

# 13 NOVEMBER 2014



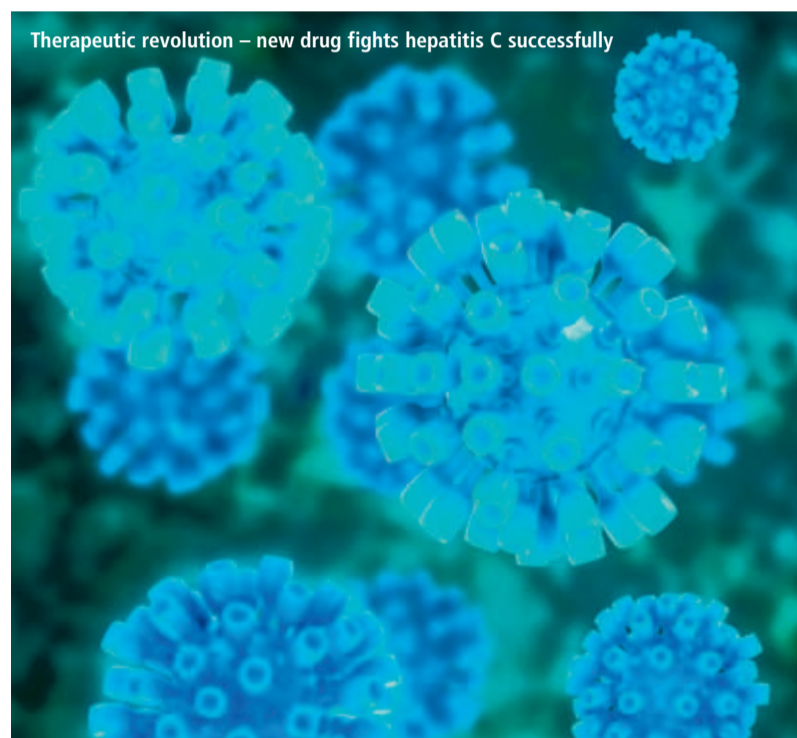
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SPECIAL ISSUE: MEDICAL, TECHNICAL, PHARMACEUTICAL, INDUSTRIAL NEWS

DUSSELDORF • THURSDAY • 13 NOVEMBER 2014

# Breakthrough in hepatitis C research

Earlier this year a drug was launched that can cure hepatitis C without severe side effects in most patients. Whilst the treatment is fast, it is very expensive but does avoid liver cancer and thus makes liver transplants superfluous. This is only one of the many promising developments in hepatitis research that Dr Markus Cornberg of the Medical University Hanover will address at the Medica Education Conference.



Therapeutic revolution – new drug fights hepatitis C successfully

'Hepatitis C is a chronic infectious disease caused by a virus which was identified in 1989,' says Markus Cornberg, adding: 'Until recently the treatment consisted of a combination of interferon and ribavirin, two unspecific drugs of which we even to date don't know why they work.' However, only about 30 percent of the infected patients received the medication, the expert points out, since 'in patients hepatitis with advanced liver disease or other severe sequelae we could not use it due to the adverse effects. However, now we have antiviral substances such as protease inhibitors, polymerase inhibitors and NS5A inhibitors which for the first time provide a targeted and effective hepatitis C treatment.'

### Expensive therapy

The new drug can cure hepatitis C in more than 90 percent of patients with a course of treatment taking at most six months. 'The major advantage of these drugs is the fact that they have few side effects,' Cornberg explains. The drawback: They come with a price tag of up to 100,000 euros per course. 'The drug development costs have to be recovered but the price will drop,' Cornberg says but underlines that life-long therapies for other diseases are equally expensive.

In January 2014 sofosbuvir was introduced, simprevir followed suit in May and in August the third new drug, daclatasvir, was approved. In November, Gilead is expected to present an oral hepatitis medication that combines two of the agents and, for January 2015, AbbVie announced a triple combination.

In his presentation Dr Cornberg will also cover other forms of hepatitis, such as A and E. Both are prevalent in tropical countries, nevertheless Dr Cornberg explains that hepatitis E pathogens can occur in Europe '...for example in food such as uncooked meat, ground pork sausage or wild boar meat.'

### Compromised immune systems are at risk

Approximately twenty percent of the German population are estimated to have been exposed to the hepatitis E virus, Cornberg says, but mostly with genotype 3, a rather benign variant, while in the tropical countries genotype 1 is common: 'In very rare cases we have patients with jaundice, albeit today we know that transplant patients or immunocompromised patients are particularly at risk.' They can develop chronic hepatitis, where the virus remains in the body and causes inflammations. 'Ever since we've understood this we detect the hepatitis E virus much more often.

Before, we simply didn't look for it,' Cornberg explains.

In Germany, estimates mention up to one million carriers of hepatitis B and C with the major transmission vector for hepatitis B being sexual intercourse. Also in that count, pregnant women are routinely tested for the virus to prevent a transmission from mother to the child. Most

But, Cornberg warns, the physicians should exercise prudence since these drugs weaken the antibodies, which in turn can activate the hepatitis B virus. The disease can be extremely severe, even fatal, Cornberg says and emphasises that physicians must be aware of this. Even in healthy patients who carry hepatitis B markers, rituximab can reactivate

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hepatitis B carriers do not show symptoms, 'the virus sleeps in the body and can break out at any time,' according to Dr Cornberg.

### Heads up, physicians!

Immunosuppressant drugs such as rituximab are used to treat rheumatism, lymphoma or multiple sclerosis.

these markers. Then, a conventional hepatitis B treatment must be initiated. 'Unfortunately it does happen that patients are not properly tested before receiving medication,' he says, 'and then the liver function tests skyrocket and before it occurs to you that your patient might have hepatitis B, he's almost dead.'

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**Dr Markus Cornberg** is managing senior physician at the Center of Internal medicine as well as senior physician at the Clinic of Gastroenterology, Hepatology and Endocrinology at the Medical University Hanover. His clinical work focuses on the treatment of patients with liver disease. He was lead physician in several clinical studies, which looked at new drugs for hepatic viral infections. In 2007 and 2010 he served on the organisational committee, which drafted the S3 guidelines for hepatitis B management. His basic research focuses on the role of cellular immune responses with regard to the course of disease and the treatments response of patients with viral hepatitis.

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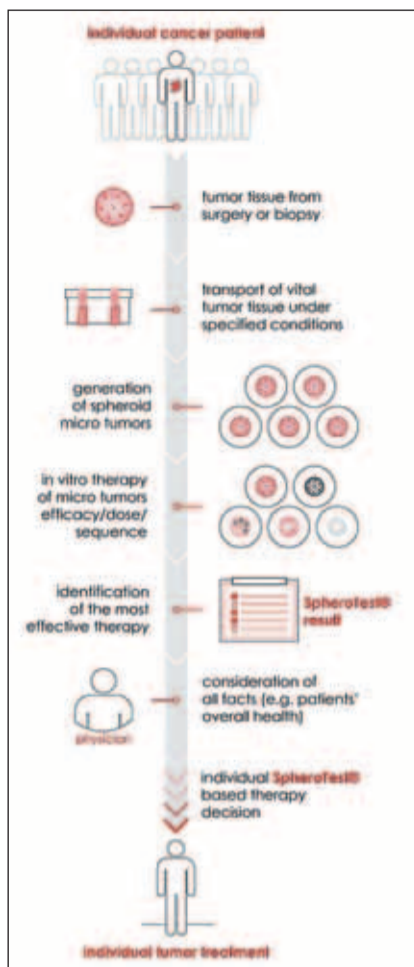
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# Individualised cancer medication

Among updates on breast cancer diagnostics and treatments aired at the 33rd German Society for Senology meeting last year was SpheroTest, an evidence-based tool that helps select the most effective drug for each individual cancer patient, Anja Behringer reports

**Like any other cancer** – breast cancer is a highly individual disease, shaped by many factors such as age, health status or genetics. Due to the complex web of molecular pathological processes and resistance mechanisms it is very difficult to select the most effective therapy for each patient. Even official recommendations have to be taken with a pinch of salt, since they are usually based on large cohorts.

The evidence-based tool SpheroTest helps in the selection of the most effective drug for each individual cancer patient. Its manufacturer is Spherotec, a spin-off from the Grosshadern Surgery Clinic, near Munich, and a brainchild of PD Dr Barbara Mayer, a biologist, and PD Dr Ilona Funke, a surgeon.

In a late 1990s research project these two researchers wanted to learn why cancer therapies outcomes are so poor despite the availability of so many therapy options. They



PD Dr Barbara Mayer, founder of Spherotec

developed and patented a procedure that grows 3D micro-tumours from patient tissue samples – within 48 hours. Since the in-vitro tumours are almost identical to the original tumour they can be used to reliably identify the most effective cancer medication.

Providing information on the chemo-sensitivity and resistance of the individual patient's immune sys-

tem SpheroTest makes trial and error approaches obsolete. German private health insurers already reimburse the costs of these diagnostic procedures.

Any individualised cancer therapy requires the tumour to be assessed correctly. Last year, the WHO published a new classification of breast carcinoma indicating 37 invasive types that can be identified using predictive markers and that are treated either surgically or medically.

## High-value advances include elastography

Thanks to new generation systems and radio frequency sonography today breast ultrasound is more than a mere complement in breast cancer diagnostics. Modern transducers can differentiate structures. High frequency transducers (10 to 18 MHz) can visualise microcalcifications. Colour and Doppler ultrasound, 3D ultrasound and elastography enhance the results of con-

ventional breast ultrasound. EFSUMB (European Federation of Societies for Ultrasound in Medicine and Biology) developed guidelines for sonoelastography that recommend using the technology as an additional tool to assess and possibly re-grade benign-appearing lesions that are stiff and consider them for biopsy. Moreover conventional ultrasound that did not yield clear results regarding benignity or malignancy of lesions can be supported by sonoelastography.

In 2012, DEGUM, the German Society for Ultrasound in Medicine, surveyed the more than 600 members of the breast ultrasound working group about elastography. Results showed 20 percent of the specialists already use sonoelastography, mainly as a complementary diagnostic tool in BI-RADS-US 3 and 4 results and for research. 85 percent of those who do not use the technology yet, are interested in elastography as an additional diagnostic instrument, particularly for earlier, more precise cancer detection.

# Putting early detection to the test

## Procedures for early cancer diagnosis must be scrutinised

The number of cancer patients in Germany continues to rise steadily. An increase in the number of newly diagnosed cases of 14% is expected by 2020 compared to 2008. Therefore early detection is increasingly the focus of attention. A continuous increase in expenditure has also been documented, with more than €1.6 billion being spent on the early diagnosis of diseases in 2011.

Does quantity equal quality? Earlier this year the German Society for Haematology and Medical Oncology e.V. (DGHO) called for a critical and differentiated review of

the procedures for the early detection of cancer in Germany.

### Early detection screening

'Cancer research is very innovative and therefore all concepts currently used in oncology need to be reviewed regularly and frequently, because new procedures become available and also because patients' prognoses change,' explains Professor Bernhard Wörmann MD, Medical Director of the DGHO in Berlin. It is not only important to adapt early detection to respective, up-to-date standards of knowledge, but also to assess

all procedures with the potential to improve early detection in a timely manner. This is the only way to ensure that early detection does not stagnate by using procedures that do more damage than good - only because the latest methods are not yet being used.

### Identifying colon and cervical cancers

Procedures to detect colon and cervical cancers have improved over those currently being offered to patients in screening. In the case of early colon cancer detection, the immunological

procedure, for instance, has a much higher sensitivity than the current chemical test. Both are based on the principle of blood detection in the stool, but the immunological test has the advantage that it needs to be carried out only once, and it shows only the presence of human haemoglobin molecules.

'With the chemical test it was necessary to examine three different stool samples to achieve sensitivity,' says Prof. Wörmann. 'The big problem is that it also reacts positively to herbal and animal matter in food. In the early days, patients even received dietary advice, but the rate of false positives and therefore the number



Bernhard Wörmann has been Medical Director of the German Society for Haematology and Medical Oncology e.V. since 2010. Following his studies in medicine, psychology and theology at the universities of Muenster and Montpellier, and qualification as a specialist, he spent two years at the University of Minnesota. He has worked in the Haematology and Oncology Departments, Out-patient Medical Centre at the Charité Hospital Berlin, since 2011

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of unnecessary colonoscopies subsequently recommended was high. The new test reduces this over diagnosis significantly.'

Unlike other countries, where this test is already standard, in Germany it is still being debated on many levels. The new, 2013 law on prevention, which stipulates conformance of the German guidelines with the European ones, makes him feel optimistic.

However, it is the health insurers, as cost bearers, who have the final say about the use of new procedures once these have been assessed in the Federal Joint Committee.

In the case of cervical cancer, comparative studies have shown that the detection of viruses in the endometrium is a test with more precise results than a microscopic smear. If a woman does not have these viruses, which are transmitted through sexual intercourse, her risk of developing this type of cancer is very low. 'Early detection screening can then be carried out at longer intervals, with the test being more precise and patients at lower risk being more easily identified,' the oncologist explains.

Continued on page 4

# Confident and quick diagnoses

## The Samsung DR GF50 optimises workflows and offers superior image quality

In many practices and hospitals the X-ray systems need to be modernised. Increasingly, physicians opt for digital radiography (DR) systems, as did Dr Joachim Münch and Dr Dennis Völker who run an orthopaedic and surgical practice in Winsen an der Luhe, Germany. Early in 2014 they installed the Samsung DR GF50 radiography system to replace their analogous and CR system. More accurate, more flexible, more efficient – three convincing arguments for the GF50 as both physicians agree.

'In our practice we need patients to move into the system and out of it quickly and without a big fuss,' explains Dr Münch and adds that 'the GF50 has significantly increased the process speed compared to our old systems. We reduced time and costs by almost 40 percent.'

More than 200 patients present every day in the two doctors' office which is located in the community health centre in Winsen, and 60 of those have to be X-rayed. Thus, efficiency is crucial, as Dr Völker reports: 'We were able to optimise our workflows. With the old systems, generating an X-ray image took much longer and now the team has much more time to deal with the patients rather than with the technology.'

### Shorter waiting times and lower radiation dose

The patients appreciate the new X-ray technology. 'We see patients by appointment only and we have pretty long waiting lists. Therefore we want to make the patients' stay in our practice as agreeable as possible. That includes short waiting times in the X-ray area,' says Dr Völker.

The reactions to the GF50 were very positive, the physician underlines: 'Particularly younger patients comment on the design of the system and on the quick procedures. They are interested and want to know more about the advantages of digital radiography.'

A major advantage no doubt is the low dose. 'One particularly crucial competence of a physician is to alleviate a patient's fear. For example, parents often ask whether it is really necessary to X-ray their child. They are especially concerned about radiation exposure.'

'With the GF50 we can demonstrate that we use state-of-the-art

Dr Joachim Münch specialised in surgery



The Samsung DR GF50 radiography system has been in use in the orthopaedic and surgical practice of Dr Joachim Münch and Dr Dennis Völker, based in Winsen an der Luhe, Germany.

technology and that we apply low dose,' Dr Münch explains.

On the previous system the dose area product was displayed on a separate add-on device and the data were not automatically transferred to the PACS (Picture Archiving and Communication System). Whether an image was overexposed or underexposed was something the physician could only see after the image had been acquired. Modern systems, such as the GF50, are fully integrated which means that all dose-relevant data are automatically stored. Dr Münch adds: 'The Samsung system immediately displays the values. Thus we can immediately react if the imaging parameters are not ideal. Consequently, the number of re-takes has decreased dramatically – almost to zero, I would say.'

### Early disease detection

More importantly – the fully digital radiography system enables much more precise diagnoses. Both physicians emphasize the superior image quality. Moreover the new system has many more post-processing functions than the previous model, a crucial precondition for diagnostic precision and confidence.

'Both my colleague and myself, we see many rather young patients who are athletes and complain about knee problems,' says Dr Völker. 'One example is osteochondritis dissecans, a disorder of the cartilage and bone

area on the inside of the knee caused by blood deprivation.'

'With our previous conventional X-ray systems we had very limited capabilities to detect early stages of the disorder. With the new and fully digital technology we can zoom in on the region, select specific areas and work with exposure, resolution and depth.'

Degenerative disorders can also be visualised early on thanks to the image quality and the post-processing capabilities of the XGEO GF50 – and early detection means early therapy. When structural changes or damages to the bone are detected early, sequelae and surgical interventions can be delayed or even entirely avoided.

'In a very busy orthopaedic practice diagnostic accuracy and fast decisions are crucial, and this is exactly where the Samsung system is particularly helpful,' says Dr Völker,

summing up his experience with this particular equipment.

### Support in the planning phase

It is not only the system performance that convinced Dr Münch and Dr Völker: they are both very impressed with the support Samsung offered in the planning phase. Dr Münch: 'We had developed requirement specifications and looked at several devices by different manufacturers. What really won us over was not only the excellent price/performance ratio of the GF50, but also the fact that the Samsung team was prepared to accommodate our needs regarding the installation and time frame.'

In view of the patient flow at their practice, for Drs Münch and Völker it was of utmost importance that the installation and time frame of the premises be kept at an absolute minimum. Be it flexible scheduling,

Orthopaedic specialist Dennis Völker, explaining damage to a patient

smooth deinstallation of the old systems and installation of the new and even inspection by the German authorities – Samsung met all the requirements of the physicians. It took a mere three days for the XGEO GF50 to be fully operational with the practice running as usual. Due to the intuitive operating concept of the new system, the staff was able to familiarise themselves quickly with the XGEO GF50.

'To my big surprise – after all I have been in this business for a long time – the system ran from day one without a hitch,' Dr Münch happily reports. 'Obviously many details will only show up when we work with the system on a daily basis. Thus, a few presets had to be changed for our specific purposes, but Samsung always responded really quickly and sent over technical staff to implement our requested changes and to fine-tune the XGEO GF50.'

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## Putting early detection to the test

continued from page 2

## Narrowing risk groups

For cervical cancer, the new screening procedure recommended in the European, but not the German guidelines, facilitates the narrowing down of a risk group. With most early cancer screening procedures the patient's risk is defined based on age, such as in breast and colon cancers. However, there are now attempts to define other risk factors, specialists are calling for an inclusion of these known factors into screening programmes. 'In the future, early detection should be much more risk-adapted, as we are becoming increasingly aware about which people are at particular risk of developing, in particular, breast or colon cancer based on their genetic disposition. Therefore it makes sense to offer women at significant risk of developing breast cancer an extended screening programme,' Prof. Wörmann believes.

However, each new procedure needs to be carefully calculated and a risk-benefit analysis carried out. Ultimately, society should decide what value it places on early detection, and at which stage it agrees to pay for it. This decision, based on the same available data, can be different from society to society, such as seen, for instance, in breast cancer

screening: in the USA this is carried out for women from 45 years of age. The most important point, according to Prof. Wörmann, is that 'the programmes must not be set in stone, even if they have been carried out for a long time, but must be continuously evaluated.'

## A lack of quality-assured procedures

The DGHO regrets that, out of all the statutory early screening procedures, only mammography and colonoscopy are quality-assured. 'We believe it is wrong to spend so much money on early detection procedures that are not quality assured. The rate of false positives and negatives and the quality of the institutions carrying out the tests must be transparent,' he emphasises, seeing an urgent need for action.

In his view the National Lung Screening Trial (NLST) to detect lung cancer in the USA is '...moving in exactly the direction that we recommend – a new procedure with CT, low radiation dose and high quality assurance. I think, therefore, that it's essential for us to have a closer look at these figures and to calculate whether CT lung screening would also be worthwhile for Germany.'

## Phase-contrast X-ray

## Creating the Holy Grail of medical imaging

Report: Sascha Keutel

Among new medical imaging innovations exhibited at Medica 2014 is a phase-contrast X-ray technique to bring greater precision to breast cancer assessment and improve biopsy diagnostics.

We asked research pioneer Professor Marco Stampanoni, a key figure in the development of this technique, to explain how it works.

'Phase-contrast X-ray imaging can be considered one of the holy grails of medical imaging,' he pointed out. 'Since the first discovery of X-rays in 1896 by Röntgen, scientists have worked very hard to address a fundamental issue: how to increase contrast in soft-tissue while keeping the dose deposition under control? Namely, in conventional X-ray imaging (radiography or CT) as it is performed daily in hospitals, the contrast is essentially determined by the absorption of X-rays in the body – which, as the name suggests, is directly related to the dose deposition.'

'On the other hand, to generate contrast, phase-contrast imaging, exploits refraction and scattering signals from the body. It can be shown that while the absorption signal might be small for a soft-tissue specimen such as the breast, the phase contrast signal can be much larger. Being able to detect such a signal and convert it into an interpretable image might provide a formidable new radiological tool: high soft-tissue sensitivity (so far a prerogative of MRI) at excellent spatial resolutions within a short time, which are typical features of CT scanners.'

## Back to the beginning

'The development of phase sensitive X-ray techniques goes back to the mid-sixties, first with interferometric experiment using crystals. Further, with the advent of synchrotron facilities, X-ray imaging experienced a first revolution, as coherent X-rays were finally in reach. Coherence is the intrinsic property one needs in order to observe interference phenomena which, in the end, allows access to the phase information.'

In the last decade we saw the development of many approaches: propagation-based imaging, diffraction enhanced imaging, coherent diffraction imaging, gratings interferometry and ptychography, to cite a few. 'These methods perform phase-contrast imaging at different length



A physics graduate (1998) from ETH Zurich, in 2002 Marco Stampanoni also graduated in synchrotron-based tomographic microscopy. In 2013 he became an associate professor there, focusing on X-ray imaging in the IT and electrical engineering department. Today he is a professor for the Institute of Biomedical Engineering at the University and at ETH Zurich, where he leads the X-ray Imaging and Microscopy Division. At the Paul Scherrer Institute he also heads the Swiss Light Source (SLS) X-ray Tomography group consisting of 19 people – two staff scientists, seven post-docs, eight PhD students, a computer engineer and technician. Dr Stampanoni's research encompasses phase contrast X-ray imaging and microscopy, real-time tomographic micro-imaging, nanotomography and novel radiological methods for clinical applications and more general non-destructive testing. In 2012 he received an ERC Grant for his phase-contrast X-ray imaging project and he won the Dalle Molle Foundation Award for his pioneering work on X-ray phase-contrast mammography.

scales, from a single cell up to whole organ imaging.'

## Further objectives for phase-contrast X-ray

'Out of the many techniques developed so far, gratings interferometry seems to be the most promising, with respect to potential clinical applications. This approach, pioneered at the Paul Scherrer Institute in Switzerland, has been proven to work very efficiently on conventional X-ray sources, i.e. without the need of a large-scale facility like a synchrotron.'

'This raised the interest of the medical community, which, as mentioned, is eager to improve soft-tissue differentiation at high-resolution keeping dose under control. 'Our research aims to develop the technology (hardware/software) to

finally bring phase-contrast imaging into hospitals, to improve diagnostic capabilities to benefit the entire population. An ideal entry point for this technology is mammography, a popular radiologic technique to investigate breast tissue. It is well known, also in relation with many active screening programs, that dose delivery is critical issue. It would be of paramount relevance if a technology were to be available that could significantly improve sensitivity to soft-tissue, sharpness as well as lesions delineation and microcalcifications visibility.

'The identification of microcalcifications is one goal of breast cancer screening and early detection of pre-malignant and malignant lesions. Breast calcifications are common on mammograms, being especially prevalent after menopause.'

'Although they are usually benign, certain morphologic (e.g. fine pleomorphic or fine linear) and distribution (e.g. clustered or segmental distribution) descriptors may indicate breast cancer.'

## Other possible applications

'Currently, it looks like mammography is very well suited for a first clinical application of phase contrast imaging. Whether this technology will make it into more complex systems, for instance a human-body CT, still needs to be verified and many teams worldwide are working toward this aim. Further, it has to be pointed out that phase contrast imaging promises to be very useful for applications outside the medical field, for example in non-destructive testing or homeland security.'

## Radiation exposure comparisons

'This is obviously a critical issue, which cannot be answered yet with a comprehensive quantitative statement, because there are no clinically compatible phase-contrast systems available that have been pushed to perform at their physical limits, as is the case, for instance, for conventional, absorption-based instruments. The theory is very promising and the hope is that one day a phase contrast mammography system, with dose constraints within the actual regulation limits and significantly improved image quality, can be deployed to the hospital.'

## Advantages and disadvantages

Continued on page 6

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# 3D printers help neuroradiologists

Developing models of individual aneurysms aids in personalised care

The treatment of cerebral aneurysms is often very complex and initially it is not always obvious which type of treatment is best suited for an individual case. In October, during the Annual Congress of the German Society for Neuroradiology e.V., a working group from Hamburg introduced a procedure that enables the production of exact copies of individual aneurysms with a 3D printer. These are then used to investigate which treatment is likely to be the most promising. Following this, complicated interventions can also be trialled on the model.

The procedure for the development of models of aneurysms with the 3D printer was developed at the Research Centre for Medical Technology, in Hamburg, led by Professor D Krause of Hamburg University of Technology, in Hamburg-Harburg, and Professor J Fiehler from the Clinic and Polyclinic for Neuroradiological Diagnostics and Intervention at the University Medical Centre, Hamburg.

'As it turned out, the procedure enables the creation of a replica of an individual cerebral aneurysm from a specific patient that is cost-effective and true to the original and contributes to individual treatment planning,' Fiehler said. 'The models can be utilised to decide which type of intervention should be considered, because they also facilitate a simulation of the aneurysm blood flow dynamics.'

'Furthermore, the precise placement of a platinum coil, for instance, can be simulated and thereby optimised – and ultimately one can run through the entire intervention to be carried out.'

The models are also suitable for testing new medical devices. In Hamburg the 3D models are already

used in treatment planning for difficult aneurysms. physician Professor Fiehler hopes that, in just a few years' time, all patients with complicated aneurysms will benefit from the innovation.

Various aneurysm models with tubing connections fabricated using Fused Deposition Modelling (FDM)



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# Small town hospital goes big on IT

Interruptions, disturbances and superfluous calls have plummeted due to a better overview of everyone's tasks, the Horens team notes

Report: Brigitte Dinkloh

Horsens Regional Hospital is a two-hour train ride from Copenhagen

in the Central Region of Denmark. Disembarking at the small town's train station nothing suggests the presence of a pioneering hospital

and flagship facility of the Danish healthcare system. Then, meeting Chief Medical Officer Jørgen Schøler Kristensen and Chief Nursing Officer Inge Pia Christensen it is immediately clear: here are hospital managers on a mission. Understandably proud of their 13-departments and 1,600 hospital employees they present their strategy for 2013 to 2016 which, briefly, is 'more, better and less expensive'.

Denmark's public hospitals are urged to increase their operating income by two percent per year and, at Horsens, they are set to meet this target. A pillar of the strategy is the partnership with referring physicians, but, above all, with their patients. Considered responsible and informed citizens, they are fully integrated in the processes as subjects, not objects. As in any modern hospital, IT networking is also a major strategic issue for the staff.

IT networking starts right with every employee. Their location on the ward is centrally displayed using ultrasound technology. Inga Christensen concedes that there were initial concerns about privacy issues and the hospital management was accused of pushing through process optimisation on the back of the employees. However, thanks to successful communication efforts today the hi-tech tracking system is accepted, also because the number of interruptions and disturbances, as well as superfluous calls, has plummeted since the team members have a better overview of one another's tasks.

The medical care data of each Danish citizen are transparent and can be accessed from anywhere across the country. Unthinkable in other countries, a situation was created in which, it seems, all actors – patients, hospitals, referring physicians and payers alike – are satisfied.

Since 1977 treatment data in Denmark have been stored digitally and, in 1994, the countrywide Health



The Horsens Regional Hospital team

Data Network was launched. In 2003 the e-health portal [www.sundhed.dk](http://www.sundhed.dk) was integrated which allows every citizen to access information on type, length and costs of his or her diagnostic and therapy procedures. The national electronic health record (EHR), introduced in 1999, was initially riddled with problems caused by different competing systems. With the Danish health reform in 2007, when 15 Danish counties were consolidated into five regions, the EHR was harmonised.

'Before, we had four counties in Central Denmark and eight EHR systems. Around 1,200 clinical software systems were in place, some of them being small clinical department solutions. From 2007 until today consolidation has been the main topic. In 2010, the Columna solution was selected as the unique EHR platform (MidtEPJ) for the entire region of Central Denmark and implemented from 2011 to 2013', explains Jens Peder Rasmussen, Export Director of the software developer Systematic. Danish hospitals are allowed to share information because the region is a legal entity.

At Horsens Regional Hospital the EHR platform is linked to a clinical information system that covers not only HIS functions but also provides

data that document the patients' care pathway, to provide the optimal treatment for the patient throughout the continuum of care.

This clinical information system in turn is integrated with a workflow solution, a 'clinical logistics' module, as Rasmussen explains, to ensure real-time awareness of the patients' actual status and make that information available across the different wards and functions in the hospital. 'The combination of vital clinical information and the workflow-oriented information provided by our clinical logistics solution tells the clinical teams where patients are at any given point in time. This improves efficiency and quality of care.'

How the integration of clinical and workflow data works in everyday life can, for example, be witnessed in the emergency department (ED). Each patient registers easily in the lobby with a credit card-sized e-health card signalling his/her arrival and treatment onset to the relevant department and the national network. The data are displayed at the emergency team's workstations.

'Medical history data and, since very recently, even data transmitted from the ambulance, are immediately accessible and the status of each patient can be tracked at any point during treatment. Medical images and lab results are also entered in the system and all major parameters are there at a mouse click, so the physician in charge can initiate necessary steps without delay', explains Ove Gaardboe, senior physician in the emergency department. Transparency and openness offer tangible benefits: on average patients admitted to the ED are discharged within 48 hours.

In the operating theatres (OTs) planning with note pads and memo boards lies in the past. Large screens provide OT manager Marie-Louise Ulsøe and team with a precise overview of activities in the different theatres. A live camera even offers images from the theatres.

In the clinical logistics system, jointly developed with the hospital, sources of errors were reduced and the OT utilisation optimised. From 2010 to 2012 Horsens Hospital was one of five others in Denmark to participate in the Safer Hospital Programme, which managed to reduce 30-days mortality by 15 percent and the number of unintended incidents by 30 percent, Jørgen Schøler Kristensen, Chief Medical Officer and CEO of the hospital, reports. The most important factor, he emphasises, was the change in culture. 'We could overcome rivalries and to start looking at the patients as fellow citizens.'

**Details:**  
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### Phase-contrast X-ray

continued from page 4

#### Advantages over others

The most fascinating aspect of phase contrast imaging is that it should be possible to achieve a significantly improved soft-tissue differentiation compared to conventional X-ray based systems. Being an X-ray technique, it is also supposed to be significantly cheaper and eventually provide a better spatial resolution than conventional MRI.

'However, phase contrast is based on ionising radiation, and therefore the minimisation of the dose delivered to a patient as well as the delicate balance between such dose and the desired and/or required diagnostic information have always to be taken into account.'

#### Research results

'With clinical partners we have contributed to the early period of phase contrast imaging in a clinical environment. For the first time, we presented images of the human breast investigated by this novel technology (outside a synchrotron) and we statistically evaluated the potential impact of such a technology in a diagnostic context. From our studies it appeared clear that sharpness, contrast, lesion delineation and microcalcifications detection are improved. 'We recently

indicated that it might even be possible to discriminate between two types of microcalcifications. If statistically confirmed, this could eventually provide an additional descriptor for a scoring system to improve risk stratification.'

#### Entering clinical routine

'Introducing a new technology into clinical routine is notably a long and complicated task. We are confident that our approach will convince the medical community that phase contrast can effectively improve their diagnostic capabilities. If this can be shown on a sufficient large scale and for a wide range of applications, then it should be possible to design, build and certify an instrument, which will make it.

'As technology developers we must show that this technique can be brought so far that it can be efficiently transferred to a hospital.

'Then, the radiologists need to assess the capability of this technique and confirm that it indeed provides a significant benefit to their diagnostic process.

'These are the two fundamental pre-requisites for a successful story.'

# Patients pay the price of over-crowding

Denmark's hospital care carries a higher mortality rate

Report: Cynthia E Keen

The medical departments of Danish hospitals routinely function at 100 percent in-patient bed capacity. Is this situation a factor of productivity and efficiency or a situation to be concerned about? Is there any clinical impact on patients admitted to such a crowded hospital?

There is a clinical impact and it is startling. Patients admitted to Danish hospitals with an 85-110% bed occupancy have an up-to-9% greater risk of dying when an in-patient, or within 30 days of discharge. Specifically, in high bed occupancy hospitals, a 1.2% increase in relative mortality risk per 10% increase in bed occupancy rate has been identified.

A statistical analysis published in Health Affairs (Vol. 33:4, July 2014) reached those conclusions after powerful computers analysed billions of data points about 2,651 million admissions of 1.24 million patients to 322 medical departments at 72 Danish hospitals in an 18-year period.

Dr Flemming Madsen, director of the Allergy and Lung Clinic in Elsinore, working with a statistician and an epidemiologist at two Danish university hospitals, could validate the concerns he had been publicly stating for years about patient safety. When working as the director of the Department of Internal Medicine at Frederiksberg Hospital in Copenhagen from 1998 to 2003, Dr Madsen said he repeatedly advised hospital administrators that physicians and nurses were overworked, that the resources of some departments were strained beyond capacity, potentially compromising the quality of treatment, and that a percentage of patients were being discharged sooner than they should have been, to create bed space for other critically ill patients awaiting vacant beds.

However, no actions were taken to investigate his concerns or make changes, he told European Hospital.

The study represents a decade of data collection and subsequent analysis of administrative data covering all hospital admissions for the years 1995 through 2012, with the exception of surgical, paediatric and psychiatric patients. Its objective was to identify risk-adjusted in-hospital mortality and risk-adjusted 30-day mortality.

Data was collected from the Danish National Health Database and from individual hospitals. Patients who died within 24 hours and children under 16 years were excluded from the study.

In addition to the level of bed occupancy, as might be expected the research team identified increasing age and disease severity as being significantly associated with increasing in-hospital and 30 day mortality rates. Patients admitted during vacation periods (January, February, March, and July) faced increased mortality risk. Being admitted after normal working hours (weekdays between 0700 and 1600) and holidays increased mortality risk 10 times more, confirming findings of previously published peer-review journal studies.

The researchers pointed out that after hours and on weekends, nursing staff levels tend to be less, diagnostic testing may not be available, and

fewer physician specialists are accessible. Patients might need to wait to see physicians or to have diagnostic and therapeutic procedures, potentially affecting diagnosis and treatment. All these factors could be contributing to less effective treatment and patient safety. Noting that

bed occupancy rates have been constant for decades, and that there was a 30% reduction in the number of hospital beds during the study,

Dr Madsen believes that the major reason for chronic bed shortages in Danish hospitals is probably the result of careful governmental planning. He is hopeful that government health department officials, politicians,

healthcare professionals, and Danish citizens will recognise, as a result of the study, that bed shortages are a potential health risk. 'When serious adverse events occur, hospitals conduct root cause analyses. This is needed to identify the specific causes of higher mortality rates and to make changes. High bed occupancy by itself is not a bad thing. 'What needs to be carefully analysed is specifically how high bed occupancy is negatively affecting patient treatment,' he said. 'Changes need to be made.' The study should also be a wake-up call for other country's health systems that might aspire to 100% bed occupancy rates for their hospitals. Dr Madsen's conclusion: 'Computational



Dr Flemming Madsen, director of the Allergy and Lung Clinic in Elsinore

analysis that was not available to medical researchers even five years ago has shown that there is a high price to pay for some patients.'



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# New diagnostic display will redefine readings

Fewer radiologists – more and more and more images

Report: John Brosky

Reading radiology exams has become a real pain.

According to Piet Candeel, General Manager for Healthcare at visualisation expert Barco, 'Today there are more studies of more patients with more images and typically with fewer people.'

The demand for diagnostic imaging services is increasing; radiologists

are tasked with a growing workload and picture archive and communications system (PACS) administrators are struggling with workflow issues, he explained.

The sheer volume and growing complexity of image studies has become so severe that, in a recent survey, these two issues were ranked as the top challenges facing radiologists across Europe and North America, surpassing in importance

the changes to reimbursement, which was ranked third.

More than a professional concern, an overwhelming majority of radiologist say they have been personally affected by the crushing demands of work.

The survey of 223 radiologists, by independent healthcare research agency The MarkeTech Group, found 85% of them use three different displays to keep up with the diverse range of studies, causing increased head and neck movements. As a result, no fewer than 87% of radiologists responding to the survey said they experience physical discomforts when reading images, including eye fatigue, neck strain, and back pain.

At the heart of the survey was a central question posed by Barco: 'What makes a good read?'

Exploring this seemingly simple point allowed the company to tease out the wants and needs of radiologists with an eye to finding a solution to go forward. The first flush of responses showed that the majority of respondents felt that higher image quality, a more efficient workflow, or increased comfort would significantly increase their reading performance.

More specific points emerged. To work more efficiently, 92% of surveyed radiologists suggested faster image loading and manipulation would help. A larger screen surface was favoured by 78 percent and two thirds said the ability to load both colour and greyscale images on one screen would make a significant change in their work.

Barco dug deeper, turning up suggestions for an easy-to-adjust stand from 83% of respondents, an increase to the ambient room lighting among 81%, which was closely followed by reduced screen glare with 71% and an idea for keyboard task lighting that won agreement among 69%.

Far and away the top provider of radiology reading systems with a market share of 70% that translates into 800,000 displays running in hospitals today, Barco is uniquely in a position to address these challenges, said Lynda Domogalla, vice president of product marketing for the company's healthcare division

The response is Coronis Uniti,



a diagnostic display system that is poised to revolutionise work and workflow for radiologists, she said. 'This will change the way radiologists work in the reading room. It's about bringing it all together, eliminating any need for a radiologist to move to another screen.

'Coronis Uniti is a single display for any type of image, whether 2-D or 3-D, colour or greyscale, static as well as dynamic images. It will display not only every type of image being seen today, but is designed to manage and display the next wave of images that's coming, especially with colour.'

Barco engineers simplified and standardised the image reading technology platform making it easier to manage and control an entire display network, she explained. The 12 million pixel display optimises the reading experience by mirroring a human's natural field of vision, according to Barco's Senior Product Manager, Albert Xthona.

## Barco is at Medica Hall 15 / Stand B21

Tightly designed, pixel level technology within the screen itself minimises the need for head and eye movements.

Thanks to an innovative multi-touch pad, radiologists have an intuitive, rapid control for managing images and views are at their fingertips.

Optical Glass technology is incorporated into the display to reduce reflections and enhance image sharpness for greater viewing comfort.

Using SoftGlow, radiologists can control the ambient light in room, while the built-in Ambient Light Compensation ensures that Coronis Uniti image quality remains flawless, in any lighting environment.

The brilliance and beauty of the new Coronis Uniti display screen masks the complexity built into a workstation, which is a workhorse

for shared services in radiology reading. The massive 33-inch screen also serves as a virtual light box where radiologists can clip a patient's archived film images alongside freshly acquired digital images.

'What's really new here is an industry first in SteadyColour, a calibration technology that meets DICOM standard for greyscales while also guaranteeing consistent, perceptually linear colour,' said Xthona.

Coronis Uniti features a next generation of the widely popular Barco I-Guard technology. Adding an embedded optical precision colorimeter, positioned at the front of the screen, the new Colour I-Guard captures precisely what the radiologist is seeing, continuously monitoring fine gradations of colours spread over the display and communicating its readings to the controlling electronics, which make corrective actions to the screen in real time.

Xthona rapidly ticks off a series of novel features on board Coronis

Uniti, eight to enhance image quality, six that address productivity issues and six that

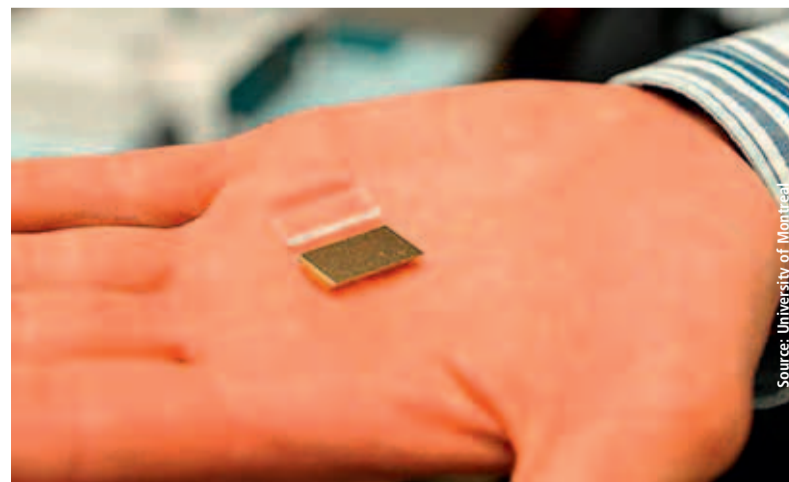
improve ergonomics. Xthona highlighted RapidFrame technology that ensures crisp and in-focus display of moving images and SpotView that focuses light for greater detail in a viewed image.

'Coronis Uniti is the leading edge of Barco innovation,' said Healthcare General Manager Candeel, who cites a long history of industry firsts. 'We have turned our experience and talents to addressing the many challenges that have emerged for healthcare organisations and we put it all together in a single system that can reduce display cost, real estate, and operational expenditure.

'We also remain the only company that offers a five-year warranty on our display equipment,' he added. 'That's how sure we are about the quality of what we deliver.'

# Tiny nanodevice monitors cancer

A tiny nanoscale device can accurately measure a patient's blood for methotrexate – a commonly used but potentially toxic cancer drug – in under 60 seconds, according to biomedical instrument designer Jean-François Masson, and Joelle Pelletier, a DHFR enzyme specialist, both at the Chemistry Department, University of Montreal. Crucially, the device's optical system can rapidly gauge the optimal dose of methotrexate a patient needs, while minimising the drug's adverse effects. Methotrexate can block the enzyme dihydrofolate reductase (DHFR), which is active in the synthesis of DNA precursors and thus promotes cancer cell proliferation – but it is highly toxic, so closely monitoring the drug's concentration in a patient's serum is vital. Currently, a device using fluorescent



bioassays to measure light polarisation produced by a drug sample is used – but this is a cumbersome, expensive platform that only experienced personnel can manipulate.

Six years ago, Pelletier and Masson investigated how to simplify the procedure. In the course of their research they developed and manufactured the miniaturised device

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# Switzerland is not really one country

If implementing an eHealth strategy, Switzerland faces more complexity than any of its neighbouring countries. Its federative structure, reflected in numerous health systems, health legislations and political organisations, calls for a high level of cooperation among involved stakeholders, explains Adrian Schmid, head of eHealth Suisse.



Adrian Schmid, head of eHealth Suisse

Interview: Cornelia Wels-Maug

'Talking about Switzerland,' says Adrian Schmid of eHealth Suisse, 'brings us the first challenge. We are not really one country, but a federation of 26 regions or cantons. Nevertheless, we have decided to tackle specific tasks together – but healthcare is not one of them! That means we have 26 health systems, 26 different health laws and 26 health ministers.'

'However, issues such as health insurance, health protection and also e-health can be dealt with at the federal level. This complexity is not only a challenge, but also an opportunity, because we're not tempted to create a big bang solution. Although we have a nationwide e-health strategy, we count on its regional roll out.'

'Passed by the federal government in 2007, the strategy is a national framework for all activities in the e-health domain. The 26 cantons joined the initiative. Due to our federal structure, the strategy's implementation is a balancing act between autonomy and commitment.'

'On the federal level, issues such as the provision of central online-services, opting in of patients and out-patient caregivers, as well as data protection and digital identity, are handled. Based on regional needs, each canton decides how to implement the federal e-health strategy.'

'Smaller cantons will probably join projects of larger ones to accelerate implementation.'

**What is the eHealth Suisse role?**

'In answer to our federal structure, the Swiss Confederation and cantons set up eHealth Suisse as a coordinating body to drive the nationwide execution of our eHealth strategy. eHealth Suisse is jointly financed by the federal state and the cantons. It brings healthcare stakeholders from four working groups together – devoted to standards and architecture, pilots and implementation, semantic, education – to agree on recommendations regarding interoperability.'

'These recommendations are not legally binding, but are used as a blueprint for formulating further e-health regulations and projects at both federal and regional level.'

**What is the state of Swiss electronic health records (EHR)?**

'The electronic patient dossier, or EHR,

forms a central element of the Swiss e-health strategy. It will eventually replace the present dominance of fax machines as the main medium for exchanging medical documents. The law regulating EHRs just passed the first of parliament's two chambers and is expected to come into effect in 2017.'

**What type of medical information**

**will be exchanged first?**

'Several cantons surveyed which type of data exchange doctors would prefer to set up first. Discharge letters and medication topped the list, along with diagnosis, allergies and test results – all in electronic form.'

'To enable data exchange, common formats need to be established. In the case of electronic immunisa-

tion records, reportable test results and test results needed for transplantations, these formats already exist, whereas those for electronic discharge letters, e-medication or e-radiology are presently being developed.'

**What is the overall acceptance of the electronic health record in Switzerland?**

'Two consecutive surveys of the Swiss population, in January 2014 and 2013, confirmed the acceptance of EHRs, although at a decreasing rate. In 2014, 55% of the Swiss population were either "in favour" or "rather in favour" of EHRs, as opposed to 60% a year

earlier. The slight drop mirrors the rising awareness that issues such as data protection and privacy cannot be tackled on the fly, but need firm commitment. 'Overall, we are on the right track, but it will take some time.'

# Singapore innovators seek partners at MEDICA

Innovation has been one of the pillars of Singapore's economic success. It has played a role across sectors and this is perhaps most evident in the medtech sector in which Singapore is fast emerging as a leader in Asia. Besides its sophisticated ecosystem, the city-state's location at the heart of Asia is another aspect multinational companies benefit from, as it allows them to springboard to different regional markets.

**Asia's opportunities**

The confluence of demographic and macroeconomic trends provides conditions for Asia's medtech industry to flourish. Asia is home to more than half the world's population, and one that is rapidly ageing. By 2050, Asia's ageing population is expected to increase to 857 million from 207 million at present. This is coupled with the fact that lifestyles are also fast changing in Asia: urbanisation in developing economies has seen an increase in lifestyle-related diseases that Asia will have to contend with. The need for innovative medical solutions and treatments is urgent.

Secondly, years of steady economic growth means that Asians

are more affluent than before, leading to an increased demand for value-based healthcare. It is no surprise that Asia-Pacific is the fastest-growing market, and is projected to occupy 30% of the global medical device market by 2015.

**Singapore's complete ecosystem**

Long seen as a gateway to Asia, Singapore offers numerous opportunities for the global medtech community. With the right infrastructure, talent pool and facilities for research, innovation and commercialisation, medtech majors quickly find themselves at home in Singapore. The ecosystem currently includes 26 R&D centres established by multinational companies such as Becton Dickinson, Hill-Rom, AB Sciex, PerkinEmer and more, as well as a critical mass of start-ups, clinical institutes, public research institutes and universities.

The Medtech Hub, for instance, is a specially built facility for the medtech industry and is set to host local and international medtech companies such as manufacturers, suppliers and service providers. Similarly, Biopolis is a premier research hub and hosts key public and private biomedical research labs, institutes and organisations. Singapore has thus far invested more than 3 billion euros (\$5 billion) in building up industrial, human and intellectual capital in the medtech area to develop the sector further. It is also home to more than 6,000 researchers from around the world.



SESTO by HOPE Technik

**Activities**

Opportunities to meet Singapore companies: daily. Networking reception – Thursday, 12pm, Singapore Pavilion@MEDICA, Hall 16 – G54/F54

This kind of clustering creates opportunities for collaboration between innovative local companies and larger global players who can tap into ongoing local research. In 2013, for instance, Baxter International entered into an agreement with Singapore's AWAK Technologies for the development of innovative dialysis technology. The agreement entails Baxter bringing AWAK's technology to market through an exclusive global manufacturing and distribution license.

**Singapore's innovators**

Innovative Singapore companies are constantly on the lookout for partners for clinical trials, prototyping or product development. Many are seeking to address gaps in the medical industry and will be showcasing their innovations at the Singapore Pavilion.

Endofotonics addresses the huge unmet need for accurate, real time diagnosis of pre/early cancers to facilitate timely treatment with the world's first and only in-vivo molecular diagnosis system. The system provides almost instantaneous molecular diagnosis of tissues during routine endoscopic examination. Diagnostic accuracy of >90% has been demonstrated in gastric dysplasia, gastric cancer and esophagus cancer, and has been published in peer-reviewed journals like Gastroenterology.

Another cancer-related innovator is INEX Innovations Exchange, which has developed game-changing technology for ovarian cancer detection. Called OvaCis, the innovative Ovarian Cancer detection kit can accurately discriminate benign from malignant epithelial ovarian cysts with 98% accuracy in five minutes. INEX has already received requests from clinicians in the US and Europe who want to license the technology for use in their countries.

Similarly, Singapore-based HistoIndex, an innovator of next generation pathology systems, is

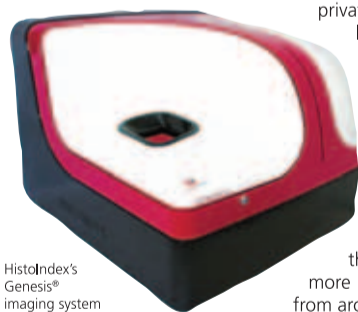
currently in the process of identifying suitable partners for market expansion of their flagship product, Genesis200. Genesis200 is a fully-automated, 3-D, quantitative, laser-based imaging system for stain-free tissue diagnostic in fibrosis and cancer. It is also looking for clinical partners to conduct trials of its upcoming Laennec imaging system for liver pathology.

The global shortage of healthcare workers is another trend medtech companies are looking to address. With a bold vision of creating a fully automated hospital, Hope Technik, another innovative Singaporean company, has developed SESTO, a highly mobile and motorised hospital bed. The new bed requires less healthcare workers for manoeuvring, freeing up manpower resources for other key tasks.

These and other Singapore companies will be present at the Singapore pavilion, located at Hall 16 – G54/F54, where you can get a glimpse into the latest innovations from the country.

**Participants @ Singapore Pavilion**

ACI Medical, AIM Biotech, AIT Biotech, Baldr Biosystems, Blue Amber Technology, Camtech Diagnostics, Endofotonics, Esco Micro, HistoIndex, HOPE Technik, INEX Innovations Exchange, Innovfusion, Marshall Cavendish Business Information, National University of Singapore, Neurostyle, Nextan, NSP Tech, Sentec, Singapore Institute of Manufacturing Technology (A\*STAR), The Biofactory, United BMCE, WEB Biotechnology



HistoIndex's Genesis® imaging system

## ... treatment

that works by surface plasmon resonance. Put simply, it measures serum methotrexate concentration through gold nanoparticles on the surface of a receptacle. In 'competing' with methotrexate to block the enzyme, the gold nanoparticles change the colour of light detected by the instrument and that colour reflects the exact concentration of the drug in the blood sample.

In tests, measurements from nanoparticles device proved as accurate, Masson pointed out, yet took under 60 seconds to produce, compared to 30 minutes for current devices used, and they were obtained easily by lab technicians inexperienced in surface plasmon resonance.

The new device is small and needs little manipulation of samples, so could soon be used at the bedside and/or in a GP surgery.

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# Navigated Augmented Reality enhances medical applications

Report: Anja Behringer

The digital world is being enriched by augmented reality (AR), which refers to any type of information offering the user additional help. Mostly, we don't even notice it; the only external sign being Smart glasses. When new cars are launched we are always surprised by the constantly developing assistance systems they offer – and it's the same for the growing number of smartphone apps.

In the medical world, thanks to AR it is imaging procedures that are becoming ever more precise and helpful. In short: These days AR is an integral part of all kinds of navigation applications.

The International Symposium for Mixed and Augmented Reality (ISMAR) in Munich demonstrated how medical fields AR is utilised now and in the future.

The more precise the navigation must be, the more sophisticated the systems are. Therefore AR is primarily used in neurosurgery. AR may be just a simple reticule that the surgeon has to hold as precisely as possible above the target area of his intervention. In practice, AR is mainly implemented with conventional display technology because the current head-mounted displays still have a few ergonomic problems.

Austrian medical technology specialist Dr Bernhard Kainz, at London's Imperial College, therefore believes that one of the future display technologies to be used in commercial products will be semi-transparent mirrors set between the operating field and the surgeon. 'Display tech-



**Bernhard Kainz**, a Marie-Curie Fellow at Imperial College, London, is researching real-time imaging, interactive image processing and visualisation for foetal MRI, in Professor Daniel Rueckert's Working Group. Earlier, he managed research projects on hardware-accelerated algorithms and medical real-time visualisation at the Graz University of Technology in Austria, where he also wrote his dissertation on real-time volume visualisation, within a team headed by Professor Dieter Schmalstieg. Dr Kainz's research links medical image acquisition with fast, hardware-accelerated algorithms to enable optimum diagnosis and intervention via interactive image processing and visualisation

nology is a huge, distinct field, and ultimately it's up to the user which type of technology will be accepted for which kind of application. Robot-assisted, minimally invasive interventions, which require stereoscopic, video-based display systems, are easier to augment than interventions that need little or no technology.'

Many ideas for desirable surgical

aids are being developed worldwide, but converting them into actual products is mainly a financial issue. Therefore, AR is used for training in big universities. In practice, doctors use the existing technology creatively. As an example, Bernhard Kainz mentions the positioning laser in the CT or MRI Scanner, which is also often 'misused' to position needles or other instruments.

Although another method may be cheaper, this type of positioning is preferred because it helps the doctor with planning based on information from just one slice. Although this is not optimal, it is an application of AR that has developed naturally.

The perfect technology allowing us to follow the path of the instruments live, inside the patient, is still being developed.

'These days, AR is used in neurosurgery navigation for minimally invasive interventions in simplified form, such as via reticule or as a visualisation for teaching purposes and, in the near future hopefully, also to overlay radiological image data for any kind of intervention with the real patient in such a way that AR is no longer even perceived as "specialist technology",' Kainz foresees.

The advantages are obvious: In the ideal case, the doctor has all information required at the right time and place and the patient is spared avoidable errors, higher radiation exposure and longer treatment times. Additionally, the technology improves the options for documentation and patient information.

The application of AR-assistance, like all new technologies, poses manifold challenges. From a human



viewpoint, it is difficult when an engineering mind-set clashes with established medical technologies, as the benefit of new technology must outweigh the costs by far.

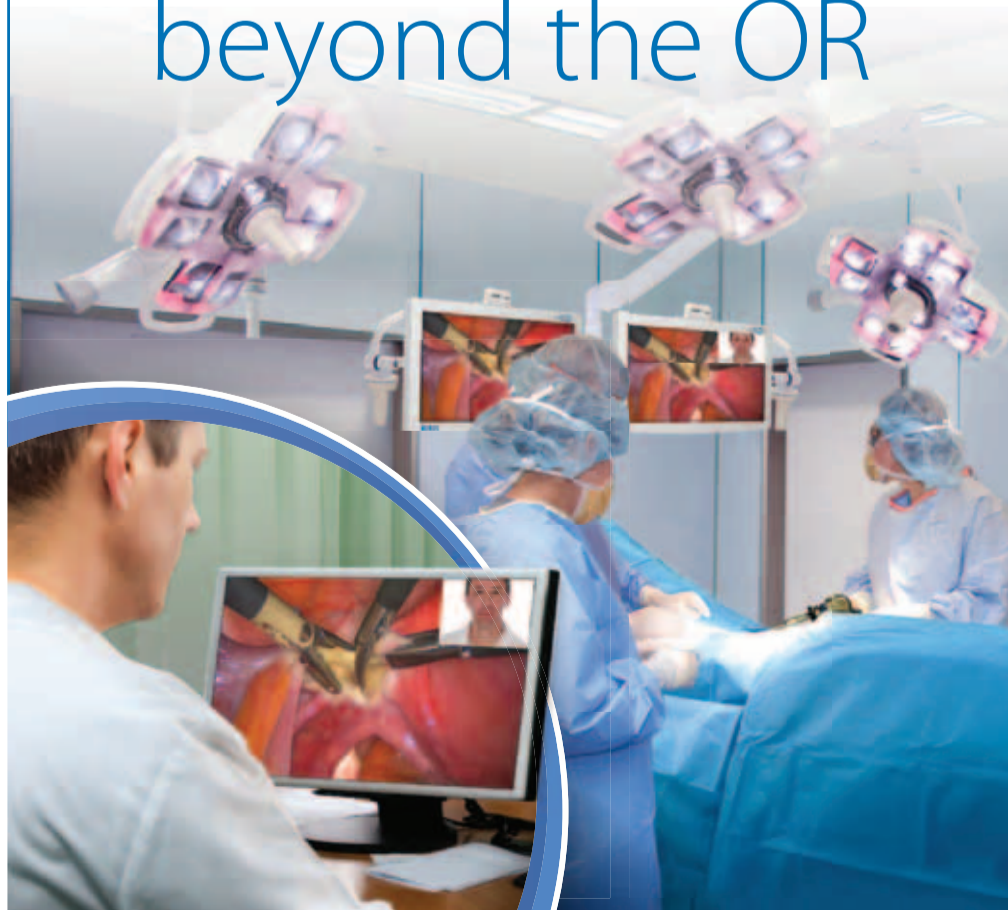
With the increased use of technology, patients often wonder if decisions are actually made by doctors or by technology. Most patients are not aware that most medical decisions are indeed taken algorithmically, based on many tests, because they cannot see these technologies. AR on the other hand is visible, and

therefore these medical assistance systems must offer a great advantage compared to conventional treatment and diagnostic procedures if they are to become established as standard applications.

A small advantage, or a pure show effect, is nowhere near sufficient enough. As a positive example, Kainz mentions the C-Arch. The use of AR has made it possible to lower the exposure dose for patients by factor 40 during this procedure.

From a technical point of view

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Mobile Health – The Potential to Shape Healthcare Future  
**Christoph Opitz**, CEO, Congen-IT Solutions

11.30 a.m. – 12.00 noon  
Open Health Platform for Pluggable Mobile Medical Apps, Devices and Health Records  
**Prof. Dr. Jörg-Uwe Meyer**, CEO, MT2IT

12.00 noon – 12.30 p.m.  
Device Management in Medical Mobile Health Projects  
**Marc Tastayre**, M2M Sales Manager Central Europe, Vodafone Group Services

12.30 p.m. – 1.00 p.m.  
Quality Assurance in Hospitals with the Help of Innovative

# Reality tations



Such systems have large benefits in practice. AR frequently also requires different types of camera, display and input technology that must be appropriately calibrated with one another. 'This is best achieved with precisely designed but easy to reproduce components,' says Kainz. 'The 3D printer has facilitated a completely new kind of prototype visualisation. Not only does it enable the exchange of building plans for building components in the simplest way – i.e. via e-mail – but it also facilitates very simple and cost-effective enhancements for existing devices.'



the specialist still sees numerous challenges such as problems with imaging, reliable and precise position tracking or issues with data preparation- and visualisation. 'In my view,' he points out, 'we currently need to invest a lot more into real-time imaging and visualisation, so that AR-systems can be utilised as naturally as possible.'

Users as well as developers see a particular potential in the use of cost-efficient and easy to implement enhancements such as 3D printers.

## ON'T MISS

Online Patient Feedback Tools  
**Dr. Raphael Kromer,**  
Managing Director, Vecara

**Thursday, 13 Nov 2014,**  
● 1.00 p.m. – 3.00 p.m.

### MOBILE APPS

Connected mHealth App  
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# Critical care ventilation

New intuitive device goes beyond traditional solutions

**GE Healthcare is at Medica Hall 10 / Stand A42**

The new **Carescape R860** is an intuitive critical care ventilator that uses advanced lung protection tools and an innovative user interface to help improve patient care.

Twenty-four percent of all patients mechanically ventilated will develop ventilator induced lung injury for reasons other than acute lung injury (ALI) or acute respiratory distress syndrome (ARDS - An official conference report co-sponsored by the American Thoracic Society, European Society of Intensive Care Medicine, and Société de Réanimation de Langue Française, which was approved by the ATS Board of Directors, July 1999. Am J Respir Crit Care Med 1999; 160:2118).

GE Healthcare supports scientific belief that a lung protection strategy can help ensure the different zones of lungs receive the treatment they need, thus potentially reducing these adverse events (Villar J, Kacmarek RM, Pérez-Méndez L, Aguirre-Jaime A. A high positive end-expiratory pressure, low tidal volume ventilatory strategy improves outcome in persistent acute respiratory distress syndrome: randomised, controlled trial. Crit Care Med. 2006 May;34(5):1311-8).

GE sums up: 'The Carescape R860 simplifies the use of advanced tools to tailor treatment for each patient by measuring patients' lung volume and potential lung recruitability, the ability of the lung alveoli to open, and titrating the appropriate positive end-expiratory pressure (PEEP) to allow better oxygenation.'



## The first fully network-based integrated OR



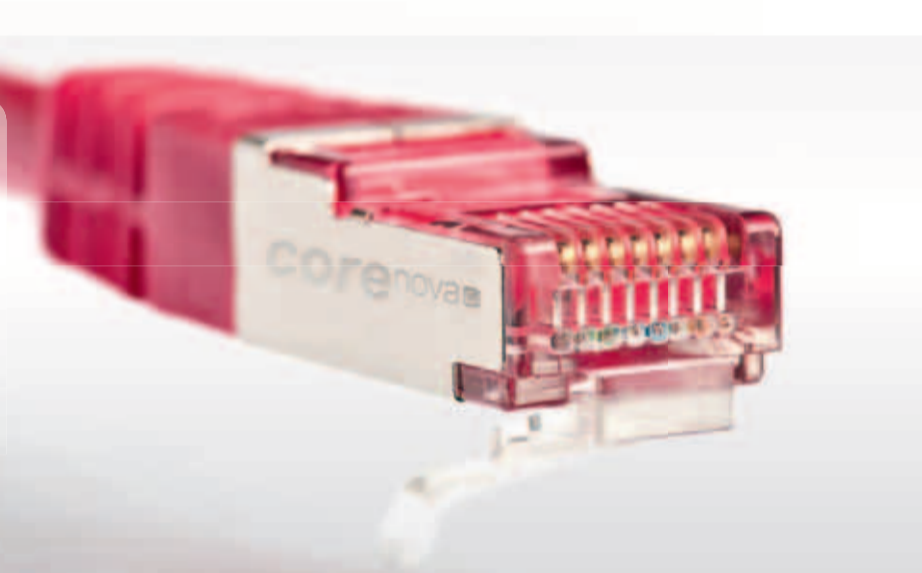
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# A pathologist in your pocket

Digitising individual health data will bring 'creative destruction' to medicine as we know it today

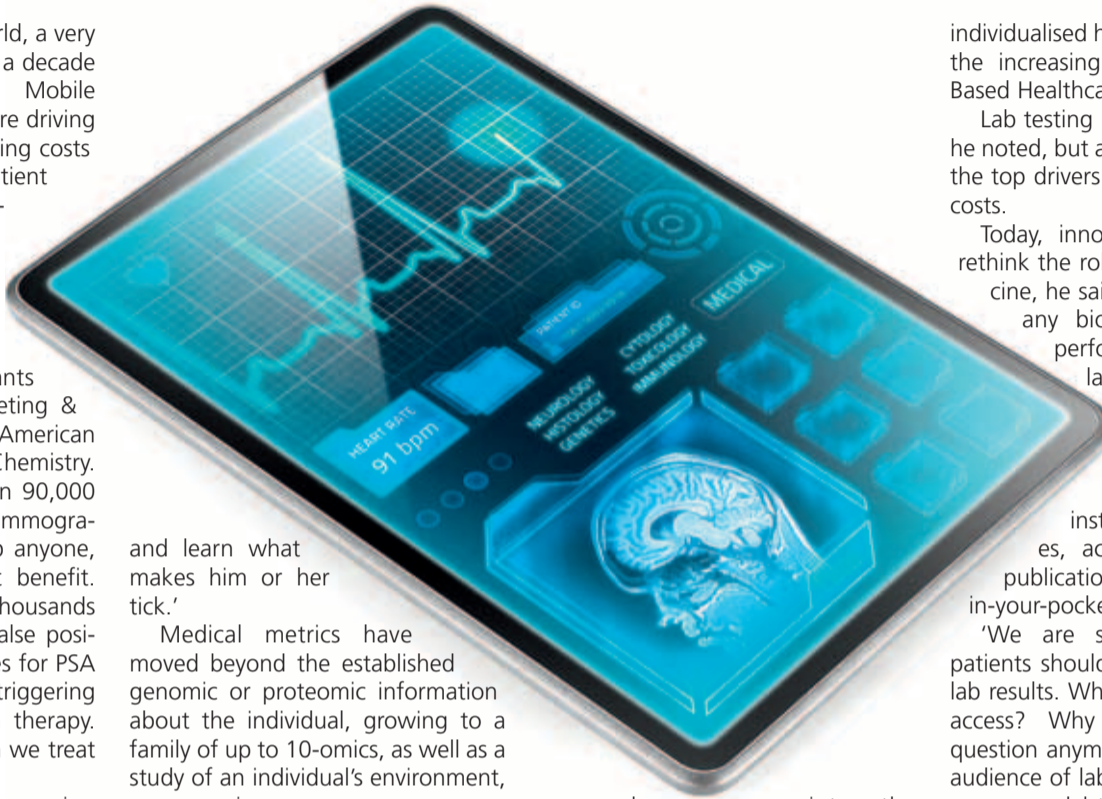
We live in a connected world, a very different world than it was a decade ago, said Eric Topol MD. Mobile devices, wearable devices are driving a creative revolution, reducing costs of healthcare, increasing patient access to health information.

'We practice medicine today at a population level. This will not continue. It promotes waste,' he told participants attending the Annual Meeting & Clinical Lab Expo for the American Association for Clinical Chemistry. 'For example, in a study on 90,000 women we learned that mammography screening doesn't help anyone, that it had no significant benefit. In fact, it hurt tens of thousands of women who received false positives. Similarly false positives for PSA screenings hurt men by triggering serial biopsies or radiation therapy. This is what happens when we treat all people the same.'

Today Moore's Law is moving technology in one direction, reducing cost, while the cost of healthcare is going in the other direction, continually increasing because, '...we haven't begun to use the information yet that's available in digital form,' Topol pointed out.

We have not been able to do better up to this point, but that is changing, and clinical labs need to adapt to the technological and societal trends. 'Today we can digitise the individual, and this is extraordinary,' he said.

In a recently published article in the journal Cell, entitled, 'Individualised Medicine: From pre-womb to tomb,' Topol suggests that through an individual's digital data we can understand their medical essence, take a pan-omic view of each individual



and learn what makes him or her tick.'

Medical metrics have moved beyond the established genomic or proteomic information about the individual, growing to a family of up to 10-omics, as well as a study of an individual's environment, or exo-omics.

Progressively, he said, this data will enable the delivery of preventive care and far better medical outcomes in the future. It will take medicine to a much higher, more precise level. Google, Apple, and Samsung are all companies positioning to aggregate this data, though it is not yet medical-grade data.

Blood pressure and glucose measures are today well established with mobile devices. Recently cardio-

grams have come into the digital picture. 'Cardiograms have been read by algorithms for decades. Now they can be read at the consumer level,' stated Topol. 'Smart watches pre-empt the need to get to a smartphone, sending all kinds of stored information to other devices that monitor vital signs continuously. All of this needs to be validated through rigorous study; but, it has been called a Trillion Dollar Cure for the healthcare system, to have

individualised healthcare, rather than the increasing cost of Population-Based Healthcare.'

Lab testing is pivotal to medicine, he noted, but at a cost that is among the top drivers of increasing medical costs.

Today, innovation is starting to rethink the role of laboratory medicine, he said. Increasingly almost any biological test can be performed on miniaturised lab-on-chip assays. At the AACC exhibitors show more and more point-of-care and hand-held instruments. These devices, according to a recent publication, put 'a pathologist-in-your-pocket'.

'We are still asking whether patients should have access to their lab results. Why shouldn't they have access? Why do we even ask this question anymore?' Topol asked the audience of lab clinicians. 'We have a new model that is going forward, with diagnostics done by patients in the years ahead.'



Eric J Topol MD, is an American cardiologist, geneticist, and researcher. Much of his career was spent at the Cleveland Clinic, where he served as chairman of cardiovascular medicine and founded the Cleveland Clinic Lerner College of Medicine. He is currently Director of the Scripps Translational Science Institute in La Jolla, California. In January 2012 he published the popular book *The Creative Destruction of Medicine*, which examined the impact of the genomic and wireless revolutions on the healthcare system.

'This will be a big shake up enabled by all this technology.'

Medical imaging is being revisited, he said, thanks to pocket tools made possible with new technologies. Patients will soon be able to do 'selfies' of a joint, or a bone. Ophthalmologic exams today can already be done with the Eye-Phone at a fraction of the cost of the usual visit to the clinic.

'The stethoscope is out,' he declared. 'Harvard is asking doctors, why would you listen to the heart, when you can see it in seconds? Taking on this icon of traditional medicine shows how these new tools will bring about a creative destruction of medicine.'

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**Venue: Hall 6. Stand 6G20**

**Thursday, 13 Nov 2014 • 11.00 a.m. - 4.00 p.m.**

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# Dress up for Ebola's unlikely EU epidemic

Full-face shields, or goggles and masks must be worn

Report: Lisa Chamoff

Unlike some news reports the Ebola virus is not as easily transmitted as influenza or other infections. Still, healthcare and laboratory workers must take precautions to quickly identify those infected and prevent an outbreak. In an October webinar, hosted by the American Association

for Clinical Chemistry, Dr Nancy Cornish, a medical officer at the Centers for Disease Control, emphasised that Ebola is transmitted by direct contact with blood and body fluids, and not spread by air or water. However, research laboratories making viral cultures so that pathogens achieve high concentrations, must increase safety precautions. Anyone

testing specimens from a possibly infected patient should wear gloves, water-resistant gowns, and full-face shields, or goggles and masks. Certified class II Biosafety cabinets or Plexiglass splashguards should be used to protect workers' skin and mucous membranes.

Anyway, medics should anyway ensure minimum infection prevention practices in patient care, including hand washing, using gloves, gowns and masks, safe injection practices and cough etiquette, Cornish said, also stressing that African facilities dealing with Ebola specimens have a different set of challenges, including no reliable running water and limited access to disinfectants.

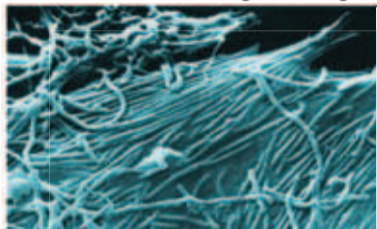
Dr Sheldon Campbell, director of laboratories at VA Connecticut Healthcare and professor of laboratory medicine at Yale School of Medicine, said facilities should come up with plans to include assessing the route and risk of transmission of certain organisms, and determine how common the pathogen is. When developing policies, Campbell said it's important to balance laboratory staff risk with the possibility of compromising care for 100 or more patients.

'When planning, plan for what's reasonable now, and that's really small numbers of at-risk patients to rule out for Ebola,' Campbell said. 'Don't try to plan yet for 100 patients with Ebola, or even for five. Plan for one and get that in place and watch what happens over the next few months. You might have to plan for more, but start with small numbers of cases and then reassess as time goes by.'

The CDC has also developed interim guidance for specimen collection, transport, testing, and submission for patients suspected of Ebola infection, which can be accessed at [www.cdc.gov/vhf/ebola/hcp/interim-guidance-specimen-collection-submission-patients-suspected-infection-ebola.html](http://www.cdc.gov/vhf/ebola/hcp/interim-guidance-specimen-collection-submission-patients-suspected-infection-ebola.html).

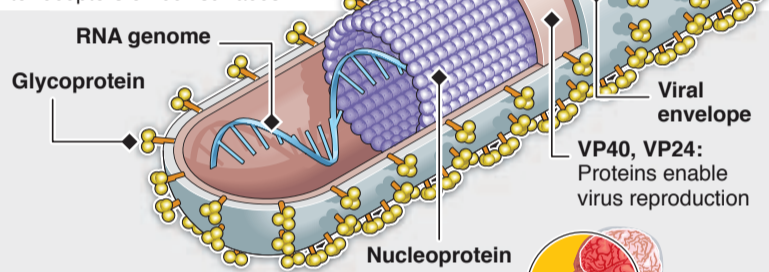
## What makes Ebola so deadly

Ebola is a viral illness which infects through direct contact with blood or bodily fluids of a sick person or animal, or with contaminated objects. It leads to haemorrhage and organ failure and kills up to 90% of victims



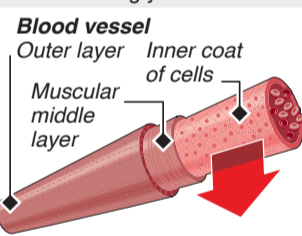
**Infection:** Ebola genome contains four genes which together prevent **dendritic cells** – in skin, nose, lungs and digestive system – from sending messages to trigger immune system

**Unchecked viral growth:** Virus spreads to cell types throughout body by binding **glycoprotein** to receptors on cell surfaces

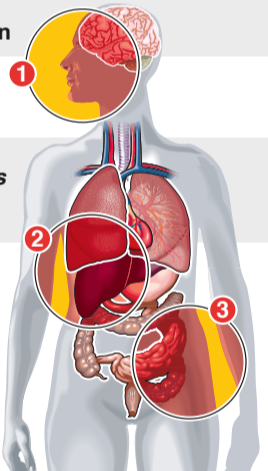


**1. Symptoms:** Onset of illness is abrupt and is characterized by fever, headache, joint and muscle aches, sore throat, red eyes, and weakness

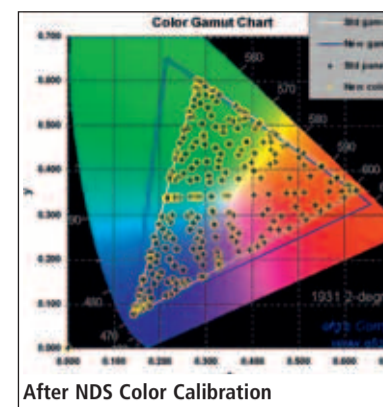
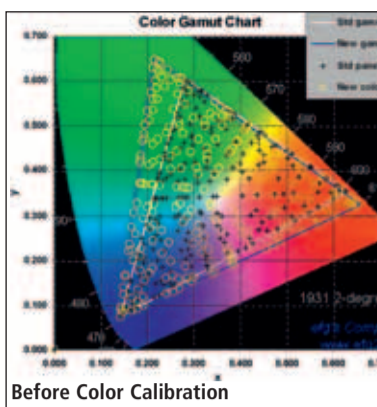
**2. Cytokine storm:** Immune cells get caught in endless loop, releasing extreme levels of **cytokines** – proteins within cells which cause inflammation – and attracting yet more immune cells



**3. Septic shock:** Infected cells detach from blood vessels, causing massive haemorrhage. Loss of blood leads to kidney and liver failure



Source: University of Texas Medical Branch Picture: Public Library of Science © GRAPHIC NEWS



## Colour calibration

NDS Surgical Imaging has developed and patented a unique method for calibrating the colour response of its Radiance surgical displays, the manufacturer reports. 'This pro-

display to the next, NDS points out. 'This is analogous to the inconsistencies that may be seen when viewing different brand TV's at an electronics store. This may be acceptable for the consumer market; however, is not ideal for medical applications.'

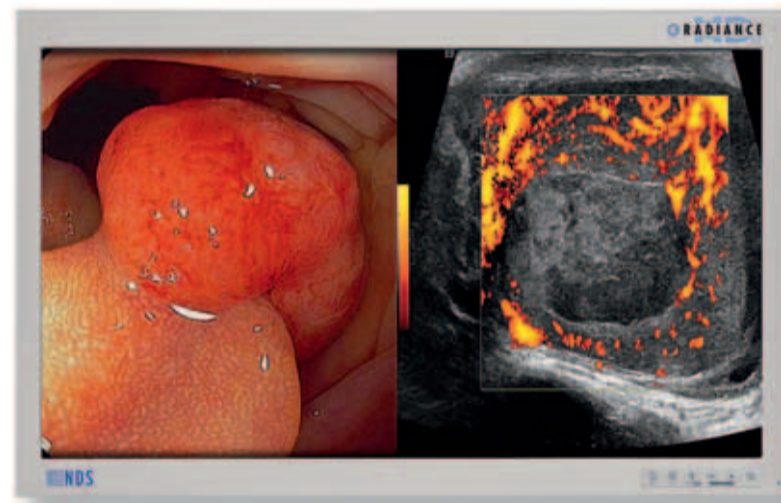
### NDS is at Medica Hall 10 / Stand G14

proprietary technology uses advanced algorithms to perform pixel-by-pixel colour response correction in real-time, delivering accurate consistent colour performance.

'Every display is individually characterised and calibrated at the factory to meet stringent chromaticity tolerances for both the primary colours (red, green and blue), and the white-point. This process ensures almost zero perceivable variation in colour from one display to the next.'

'Certain brands of surgical displays are not calibrated in such a manner, which would result in inconsistent colour appearance from one

When performing minimally invasive surgical (MIS) procedures, surgeons rely on flat panel LCD displays as their only method of visualisation of the surgical site, NDS points out. 'The colour appearance of tissue, vascular structures and other anatomy can tell the surgeon a lot about the condition and health of the patient. Therefore, it's critically important that the flat panel displays used by surgeons always render anatomical colour consistently and accurately. NDS Radiance displays do exactly that, giving clinicians a higher level of confidence in their procedures, no matter what mobile cart system or operating room they are using. ■



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'The lamp grants a homogeneous and shadow-less light thanks to its special LED optics created by ACEM Medical Company, which directs light beams at best according to

and the life cycle of the LEDs is around an impressive 50,000 hours.

The model has three reflectors producing a blended and intense cone of light, focused through automatic adjustment of the light spot diameter, the firm points out. 'The slim, practical, compact design makes it perfect for several uses. The lamp is ergonomic, easy to move and to position and suitable for the laminar flows of the operating room.'

### ACEM is at Medica Hall 10 / Stand E31

the needs,' the Italian manufacturer reports. 'The visual area is perfectly illuminated assuring both excellent visual comfort and working conditions. Its next generation LEDs produce an unparalleled quality of light with a colour temperature (CCT) of 4.500 °K and a colour rendering index (CRI) of 95.'

Light intensity is 130.000 lux with low energy consumption of 69W,

The ENDO function (light for endoscopy) enables the lamp's use during MIS.

Functions are touch-screen adjusted via the I-SENSE control panel – covering light intensity, DoF (depth of field), ENDO (for MIS), SIZE (light spot diameter adjustment), SYNC (optional - to synchronise controls of the firm's combined lamps).

Details: [www.acem.it](http://www.acem.it)



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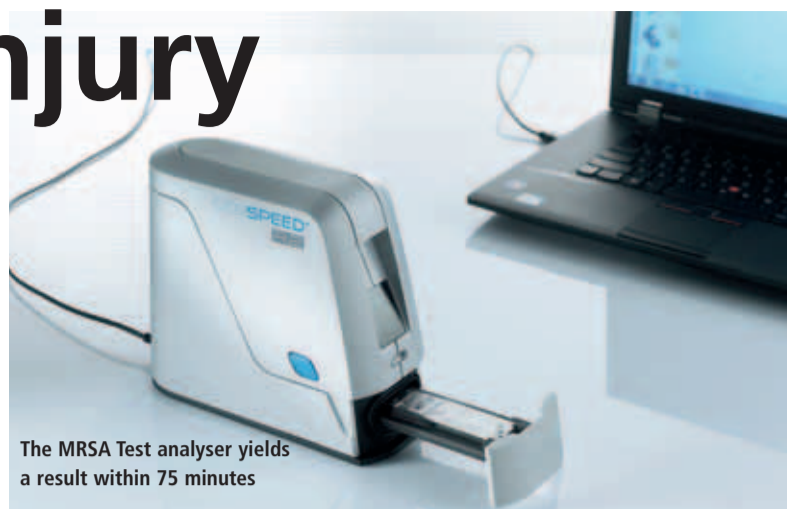
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# Cutting the risks of injury and contamination

Austrian firm Greiner Bio-One is presenting products for the pre-analysis and diagnostics industry at this year's Medica. Vacuette safety products have been developed to

maintainance-free and easy to use. 'Pre-filled reagents and the automated Genspeed R2 analyser reduce the number of process steps to a minimum,' Grenier Bio-One adds about

this newly available in Europe product. 'One example is the Genspeed MRSA Test, a DNA-based, in-vitro, diagnostic tool for the qualitative detection of MRSA within 75 minutes from human nasal and pharyngeal smears. It features the detection of the two relevant resistance genes, mecA and mecC.'



The MRSA Test analyser yields a result within 75 minutes

**Greiner Bio-One is at Medica Hall 03 / Stand G60**

minimise this risk of injuries from contaminated puncture devices – a significant safety hazard to health-care workers, the firm underlines.

'Special product solutions, such as the Vacuette Quickshield Safety Tube Holder with 360° rotatable safety shield, or the Vacuette Premium Blood Collection Tubes with safety screw cap, reduce the risk of injury or contamination to an absolute minimum.' For rapid identification of nosocomial infections, Greiner Bio-One developed Genspeed, a molecular diagnostics system that combines crude lysis of bacteria with multiplex PCR followed by automated analysis of PCR products in the new Genspeed R2 analyser.

'The Genspeed Test System stands out in terms of speed and high sensitivity,' the manufacturer points out. 'Analyses of individual samples can be made at any time. The three controls (for DNA amplification, hybridisation, as well as a negative control) on the Test Chip guarantee maximum reliability.' The system is also reported to be compact and

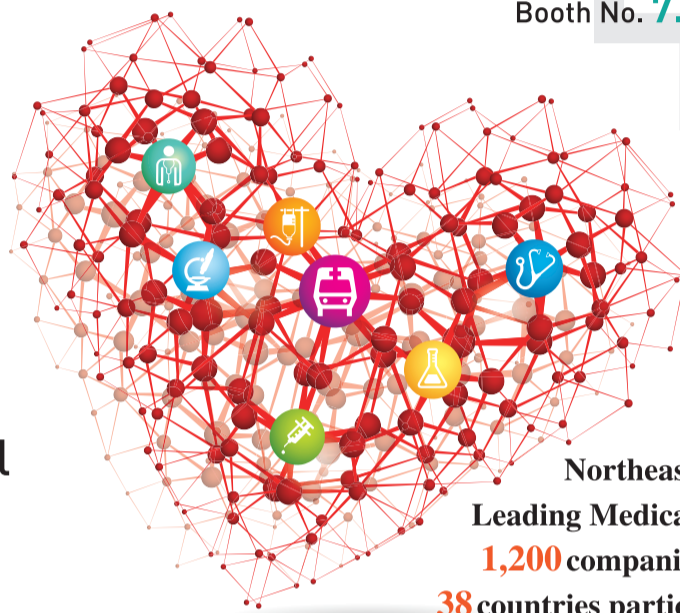
The Vacuette Quickshield Safety Tube Holder



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