handle makes it suitable even for critical sanitary applications, the firm points out. All the lamp's functions –light intensity adjustment, parts selection (SEL), brightness increase (Boost), are controlled via the I-Sense touch panel. That 'SEL' function is new. Using it, you can select single parts of the light beam and activate the desired LEDs in a sequential way according to your needs. 'Boost' is used to reach a maximum light intensity when the light field is wide. This approximate 20% increase deactivates automatically after five minutes.

Soled15 can be ceiling, wall, trolley mounted (battery on demand) – just make your choice.

Mechanical recanalisation of blocked cerebral arteries for acute severe ischaemic strokes

Six international studies endorse thrombectomy

Results from six international randomised controlled studies conclusively and uniformly confirm, for the very first time, the effectiveness of thrombectomy in patients with acute, severe ischaemic strokes caused by a blood clot in one of the proximal cerebral arteries. The endovascular procedure is an add-on to conventional thrombolysis. Bettina Döbereiner reports from a German Stroke Society (DSG) press presentation held this May in Berlin.

A thrombectomy shown in a biplane, flat panel angiography carried out at the Department for Neuroradiology, Asklepius Klinikum, Altona, Germany; while the neuroradiologist and head of the department, Prof. Bernd Eckert, and an assistant carried out this procedure the patient (not visible) lay under the table under general anaesthetic. The procedure can also be carried out under local anaesthetic. The insertion of the micro-catheter from the femoral into the cerebral artery is controlled via the monitors shown on the right side of the image. A thrombectomy usually takes between 20 and 60 minutes.

The interventional procedure of endovascular recanalisation, in short thrombectomy, for acute severe ischaemic strokes, is not new. With this procedure, which has been carried out worldwide for several years, the occluding blood clot is mechanically removed with the help of a so-called stent retriever – a micro-catheter developed only quite recently – which is guided to the cerebral artery from the femoral artery.

The procedure is carried out in addition to the administration of thrombolytic medication within the first six hours of the start of symptoms and facilitates recanalisation, which cannot always be achieved with thrombolysis alone (general recanalisation rate in severe strokes around 35%) – particularly for clots >1cm (recanalisation rate for thrombectomy around 80%).

Until now no studies could prove the benefit of the endovascular recanalisation for patients with regards to lasting disabilities and mortality compared to the conventional procedure of intravenous thrombolysis. However, this has now changed.

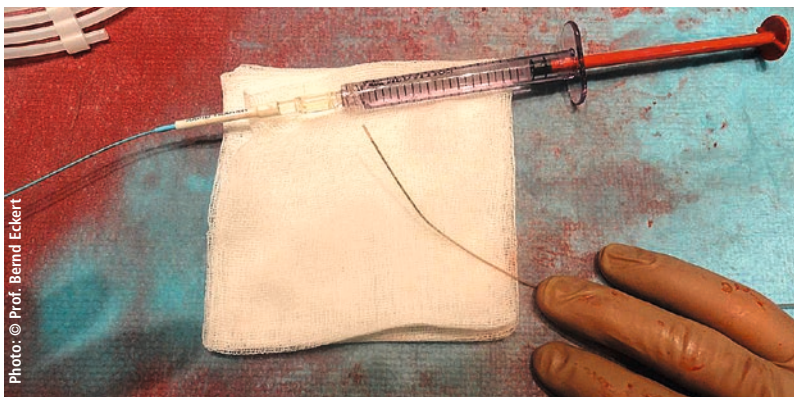
'We now have the certainty, for the first time, that if this procedure is used in a specific and systematic way, our patients experience fewer lasting disabilities and lower mortality at three months after the procedure,' said Professor Matthias Endres, Director of the Clinic for Neurology at the Charité University Hospital in Berlin, Germany and Deputy Chairman of the German Stroke Society, during its related press presentation.

The first of this round of six studies that recently scientifically confirmed the benefit of thrombectomy was the Dutch MR CLEAN study presented at the World Stroke Congress in October 2014. This showed that the functional independence rate which scores how patients can independently cope with their daily lives 90 days after the procedure (modified Rankin score 0-1) was 13.4 percentage points higher in patients who had received an additional thrombectomy compared to the control group where patients only received thrombolysis (32.6% vs. 19.1%).

The following five studies were all terminated early because their preliminary results were, in some cases, significantly higher still than the results of the MR CLEAN study. The continuation of the studies would not have been justifiable for ethical reasons. The first three of these studies – presented at the International Stroke Conference in Nashville, USA in February this year (EXTEND-IA, ESCAPE 2, SWIFT-PRIME) – confirmed that the chances of patients achieving a favourable treatment outcome through thrombectomy were 20-30% higher overall than those of patients in the control group, Endres said.

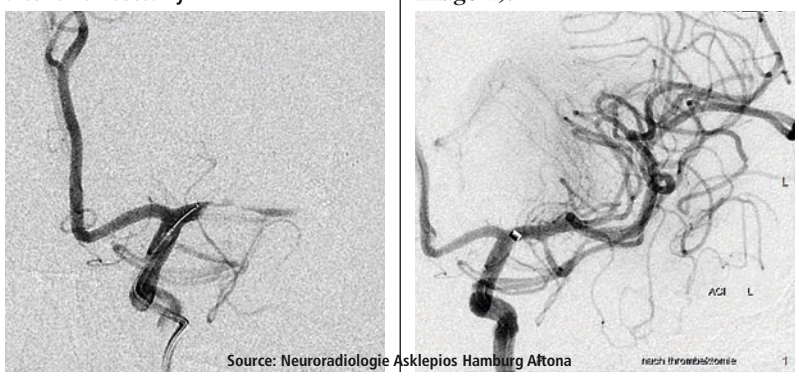
Patients' independence was maintained more frequently, as confirmed in the EXTEND-IA study: 90 days after the stroke occurrence almost twice as many patients could lead their lives without any functional impairments (71 vs. 40%) compared to the control group. Mortality was also considerably reduced from 19% to 10.4% in one study (ESCAPE). These results were also confirmed by the results achieved with the REVASCAT and THERAPY studies so far, which were presented at the European Stroke Organisation Conference in Glasgow in April this year, with some minor deviations attributed to the design of the studies.

Professor Bernd Eckert, Head of the Department for Neuroradiology at the Asklepios Clinic in Altona, essentially attributes the positive results of the new studies to the utilisation of modern, cranial imaging procedures as the basis for precise patient selection, and, in particular, to CT angiography (vs. unenhanced CT as in the 2013 studies), and overall also to considerably shorter processes and the predominant use of modern stent retrievers (see image 2).



The microcatheter (blue) is guided into the blood clot in the cerebral artery. The stent retriever (dimension 0.4mm – max 4mm) is then pushed into the micro-catheter via the sleeve, expands in the blood clot in the cerebral artery and is then removed together with the blood clot, so that blood flow in the brain can be restored.

Angiography before and after thrombectomy



The rate of complications for a thrombectomy compared to the rate of complications for alternative procedures is relatively small and in view of its large benefits negligible, Endres and Eckert said. One possible complication is that a blood clot floats upwards. New procedures that produce a vacuum in the carotid artery when the catheter is removed could lower the risk to below 5% of cases, Eckert said.

A further risk lies in the fact that blood vessels may be damaged or burst while the catheter is being guided, resulting in bleeding. However, said the neurologist, 'studies show that this risk, at 3%, is comparatively low in experienced hands.'

Thrombectomy as acute therapy is suitable for only 5-10% of all patients who have suffered an ischaemic stroke, said Endres. In Germany this corresponds to at least 11,000 patients a year. Ischaemic stroke caused by a blood clot must be confirmed in the proximal cerebral arteries and the patient must be treated no later than six hours after symptoms first appear. The extent of irreversible damage suffered must be low and there must be saveable ischaemic tissue for thrombectomy to be effective.

Germany is not alone in preparations to continue to offer high quality thrombectomy to all patients who would benefit from it is, based on the scientific evidence of the effectiveness of the procedure. The European Stroke Organisation, European Society of Minimally Invasive Neurological Therapy and European Society of Neuroradiology are already working on respective updates of their guidelines. Up till then, the Consensus statement on mechanical thrombectomy in acute ischaemic stroke, jointly published in February this year, will continue to be the binding recommendation for the use of this procedure.

A new super-smart medical mobile

A new portable mobile-style device, supports even earlier therapy adjustments in cardiac patients with pacemakers, implantable cardioverter defibrillators (ICDs), cardiac resynchronisation therapy device (CRT) and biomonitors.

Home Monitoring technology from the firm Biotronik, in itself has advanced the care of patients at home. Now the firm has gained CE approval for its new CardioMessenger Smart, which looks and feels similar to a smartphone. Smart indeed, because this device offers fully-automatic transmission of vital signs, keeps pacemaker and implantable cardioverter-defibrillator (ICD) wearers connected to their physician from almost anywhere in the world, and also relays technical data about the patient's device.

Dr Volker Leonhardt, Director of Telemedicine at Pacemaker and ICD Centre (HIZ), Berlin, was one of the first physicians to experience working with the product. 'I can keep track of each patient without subjecting him to needlessly intrusive in-person follow-ups and react quickly when necessary,' he said. 'This has clear clinical advantages for the patient, especially for heart failure patients who, according to the IN-TIME study, benefit from a mortality reduction of more than 50 percent.'

CardioMessenger Smart uses an intrinsic, coded data transmission system to send secure, safe information from the device to Biotronik's Home Monitoring Service Centre over the Global System for Mobile Communication (GSM) cellular network. 'Consistent and reliable data transmission occurs both daily and when triggered by an event. A call back message for patients lets physicians get in contact with their patients whenever necessary,' the firm reports.

Wolf Ruhnke, Vice President of Biotronik: 'Recent years have seen a shift towards early detection and prevention. By helping healthcare providers better manage their patients, Home Monitoring improves the efficacy and safety of cardiac rhythm therapy.'

Dr Volker Leonhardt is Director of Telemedicine at the Pacemaker and ICD Centre (HIZ) in Berlin

Implant patients, he added, can go about their lives 'with the peace of mind that comes from knowing they are taken care of, anywhere, anytime'.

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