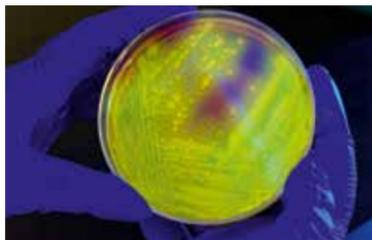


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INFECTION CONTROL 13-17

- NICE sets nosocomial infection guidelines
- Hot air dryers a potential disaster
- Medicine infection accident fines bite deep



LABORATORY 18-24

- Hand-held device for same day diagnostics
- More visibility for pathologists
- Sepsis cases are rising



Google Glass goggles stream live surgery

Other beta test evaluation shows mixed result

Report: Cynthia E Keen

Some time this year, exact date unknown, Google Glass – a miniature computer attached to a pair of glasses – is expected to make its consumer debut. There's a lot of interest by healthcare providers, some of whom are among thousands of Google-selected 'explorers' who paid \$1,500 for the privilege of beta testing the preliminary system.

The Google Glass device is worn like a pair of glasses, but includes a computerised central processing unit, integrated display screen, high definition camera, microphone, speech recognition and dictation software, and has wireless connectivity. It will work with apps based on the Android operating system.

The reviews of Google Glass are mixed. Some perceive it as a gimmick and a patient privacy nightmare. Others are delighted. One medical school in California has even incorporated the use of Google Glass into its academic curriculum.

Interactive videoconferencing for consultation about patients and video streaming of treatment and surgeries are two of the most popular test applications.

In March 2014, Providence-based Rhode Island Hospital began a six-month long feasibility study to use a customised version of Google Glass containing a HIPAA security app in its emergency department, to stream live images of a patient's dermatological condition to a consulting dermatologist. Emergency physician Dr Paul Porter, the project's principal investigator, believes that the tech-



According to Dr Parekh, video streaming could help to disseminate and share techniques in surgery around the world.

nology has the potential to make coordinated care easier and make interventions and treatment faster. *The New York Times* has reported that Dr Paul P Szotek, a trauma surgeon at Indiana University Health, is currently developing an app for use by paramedics. Live feed streamed to the closest hospital emergency departments so that physicians can see accident victims at the scene.

He believes that wearable technology will be able to assess patients on the scene, give instructions to paramedics and better prepare for

the patient's arrival at an emergency department. 'Google Glass has the potential to decrease the mortality associated with trauma significantly,' he said.

Dr Selene G Parekh, an orthopaedic surgeon at Duke Medical Center and associate professor in the department of orthopaedic surgery at Duke University in Durham, NC, is planning to test the glasses to be able to stream his surgeries securely over the Internet to surgeons in India. While waiting for HIPAA privacy compliance to be

established and for Duke Medical Center to approve this – anticipated in late fall of 2014 – he has been experiencing the use of Google Glass while performing surgeries.

Although videoconferencing using conventional equipment is commonplace to record surgeries, Dr Parekh believes that the technology will be more economical and shows tremendous potential. The surgeries will be streamed through Dr Parekh's personal website at www.footonline.com and through the training website of the Parekh

Family Foundation (www.footandanklecourse.com).

The foundation currently sponsors an annual Indo-US Foot and Ankle surgery Conference to disseminate and share techniques in foot and ankle surgery with surgeons in India and South Asia. Video streaming will enable surgeons around the world to join the video feed by using a secure website.

Dr Phi Haslan, a consultant interventional and uro-radiologist at the Freeman Hospital in Newcastle on Tyne, UK, also sees Google Glass as a way for an unlimited number of medical students and fellows to observe interventional radiology procedures without the necessity scrubbing up to stand in a crowded procedure suite and potentially be exposed to radiation. He also believes that the technology has potential to make image-guided procedures easier. The glasses with inte-

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EH 3/14

Seeing sights on a stroll down StreetLab

Controllable indoor city street aids visual impairment studies

Report: Annick Chapoy

At a glance, StreetLab looks like a city street, peppered with shops and street signs. However, this special area belongs to the Paris-based Vision Institute. Founded in 1992 by leading ophthalmologist Jose-Alain Sahel, today the institute employs 200 people and is one of Europe's most advanced research centres for eye diseases.

According to the 2002 HID Survey (Handicap-Incapacities-Dependency) visual deficiency strikes 1.7 million people in France, among whom 60,000 are blind and 1,640,000 are partially-sighted. Considering demographic trends in more developed countries, the number of visually impaired people could double by 2030. Thus, to improve their future autonomy, security and comfort with the right technology, the indoor street is an important R&D laboratory to help in the conception, development and evaluation of innovative technology.

To analyse the behaviour of visually impaired patients, environmental parameters in the street – including the lighting, noise, outdoor urban items, experimental scenarios and information systems in the street – can be controlled by the researchers using sophisticated instruments. StreetLab is also rich in the number of objective measuring tools, such as biometric captors for movement analysis, eye trackers for analysis or gaze strategy, and infra-

red control cameras to record and monitor experiments.

Among the first StreetLab projects is a study on motricity and impaired vision conducted at the Institute by Dr Colas Autié and Prof. Avinoam Safran. This aims to identify the optimal paths of eye movement in severe pigmental retinopathies patients during tasks such as locomotion of visual localisation.

The research conclusion could lead to the development of rehabilitation protocols for pigmental retinopathies patients and increase their autonomy in daily activities.

'StreetLab's facilities innovate with realistic environments representing daily life situations during clinical tests, just like the Homelab* does for tasks performed in an apartment,' Prof. Sahel told European Hospital during the street's inauguration in December. Numerous recorders enable the team to gain a clear analysis of a patient's behaviour in terms of body motion and eye movement. Thus we'll understand better the reasons for a failure to do a certain task and measure the real therapeutic benefit for a visually deficient patient who is undergoing treatment.

'StreetLab demonstrates,' he added, 'that innovation stems from research. We have managed to set up a spectacular system for scientists and industry partners while also involving the patient.'



José-Alain Sahel is director of the Vision Institute, a translational research centre in Paris, and Professor of Ophthalmology at Pierre and Marie Curie University, as well as for Biomedical Sciences (Cumberlege Chair) at University College London. The major focus of his clinical research is to develop treatments for currently untreatable retinal diseases, such as retinitis pigmentosa, age-related macular degeneration and vascular eye disease, by resorting to pharmacological treatments, gene therapy and stem cell therapy.

* Other innovative facilities in the Handicap Department at the Vision Institute, include Homelab, which helps industrial partners to be aware of how to improve the living environment of visually impaired people. All the institute's facilities are managed by the Pierre et Marie Curie University of Paris, the Caisse des Dépôts, and the Fédération des Aveugles de France (Blind people associations). Support is received from the Paris City, the Région Ile de France and the Ministry of Education and Research.

Google Glass goggles stream live surgery

Continued from page 1



grated computer technology may extend PACS image display as well. Dr Oliver Muensterer, at the Division of Paediatric Surgery, New York Medical College in Valhalla, told European Hospital that he and his colleagues are planning a study to evaluate the head-up display of Google Glass for reading chest X-rays. Fifty radiographic images will be presented to surgeons to view on a conventional medical display PACS workstation monitor and on Google Glass.

The study's objective is to compare the ability to identify the 25% of images with significant abnormal findings: pneumothorax, haemothorax and lung contusion.

Dr Muensterer et al. conducted the first formal systematic evaluation of the capabilities of Google Glass in clinical settings at Maria Fareri Children's Hospital of Westchester Medical Center in New York. His team wore Google Glass for four consecutive weeks for hands-free photo/video documentation in clinic and in surgery, making hands free telephone calls, looking up procedure billing codes, and conducting Internet searches.

The beta version of Google Glass proved to be clunky. Its battery life is as short as 45 minutes when the video streaming application is used and several hours when it is not. However, some surgeries have a longer duration. The time it took to recharge the battery took hours.



Dr Oliver Muensterer, Division of Paediatric Surgery, New York Medical College, Valhalla

The audio/speech recognition interface was inadequate except in a very quiet room. Some ergonomic features were awkward, and, when the researchers loaded PACS CT images into Google Glass, they discovered that the app displaying the images did not have a 'rapid image scroll' command.

Problems are to be expected in a beta test first generation version of any product. Other companies are starting to develop the technology as well. In his article published in the *International Journal of Surgery* earlier this year, Dr Muensterer concludes that 'Google Glass has some clear utility in the clinical setting and foreseeably a great potential to impact medical and surgical practitioners in their daily activities.'

Unified training and certification efforts promise rewards

Exciting times for European interventional radiology

Efforts to unify training and certification, a regulatory environment conducive to innovation and a growing bank of clinical evidence for key procedures, is helping interventional radiology (IR) to move to a new level, according to Professor Anna-Maria Belli, President of the Cardiovascular and Interventional Radiological Society of Europe (CIRSE). This has been further enhanced by closer collaboration with IR societies across Europe and around the world.

Professor Belli: 'I think that interventional radiology in Europe is at a very exciting point. Our efforts to unify training and certification pathways are starting to bear fruit and we're making important progress in terms of gathering clinical evidence for many of our procedures. Interventional radiology is a discipline born of innovation, and luckily the current regulatory environment in Europe is conducive to us continuing this trend. The CE-mark is not a perfect tool, but it does allow European companies and doctors to advance medicine and new techniques, which is reflected in the clinical results presented at CIRSE.'

With an EU directive on medical devices currently pending – though still too early to tell how it will affect innovation – interventional radiologists are hoping it will continue to permit them to pursue cutting-edge work for the benefit of patients.

Professor Belli remains convinced of the need to establish consistent levels of training within IR in Europe. 'To this end, CIRSE has developed an IR curriculum and a competency test, which ensure that trainees receive comparable training and are subject to comparable assessments before they are deemed specialists in interventional radiology,' she pointed out. 'We could never have achieved this without the input, strong support and endorsements from national IR societies throughout Europe.'

Professor Belli believes an important next step for CIRSE is to secure subspecialty status for IR in all European countries as well as making it a priority to 'support first-rate, thorough research that con-

cerns that new technologies and techniques are safe, efficacious and cost-effective before they are enthusiastically embraced.'

To help achieve that, the CIRSE Research Network has been set up to make it easier for researchers to

apply for and obtain EU funding for their work. The organisation is also continuing to develop and run registries that assess the safety and efficacy of specific treatments and intensifying collaboration with other clinical disciplines to ensure

all angles are considered before condoning new treatment options.

The CIRSE annual congress (13-17 September in Glasgow, Scotland) offers an excellent opportunity to review the progress made in IR and celebrate achievements, Prof. Belli

added. 'The field of IR is increasingly gaining recognition, but we can't be too complacent, because sceptics remain. So, I do think one of the most important goals of the congress is to join forces with colleagues from around Europe and the rest of the world in order to highlight the enormous contributions interventional radiologists are making to patient care.'

* Reprinted from R6Ko HEUTE 2014, the official congress publication of the German Radiology Congress

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Anna-Maria Belli is Professor of Interventional Radiology & Consultant Radiologist in the Radiology Department at St George's Healthcare NHS Trust in London and President of the Cardiovascular and Interventional Radiological Society of Europe (CIRSE). Her special interest lies in vascular interventional radiology, particularly endovascular management of peripheral arterial disease, embolisation for obstetric and gynaecological haemorrhage, and also in vascular malformations treatment.

Two people and their team are changing the world: the neurologists Prof. Markku Kaste, MD, and Atte Meretoja, MD, of the University of Helsinki are revolutionizing acute stroke care – and their tools are careful consideration and human labor. In order to save time, they installed their CT system in the emergency department to be able to perform lysis therapy immediately after the CT scan and to avoid long distances.

This head start will be increased even more by optimized processes and collaboration. Specialists are available around the clock so that thrombolytic therapy can be delivered in record time. "In patients with acute stroke, time is brain," says Kaste.

For stroke patients, this reduces the mortality rate, increases the chances of survival – and minimizes the risk of permanent damage or disabilities.

Helsinki University

Location:	Helsinki, Finland
Innovator:	Prof. Markku Kaste, MD, and Atte Meretoja, MD
Specialty:	Neurology
Scientific publication:	Neurology 2012;79(4):306-313

Answers for life.

France sees a sharp increase in violent behaviour

Aggression in hospitals

A receptionist threatened with a butcher's knife in Bourgoin-Jallieu (Isère); gunshots in an emergency unit in Delafontaine, at Saint-Denis, near Paris; a nurse wounded with a knife in a Marseille hospital – three separate incidents in just one week last August brought into sharp focus what has become a worrying phenomenon.

Report: Annick Chapoy

Indeed, incidents have increased by 80% in the last five years, according to doctors and hospital workers.

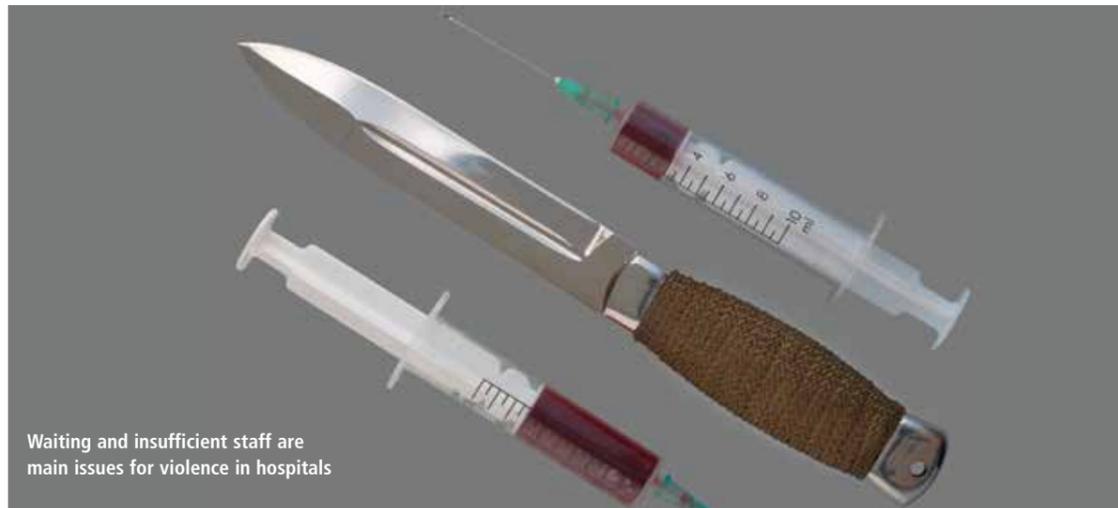
Now, the Association des Médecins Urgentistes de France (AMUF), a union gathering emergency care unit events, has pressed the alarm-bell, and is expecting the Ministers of Health and the Interior to come up with 'concrete measures to address such explosive situations, unbearable not only for patients but for healthcare workers'.

According to Dr Patrick Pelloux, the outspoken President of AMUF, aggressive acts in emergency wards are not a new phenomenon. The union was created 16 years ago following the first death that took place inside a hospital compound in the wake of a shooting incident near Paris.

'The hospital is a mirror of society, and our society is more violent nowadays. In emergency units we are at the heart of crisis situations. We are here to treat the victims of aggression as well as their attackers,' Dr Pelloux points out.

On the cause of violent acts, he stresses that waiting is the main issue. In Marseille, and later in Bourgoin-Jallieu where a nurse was knifed, the patients could not bear the waiting and so attacked healthcare staff.

François Hollande pledged that no French citizen should be more than 30 minutes away from an emergency care facility. That measure should apply to the waiting line once a person arrives in the emer-



Waiting and insufficient staff are main issues for violence in hospitals

gency unit, Dr Pelloux explains.

'There is,' he adds, 'a need to humanise the hospital environment. Some of them do not even let the patient's families inside. Healthcare facilities have become "bunkerised". That means very negatively perceived by patients.'

'We now expect something concrete from the government, for example to redesign emergency unit architecture to organise the rotation of people better. We don't want to create bunkers. However, we would like, for example, secure cubicles for violent people and specific pathways for psychiatric cases.'

'We also notice high tension between medical workers and patients because of insufficient staff. Patients become nervous and the medical personnel, under stress because of too many job cuts, tend to be less tolerant. In this respect,

some find Canada's policy of placing mediators between patients and medical staff interesting.'

Dr Pelloux rejects as insane the idea of posting soldiers within hospitals, as suggested by some members of Marseille's city council. 'Can we welcome our patients with machine-guns around? No. One must keep a cool head in the face of these incidents. All we need is better coordination between emergency wards and the police, so that their interventions become more reactive and adequate.'

In the past, government authorities have always offered the same wrong response, which is to provide more security guards. We'd much prefer an alarm system directly linked to the police, just like in banks or jewellery stores. If we know how to protect jewellery or precious paintings, we could do the

same for the personnel of emergency units.

Security guards are costly and 99% of the time nothing happens, so their presence is a waste. In the remaining one percent, they cannot cope with the situation. We have repeatedly said that we need to have the police in position to intervene more rapidly and adequately,' Dr Pelloux explains.

The last report from the Observatoire des violences en milieu de santé (ONVS), a national body that monitors acts of violence, states that the increase of incidents has actually been 100% in one year: 11,344 incidents (71% of which involved people, the rest concerning hospital equipment) were reported by health institutions in 2012, compared to 5,760 in 2011.

The psychiatry units are the worst hit (2,886), followed by emergency



Patrick Pelloux was joint-chief of emergency unit at the Saint-Antoine hospital in Paris from 2005 to 2008 before joining the Service d'Aide Médicale Urgente (SAMU) in Paris. He has presided over the Association Française des Médecins Urgentistes (AFUR) since 1998 and, in summer 2003 he became a public figure after he pointed out the lack of hospital resources to deal with the heat wave. This led to the resignation of the then Minister of Health. Hospitals as well as retirement homes were later obliged to make the necessary investments to cope with heat wave episodes.

wards (1,611 against 865 in 2011), geriatrics (1,166) and general medicine (932). In the Ile-de-France region around Paris, accounts for 30 percent of reported violent acts.

However, the ONVS wants to put those figures into perspective: 'The number of hospitals that reported acts of violence increased a lot in 2012, notably the AP-HP (the entity regrouping 37 Parisian hospitals), says Stéphane Grossier, spokesman for ONVS. 'Things are beginning to be told openly. Hospitals are no longer reluctant to admit that violent incidents can happen in their facilities, and less fearful that this could be understood as malfunctioning on their part.'

Alarm technology for hospital staff

When helpers need help

Violence from patients or their relatives is no longer unusual in hospitals, with A&E doctors and nurses particularly affected, as confirmed in the recent study *Violence against Staff in the A&E Department*.

Working on behalf of Ascom, provider of onsite wireless communication systems, the management consultancy openConsulting GmbH evaluated responses to questions on specific topics from around 100 hospitals in Germany, Austria and Switzerland.

The survey included aspects such as frequency and type of assaults, the offenders, formalities and emergency technologies. The results paint a clear picture: 73% of all those surveyed complained about assaults in the preceding year, which ranged from vandalism in the A&E unit to scuffles or even blows and kicks. In a third of cases objects were thrown or specifically misused for certain assaults; weapons were also used. Alcohol misuse played a significant role in almost all cases of assault.

Relatives displayed a

clear propensity for violence in more than 40% of cases. Unhappy patients made up a third of all offenders. When it came to the question of frequency, 43% of hospitals stated that the number of assaults had increased over the last two to three years.

Alarm technology is insufficient

When calling for support, large numbers of the affected staff use normal telephones on the wards, and more than half directly shout for help. 'We waste a lot of precious time because of the way in which staff are forced to raise the alarm,' explains Jörg Gebauer, managing director of Ascom Wireless Solutions for Germany, Austria and Switzerland. 'The affected members of staff have to start by finding a telephone, then dialling a certain number and

providing precise information about their location and the situation. In stress situations this is not always easy,' he points out.'

Loud calling, frequently and repeatedly necessary, or even an acoustic alarm, are not considered the best options by safety officers. 'It's better to have a silent alarm and regulated de-escalation. A siren unsettles other patients and makes the offender even more aggressive,' explained the technical director of one of the surveyed hospitals. 'This practical experience also concurs with our findings,' Jörg Gebauer explains. 'Around 85% of assaults can be defused in time. However, this also means that in 15% of cases the situation becomes more or less out of control.'

'The results of the study have confirmed to us that mobile alarm systems and communication can make daily hospital routine safer and also more stress-free for the staff.'

Manual or automatic alarm for more safety Victim

Modern mobile telephones for the hospital, such as the Ascom i62,

have an easily accessible alarm button. An alarm can also be triggered if the device has not been moved or tilted for a predefined length of time, for example in situations where the victim has already been overcome.

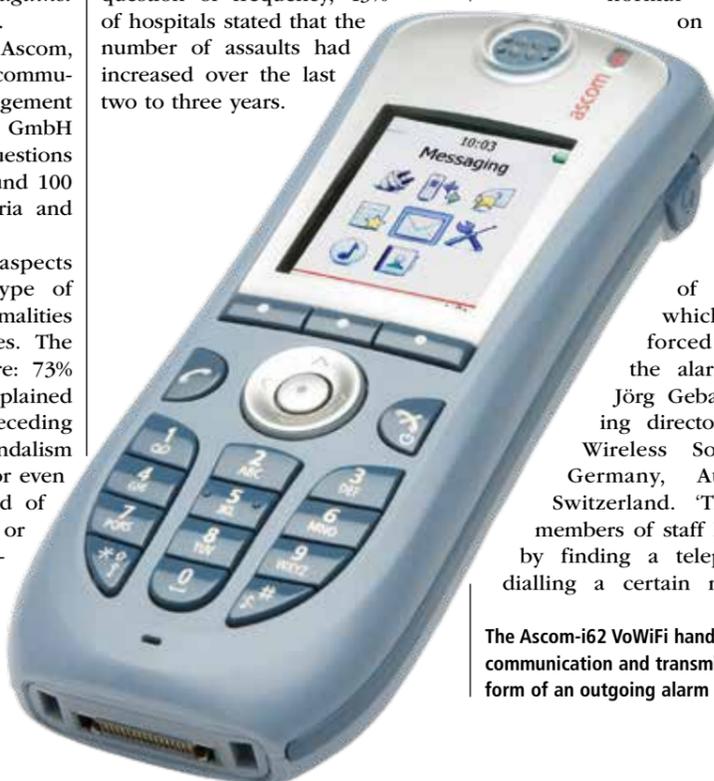
In these situations it is very helpful that modern communication technology pursues the emergency concept automatically.

Locating the victim

In cases of alarm, mobile devices such as the Ascom i62 send out localisation information to the respective communication centres and/or to the mobile devices carried by people rendering assistance.

When an emergency call is received the alarm-PC immediately displays both an acoustic and visual alert, which is automatically transmitted as a group notification to specified mobile devices, such as the Ascom a71.

The alarm always includes information on the location of the victim. An intervention team can then immediately be deployed to the correct location.



The Ascom-i62 VoWiFi handset offers communication and transmission in the form of an outgoing alarm

Medic migrations around the Med

EU countries compete for staff

Report: Moira Mizzi

In Europe the northern Mediterranean region has a unique character, in culture, cuisine, lifestyle, finance and healthcare. Migration follows the same pattern, going beyond the exodus of people of African origin seeking a new life. The migration of workers, including healthcare professionals, is often overlooked, even if it is among major factors in the pressure on European healthcare systems.

Healthcare in most EU states faces daunting challenges from financial and economic crises, aging populations (including medics) and a drop in birth rate. Workforce characteristics are also changing, especially where working hours and work/life dynamics, gender ratios and the specificities of medical roles are concerned. These push-pull factors cause significant competition between and within member states, resulting in medics' migration to 'better' work scenarios.

Romania, for example, has the lowest doctor/patients ratio and most of its medical workforce, including specialists, is concentrated in university cities, e.g. Bucharest, or in economically comfortable regions such as Transylvania. Medics have a low social status in Romania – doctors' monthly remuneration in 2008 was €345, a pittance compared to other EU doctors. The language barrier discourages immigration of medics to Romania; however, they are still attracted from underprivileged non-EU countries, hoping for a pass to more affluent Western states.

Italy, on the other hand, has the highest rate of doctors per 1,000 patients in the OECD region – four as opposed to three in the other regions, resulting in underemployment and thus migration to other European states, mostly Germany. The peninsula also holds the second highest immigration rate of non-EU doctors; of these 20.1% come from America, 18.6% from Asia, 13.5% from North Africa and the Middle East, while 13% hail from Sub-Saharan Africa. However, most foreign doctors come from the EU (47.8%). Whilst most cannot be employed directly in the public health system, most work in the private sector, mostly in the northern regions.

Tiny Malta has its own valid share of history in this migration saga. Maltese doctors tend to pursue specialisation training in the UK, especially since their own country has no postgraduate training facilities and medics are paid up to five times as much in Britain than locally. The brain drain – up to 60% in the early millennium – increased to a third in 2005, when the UK introduced a foundation course to its postgraduate training programme; thus, straight after graduation, Maltese medics left for the UK, a mass migration curbed when the course was implemented in Malta in 2009 – most local graduates stayed and the newly graduated came from abroad.

In the 1970s, hiring foreign doctors, especially from the East European block, was very common due to the political situation then; presently, foreign doctors from EU and Arab countries are most commonly hired in the private sector following a significant improvement

in wages in the public sector.

Greece has been in an unhappy situation particularly since the 2010 financial crisis. Recent statistics show that masses of Greek doctors have fled the country seeking better jobs. The Medical Association of Athens (ISA) reported the exodus of 4,000 doctors within the past three years – 62.5% of them specialists. For training they particu-

larly favour Germany, France, the UK and Scandinavia, while skilled doctors, including gastroenterologists, paediatricians and surgeons, prefer to migrate to countries such as Germany and the United Arab Emirates.

One consequence of this poor-to-rich medics exodus is that countries like the UK brim with psychiatrists, whilst Mediterranean countries, such as Romania, hardly have enough medical staff even for basic

healthcare needs. Logistically, the receiving countries gain medical expertise at the cost of the 'rejected' countries that educated and trained them. At a personal level, the personal cost and psychological impact of a move on the medic cannot be overlooked.

Faced with such challenges in healthcare and with Europe 2020 targets – the EC's 10-year strategy plan to improve the EU economy – breathing heavily down its neck, the

EU, especially the Mediterranean basin, needs some soul-searching about how to use resources more fruitfully.

More medics' migration data is needed as a launching pad to strategic planning and mapping. Health is, after all, a basic human right and it beats the purpose of Europe's unification if this unequal state of affairs is allowed to perpetrate.

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Contradiction? No, a perfect match

High quality care at low costs

The German healthcare system urgently needs structural changes to reduce costs and augment quality of care, Brigitte Dinkloh reports

Whilst participants at the 'Boundary-less Hospital in Health Care Networks' conference, organised by the Centre for Advanced Studies in Management (CASiM) at Leipzig Graduate School of Management (HHL) in mid-June agreed on the need as such, there was plenty of room for Professor Wilfried von Eiff, director of the Centre, Professor Dr Andreas Pinkwart, Dean of HHL, and all the business leaders, economists, physicians and junior researchers gathered there, to discuss exactly which changes could make the German healthcare system future-ready.

The health economy, a 100-year-old success story, still has much unused potential, according to Dr Nicolaus Henke, Director Healthcare Systems & Services at McKinsey & Company. He suggested three options to tap this potential: embracing the data opportunities; re-inventing delivery models and leading a multi-sector approach to build healthy 21st century cities.

Wolfgang Bayer, CEO of Siemens Healthcare in Germany, and Dr Ulf M Schneider, chairman of the Management Board of Fresenius Group, explored the growth potential of their companies. Siemens is focusing on companion diagnostics, i.e. further development of approaches in personalised medicine. In December 2013, Siemens launched a partnership with Pfizer to develop and commercialise lab diagnostic tests designed to help physicians make personalised therapy decisions for their patients. Dr Ulf Schneider explained why Fresenius has been



Prof. Wilfried von Eiff

acquiring hospitals since 2001. Only the interaction of medical technology products and their clinical environment, he argued, will generate more value for the company in the long-term, particularly because the industrialised countries spend up to fifty percent of their healthcare budgets for services – much more than for medical technology products.

Dr Sören Eichhorst, physician and head of the McKinsey Hospital Institute, suggested new chains of value creation. 'In healthcare, value is easy to define: it is that which we optimise every day, namely costs and quality. We all have to make joint efforts to ensure that cost efficiency is directed towards the right treatment,' emphasised Eichhorst, a former head of a hospital group and

The Centre for Advanced Studies in Management (CASiM) conference was dedicated to health economy for the first time, reflecting an expanded course to be provided this summer. The two-year part-time MBA programme in General Management will focus on Hospital Management, initially only at Leipzig, and later also at the Cologne campus. HHL will thus become the first German business school to establish a Centre for Health Care Management and Regulation and this is to be headed by the renowned expert Professor Wilfried von Eiff.

today a hospital consultant.

Patients should receive exactly what they need – high quality at low costs, he said... this is not a contradiction but a perfect match: 'There is a clear trend: the personal experience of the patient and his opinions and perceptions play an increasing role.' How does the patient perceive the treatment? What is the treatment benefit? To what extent can, and should, a patient influence treatment? Where is the patient as well informed as the physician?

For a long time, Eichhorst reminded the audience, the focus has been on patient output, but the outcome, he emphasised, is equally important. The way hospitals define 'patient' is changing and in the future the patient experience will affect reimbursement. The lack of communication between the different professions in a hospital is an enormous obstacle for optimisation, he believes. 'Ideally, the decision-makers of different hospital departments, such as clinical services, nursing, administration or IT, are at the centre of communication processes. However, the network analyses of hospitals often show that these people do not talk to one another. As far as I'm concerned, further standardisation and 'professionalisation' of hospital workflow are desirable. As soon as the actors involved in every step –



Dr Sören Eichhorst

from admission to discharge – are clearly defined, the individual groups leave their isolation and communication improves.'

The consultant then identified a further trend: the increasing interest of medical technology and pharmaceutical companies in the core area, 'hospital'. 'For a manufacturer, it won't do to simply offer the next CT. His added value is created by understanding hospital processes.' Today, Eichhorst observed, many companies make efforts to do just that – trying to understand the procedures and identify opportunities to standardise and find ways to make the healthcare system better in terms of quality and costs. Therefore, he adds, 'projects are being funded that will not yield an immediate profit, but which will help improve future business decisions.'

If the opportunities provided by new technologies are used, a disruptive change might be possible, despite the strict regulation of the healthcare market. In short, he concluded, the future focus should be on a balanced doctor-patient relationship, up-to-date means of communication and innovative hospital concepts.

Professor Manfred Dietel, of Charité Berlin, encouraged a broad public discussion on the affordability of the healthcare system. In view of exploding costs of personalised medicine and ageing population, we must ask who will pay those rising costs, he asked, and suggested raising healthcare insurance premiums to avoid having to exclude certain patient groups from medical care in the future.

Hospital dying

Study reveals significant differences in hosp...

Ten recommendations drawn up to improve care of the dying in the United Kingdom, will provide data to help hospitals to identify good and poor practice and to make changes to enhance learning in this care area.

Led by the Royal College of Physicians (RCP) and funded by Marie Curie Cancer Care and Public Health England, the recommendations were drawn up by the National Care of the Dying Audit for Hospitals (NCDAH), which had assessed the quality of care received by 6,580 people who died in 149 hospitals in England during May 2013.

Lack of communication

The NCDAH used responses from questionnaires completed by 858 bereaved relatives or friends about the treatment of their relative, their involvement in decision-making, and the support available to them.

The auditors also assessed the organisation of care, including the availability of palliative care services, numbers of staff members, training, and all the responsibilities for care.

Dr Kevin Stewart, Audit Steering Group chairman and clinical director of the RCP's Clinical Effectiveness and Evaluation Unit (CEEU), said: 'Although some aspects of care are good in hospitals in England, I am deeply concerned that some hospitals are falling short of the excellent care that should be provided to both dying people and those important to them. In particular, communication with patients and their families is generally poor.'

Women's mental health

How to end gender discrimination

Report: Dr Eduardo de la Sota

According to the World Health Organisation (WHO), mental illness is associated with a significant burden of morbidity and disability. Despite being common, mental illness is under-diagnosed by doctors. Doctors identify less than half of those who meet diagnostic criteria for psychological disorders. Patients, also appear reluctant to seek professional help. Only two in every five people experiencing a mood, anxiety or substance use disorder seek assistance in the year of the onset of the disorder.

Gender disparities and mental health

Overall rates of psychiatric disorder are almost identical for men and women but striking gender differences are found in the patterns of mental illness.

Gender is a critical determinant of mental health and mental illness. Gender determines the differential power and control men and women have over the socio-economic determinants of their mental health and lives, their social position, status and



treatment in society and their susceptibility and exposure to specific mental health risks. The following WHO data shows evidence:

- Depressive disorders account for close to 41.9% of the disability from neuropsychiatric disorders among women compared to 29.3% among men.
- Leading mental health problems of older adults are depression, organic brain syndromes and dementias. A majority are women.

- An estimated 80% of 50 million people affected by violent conflicts, civil wars, disasters, and displacement are women and children.
- At least one in five women suffer rape or attempted rape in their lifetime.

Up to 20% of those attending primary healthcare in developing countries suffer anxiety and/or depressive disorders. In most centres, these patients are not recognised and therefore not treated.

Communication between health workers and women patients is extremely authoritarian in many countries, making a woman's disclosure of psychological and emotional distress difficult, and often stigmatised. Organised by CES University, through its College of Medicine (Colombia), the 5th International Conference on Women's Mental Health highlighted advances in the understanding of mental diseases, its approach and treatment, from a gender perspective.

Women have different processes to become ill and heal, as shown in lectures by several speakers who presented the differences that lie behind the way in which a woman's brain functions with respect to a man's brain. Interestingly, one presentation concerned the invitation extended by the Renault Car Company to have a chat in its Medellin headquarters with both male and female employees. The topic 'Gender equality in the work place' was very edifying, enriching and supplementary for the work being done by the company through its programme Women and Renault. Guest lecturer Dr Donna Stewart is

a UN consultant for topics related to women's rights. As an expert, she highlighted the work undertaken by the car company relating to women's work participation and openness to more equality.

An interesting resource

The Massachusetts General Hospital Center for Women's Mental Health has an interesting and useful website (womensmentalhealth.org) provides a range of current information, which includes discussion of new research findings in women's mental health and how such investigations inform day-to-day clinical practice. Despite the growing number of women's health studies being conducted the clinical implications of such work are frequently controversial, leaving patients with questions regarding the most appropriate path to follow.

The evidence mentioned here suggests the convenience of developing policies and programmes to stop this gender discrimination. A lot of work must be done in several areas and probably decades will be needed to appreciate strong results.

End of life care for the dying must improve

End of life care of the dying across England, Mark Nicholls reports



Dr Jane Collins, who joined Marie Curie Cancer Care as Chief Executive in September 2012, was previously Chief Executive of Great Ormond Street Hospital (GOSH) for Children for 11 years, having been the medical director of the hospital for two years. Dr Collins qualified in medicine at Birmingham University and became a consultant paediatric neurologist at Guy's Hospital in 1991 and GOSH in 1994. In both her clinical career and management career, she has focused on improving the quality and safety of care, as well as helping to support new research and treatment programmes.

'It is disappointing that hospitals don't seem to recognise this as an important issue, not just for those experiencing it in their own lives, but for the wider public.'

In terms of the quality of care, the audit found that for 87% of patients, healthcare professionals had recognised they were in the last days of life, but had only told 46% of patients capable of discussing this; communication with family and friends about the death of their relative/friend occurred in 93% of the cases; most patients (63-81%) had medication prescribed 'as required' for the five key symptoms often experienced near the end of life – pain, agitation, noisy breathing, difficulty in breathing, and nausea and vomiting; 59% of patients were clinically assessed to see if they needed artificial hydration; 45% were clinically assessed to check whether they needed artificial nutrition.

Only 21% of the patients capable of having the conversation were asked about their spiritual needs; however, 87% were assessed five or more times in the final 24 hours of life, which falls in line with the national guidance.

Ten Recommendations to improve quality

A survey of bereaved relatives revealed that 76% were very or fairly involved in decisions about care and treatment of their family member, and 63% reported that the overall level of emotional support given by the healthcare team was good or excellent.

However, within hospitals only 21% of sites had access to face-to-face palliative care services seven days a week; mandatory training in care of the dying was only required for doctors in 19% of Trusts and for nurses in 28%, despite national recommendations that this be provided; though 47% of Trusts had a formal structured process to capture views of bereaved relatives.

care for people who are about to die in hospital.

These include providing face-to-face specialist palliative care service from at least 9am to 5pm, seven days a week; making education

Based on the findings, the audit report made the ten recommendations aimed at driving up quality of

Cold Energy for Hot Wounds – General Experiences of Plasma Treatment in the Example of Herpes Simplex

Dr Susanne Pavisic, Dr Christoph Blum

Herpes simplex infections rank among the most common skin infections. Approximately 85% of the global population carry antibodies against HSV-1, with this figure rising to 90% in Germany alone. Herpes simplex virus type 1 (HSV-1) is responsible for lip herpes.

The first case involving a young patient shows that even a one-off application of a two-minute plasma treatment results in very noticeable pain relief and a very significant reduction in the size of the lesions. The conventional treatment commonly takes between 9 and 14 days. With *plasma ONE*, the treatment duration could be reduced to 2 to 4 days, without the additional use of salves, creams and similar products.

In a second case, a significant improvement was noticed in a 54-year-old patient 24 hours after the first treatment.



Recurring herpes simplex - labialis ICD-10: B00
Treatment with plasma ONE at level 4 for 2 minutes with PS12



Stages of Sore Healing

Dormant phase	Use of blood clotting; stopping micro and macro circulation
Inflammatory phase	Wound cleansing through defence cells; beginning of the formation of connective tissue through fibroblasts
Granulation phase	Filling the sore defect while breaking down the fibrin scaffold; serious disturbance through lack of blood supply, lack of nourishment and metabolic disturbance
Regeneration phase	Closes the wound through 1/3 contraction and 2/3 scarring
Maturity phase	Regeneration, fading and smoothing of scars

Local antiseptic, local or systemic antibiotics and dressings can positively affect wound healing in particular areas. Through the use of plasma, for the first time, a procedure can have multiple positive effects on a sore.

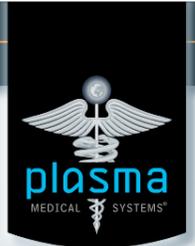
Plasma is a substance that we encounter every day: in the sun's rays, the aurora borealis, lightning, in fluorescent bulbs. Here, a gas is so energetically excited that it partly or entirely disintegrates into ions and electrodes, which outwardly remain electrically neutral, however. The light is characteristic for the radiation emission from the excited atoms and ions.

and training in care of the dying mandatory for all staff caring for dying patients; all hospitals should undertake a local audit of care of the dying at least annually; the decision that the patient is in the last hours or days of life should be made by the multidisciplinary team, and pain control and other symptoms in dying patients should be assessed at least four hourly, with medication given promptly if necessary.

In addition, hospitals should organise having a pastoral care team to ensure that the spiritual needs of dying patients as well as any need among their relatives and friends can be provided when wanted.

A need for decisive action

Marie Curie chief executive Dr Jane Collins said: 'There's only one chance to get people's care at the end of their lives right, but we know that our hospitals do not always provide the high quality care and dignified death that we all have the right to expect. The recommendations of the audit are clear. In particular, more needs to be done to improve governance, staff training, access to pastoral and specialist palliative care teams. We need everyone involved to take decisive action to ensure dying people and those close to them get the care and support they need and deserve.'



Innovative Plasma Treatment for Germ Reduction and Sore Healing!

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The 15th European Congress of Trauma and Emergency Surgery

'Treat first what kills first'

1,500 international trauma surgeons descended on ECTES and WTC 2014

Report: Ralf Mateblowski

There is room for worldwide improvement of trauma care, as Congress President Professor Ingo Marzi, Frankfurt/Main (Germany), emphasised. Although road traffic deaths – around 1.25 million annually – are declining in countries where the comprehensive care pathway, from pre-hospital through emergency and primary surgical care has been optimised, the logistics, procedures, workflows and resources remain insufficient in many regions.

During our EH interview (see underneath), Professor Luke Leenen, Utrecht (Netherlands), President of

the European Society for Trauma and Emergency Surgery (ESTES), elaborated on the significant differences in trauma care within Europe. The European umbrella organisation ESTES brings together 30 national professional associations in trauma care and emergency surgery representing more than 10,000 members.

All diagnostic and therapy measures in trauma care aim at speedy vitalisation and maintenance of functionality. This, according to Pol Rommens, Mainz (Germany), requires the first caregiver to do a primary survey, a quick but nonetheless comprehensive assessment of the trauma pattern. An in-hospital examination, including imaging, is followed by primary life-saving surgical care of the trauma patient. A final care plan can only be designed and implemented after the patient has achieved a certain degree of stability.

At ESTES, Professor Reinhard Hoffmann, Frankfurt/Main (Germany), looked at the principle 'treat first what kills first'. Hoffmann, Secretary General of the German

Trauma Society, confronted the fictional 'Emergency Room' image of daily work in a shock room with the reality. No doubt, he conceded, time is of the essence in any medical emergency, but work in a shock room is far from chaotic. To the contrary; headed by a trauma leader, a life support team applies minutely

and diagnostic imaging.

However, the actual contents of the initial care procedure implemented in a trauma centre can vary greatly, depending on the available infrastructure and individual hospital environment. In Germany, for example, diagnostic peritoneal lavage has almost entirely been replaced by ultrasound. Today, Focused Abdominal Sonography for Trauma (FAST) is the routine, first-line, diagnostic procedure in almost every shock room. Additionally, in this and other ultrasound procedures the real work horse in any shock room is computed tomography (CT). Almost 75% of all trauma patients undergo a usually contrast-enhanced whole-body CT.

In the past decade the time-to-CT has been reduced from 40 to 20 minutes. In Germany, however, the costs for having both technology and staff on stand-by are neither recorded nor reflected in the diagnosis related groups (DRGs). In 2006, the German Trauma Network (TraumaNetzwerk DGU) was established to counter the reimbursement gap in polytrauma care, the reduc-

tion of staff in trauma departments and the care providers' increasing focus on plannable and thus lucrative care options.

These networks, as Professor Bertil Bouillon, Cologne (Germany), President of the German Trauma Society, explained, managed to secure qualified care of acutely injured patients across the country. Today, the 'relay' of the different care systems from the site of the accident to a rehab centre can well be called high-end care, which not merely saves patients' lives but also ensures the best possible quality of life later on.

According to Bouillon, it is the successful network structure that enables ambulance services, hospitals and rehab centres to provide such high-quality services. Like Professor Marzi before him, and moving beyond any professional turf wars in Germany, Bouillon acknowledged the crucial role of the trauma surgeon. However, despite the many improvements, a European-wide high standard of trauma care remains pie-in-the-sky as long as regions exist where accident victims have to be carried to the next hospital in a donkey cart.



designed and highly standardised procedures. Certified trauma centres comply with the care algorithms defined in the Advanced Trauma Life Support (ATLS) programme, including the so-called ABCDE process, a step-by-step diagnostic assessment,

Primary assessment and networks

Trauma care: the alpha and omega in emergency

Recently, ways to improve trauma care, particularly the care of acutely injured victims of traffic accidents, was discussed by international experts gathered at the World Trauma Congress (held in Frankfurt/Main, Germany). During our EH interview, Professor Luke Leenen, President of the European Society for Trauma and Emergency Surgery (ESTES) and Director of the Trauma Clinic at Medical University Utrecht, provided an insight into innovative approaches and concepts in trauma care.

EH: Is computed tomography the modality of choice in primary trauma assessment?

L PH Leenen: 'Absolutely! However, we have to strike a balance between the quick overall assessment with the help of CT and the primary assessment, because an acutely injured person who might have bleeds has to be treated as quickly as possible. CT might take too much time, particularly if the radiology department is far away. Every individual hospital decides whether a patient undergoes a CT scan, or whether an ultrasound exam will be performed because immediate surgery is required.'

Today, a CT exam takes only a few minutes...

'The problem is not the CT as such but the transportation of the patient. In general, a trauma patient is taken to the emergency department from



A CT in emergency rooms optimises the logistics around the patient

where he or she is moved to the CT room in the radiology department. This may take half an hour, even an entire hour – time a severely bleeding patient simply does not have. That means the logistics around the patient should be optimised and, ideally, every emergency department would be equipped with CT; but, even in a facility like ours in Utrecht, this set-up was introduced only a few years ago for a CT scan to be obtained right away from every trauma patient with very low blood pressure.

'There is an increasing consensus that CT plays a crucial role in primary trauma assessment. According to the German Trauma Register, recovery of trauma patients was much better among those who underwent

a CT scan as a first-line measure recovery process, compared to those who did not have a CT.

Optimum care of severely injured people depends, to a high degree, on organisation and workflows. Where is this particularly visible?

'Today the trend is towards regionalised care of trauma patients to ensure best possible care. Hospitals – along with all players involved when an emergency occurs – are grouped by regions. They jointly decide to which facility an accident victim should be taken and where the quickest care is available. In Germany and the Netherlands, these trauma networks are well established and in Great Britain they are being discussed. It's important

to create these networks because not all acutely injured people need the same degree and type of care. Thus, directly at the accident site, a triage system is applied that helps to categorise the patient, who will then be taken to a hospital providing level 1, 2 or 3 care. Very severely injured patients usually require 24/7 multidisciplinary care, which not every facility can provide. An accident victim with a severe head injury should be taken, as quickly as possible, to a hospital with neurosurgery expertise and someone suffering several injuries should be treated by several physicians. Each type of injury is covered in such an emergency system.'

Does such cooperation work across borders – say, between the Netherlands and Germany?

'Yes. The EU co-funded a partnership effort between the border towns of Maastricht and Aachen. An accident victim in the Netherlands may well be taken to a German hospital because it's closer. The European Society of Trauma & Emergency Surgery (ESTES) has established a committee to promote cross-border cooperation.'

What role do trauma networks play in post-accident surgical care?

'That will depend, to a large extent, on the future training of surgeons. Until recently, Germany had well-trained trauma surgeons who were

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Subscriptions

Janka Hoppe, European Hospital,
Theodor-Althoff-Str. 45, 45133 Essen, Germany

Subscription rate

6 issues: 42 Euro, Single copy: 7 Euro.

Send order and cheque to:

European Hospital Subscription Dept

Printed by: WVD, Mörfelden-Walldorf, Germany

Publication frequency: bi-monthly

European Hospital ISSN 0942-9085

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CT is still the *be all and end all*

At this year's meeting of the German Radiological Society (DRK), Dr Mathias Langer, Head of the Radiology Clinic at Freiburg University Hospital and the society's 2013 President, assured EH that CT is still the *be all and end all* in trauma surgery. 'As yet,' he explained, 'there is no alternative for the care of acutely injured patients, and there's a simple reason for this. Taking conventional X-ray images is considerably more time-consuming than CT. Also, modern CT systems are now so good that radiation exposure is almost no issue at all these days...'

... although this procedure was also being performed before this was the case.

'Yes. And the third reason, which also explains why this procedure was being used before, is the type and amount of information it delivers about patients that cannot be obtained with conventional radiology. This starts with the classic diagnosis of epidural or subdural haematoma, assessed with the help of CT for the last 20 years, and extends to vascular lesions in the thorax and abdomen/pelvis, injuries to the liver and spleen, as well as spinal injuries such as vertebral fractures, which, during repositioning of a patient, can potentially cause paraplegia. CT with contrast agents provides a clear diag-

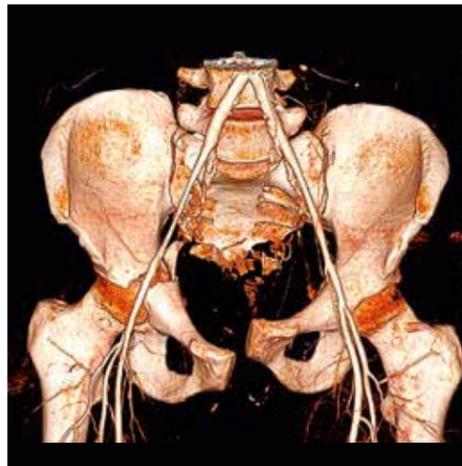
nosis for arterial or venous injuries in the pelvic area or the legs so that, for example, imminent haemorrhagic shock from a pelvic fracture can be detected. Radiological intervention can then quickly help the patient.'

What are the current drivers in this field if there are no technological challenges?

'To say that there are "no technological challenges" would be an exaggeration. A topical point at the moment is the immediate integration of the CT unit with the A&E department



Prof. Mathias Langer, head of the radiology clinic at Freiburg University Hospital, Germany



Female motorcyclist who collided with a motor vehicle



– in other words, a reduction in the amount of time wasted due to long distances between the resuscitation room and CT. Furthermore, there are still many systems in clinical use that do not meet current demands in this highly technological field, i.e. the initial and immediate diagnosis of bones, soft tissues and the entire vascular system in just one examination taking less than half a minute for data acquisition.'

Down to the awkward question of money, is that correct?
'Yes, of course.'

How can you manage without a system that can do all this in under a minute?

'With good anaesthesia, good patient monitoring and optimal timing of the various examinations, i.e. with excellent interdisciplinary cooperation based on standard operating

procedures jointly established by the team. This ensures that the patient can be monitored and cared for in the best possible way, and that a timely diagnosis is achieved despite longer examination times. Without good organisation even the most up to date technology does not really help.'

* Reprinted from RÖKO HEUTE 2014

Arietta: advanced functions, higher image quality and highly mobile

Ultrasound steps up for emergencies



Prof. Luke PH Leenen studied medicine at Radboud University in Nijmegen in 1982, earning his PhD in 1985 with neuroanatomical basic research involving electron microscope analysis of the pyramidal tract of the rat. In 1999 he became staff surgeon for Trauma and Intensive Care at the Utrecht University Medical Centre (UMC). Director of Surgical Intensive Care since 2005, today he heads the Emergency Department and Major Incident Hospital (Calamiteitenhospitaal, located in the UMC). A founding board member and secretary of the European Trauma Society (currently ESTES), Dr Leenen is now the society's past-president.

called upon for all types of trauma and who provided integrated care. No matter whether the trauma concerned the thorax or abdomen, pelvis or limbs – the trauma surgeon performed the operation. 'However, the number of traffic accidents with acutely injured patients has been declining in the past year, creating a problem for trauma surgeons. It may be, for example, that a trauma surgeon has never performed a thorax operation simply because he never had to do it – thus he has neither the experience nor routine. Yet, today a surgeon can no longer be a generalist who performs any kind of operation; so, it's extremely important to establish trauma centres that provide multi-disciplinary care.'

Report: John Brosky

You never know what you're going to see in the Emergency Department (ED); but, more and more the first evaluation of a trauma patient's condition will be with ultrasound.

It is easily the most portable and accessible imaging technology, perfectly adapted for the front line of healthcare where 'fast' is the first requirement. Simply put, the conventional diagnostic imaging modalities of computed tomography (CT) or magnetic resonance imaging (MRI) take too long and put patients at risk by requiring that they are transported away from close monitoring in the ED and, in addition, expose them to radiation in the case of CT, or sometimes toxic contrast agents in the case of MRI.

Now Hitachi Aloka, one of the pioneering companies to introduce an ultrasound platform, has built a new system called Arietta from the ground up, to bring advanced

functions and higher image quality in a lighter, highly mobile platform to give a greater range of tools to people on the front line in the ED.

'This system can go anywhere in the hospital, and we use it routinely in my area for abdominal exams, but it can also be used in Emergency because it makes it much easier to have a higher confidence for diagnosis,' explained Fabrizio Calliada MD, professor of radiology at the University of Pavia who practices at the San Matteo Polyclinic.

The most routine, and critical, exam in the ED is called FAST (focused assessment with sonography for trauma), which seeks to rapidly detect any bleeding in the peritoneal, pleural, or pericardial regions. Anyone trained in this exam is going to see and decide faster, thanks to the higher image resolution and the new abdominal transducer on the Arietta system, said Calliada. 'It is the first thing that needs to be done, and this probe

makes it very easy to do that.'

These capabilities come from a re-engineering of the ultrasound architecture, which combines proprietary technologies for multi-layered crystal transducers that send and receive the sonic pulses with minimal energy loss, increasing both sensitivity and image clarity. The Compound Pulse Wave generator shapes waveforms to increase the signal to noise and enhance resolution. Unique technology for pixel focusing provides an industry-leading delineation in the region being studied.

The more advanced functions available on the Arietta platform for ED staff would come into play during follow up exams once a patient has stabilised after treatment.

Calliada cites as an example – contrast-enhanced ultrasound exams that can now be more confidently performed in the ED. 'Contrast creates the possibility to see trauma, to see lesions inside the parenchyma, or the liver or spleen, or else to



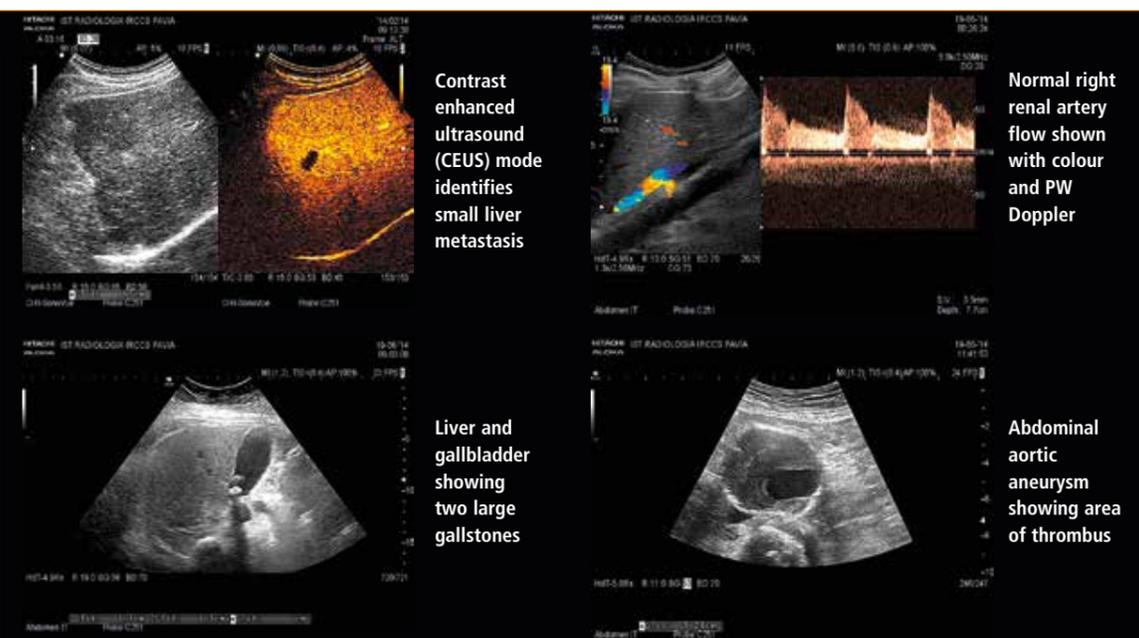
Fabrizio Calliada MD, professor of radiology, University of Pavia

confirm or clarify the nature of any injury to internal organs. It becomes easier to detect with this advanced system than with a baseline ultrasound system.'

Other trauma patients who could benefit from this exam include younger patients, as it can avoid the need in some specific conditions for a CT exam, such as in the case of a child with an abdominal injury who is not otherwise in trauma.

A specialist in abdominal exams, who sees up to fifty patients on some days, the professor said his own preference for the Arietta system is with the new transducers. 'I do a very specific exam of the renal arteries that requires very deep penetration with ultrasound. Excellent image quality and very good Doppler, even at very low frequency, is mandatory. With Arietta, this exam becomes possible because it provides very clear images, even when we are going very deep, which is required more and more because in everyday practice it's becoming common to see patients who are larger, even obese.

'Previously we would use MRI, of course, but it's so expensive we can now turn to ultrasound because we can capture images easily, even in the largest patients. It provides a very good alternative.'



Contrast enhanced ultrasound (CEUS) mode identifies small liver metastasis

Normal right renal artery flow shown with colour and PW Doppler

Liver and gallbladder showing two large gallstones

Abdominal aortic aneurysm showing area of thrombus

Around 5.9% of Western Europeans suffer bronchial asthma

Air trapping and variations in ventilation

Imaging procedures are rarely used to diagnose and treat asthma – but this may well change in the future.

'Asthma is a disease that primarily is clinically diagnosed. Despite this fact, in some cases radiology does come into play,' says Dr Helmut Prosch, at the University Clinic for Radiology and Nuclear Medicine in Vienna's Medical University.

Imaging procedures are mainly used to obtain a differential diagnosis, as the typical symptoms of asthma – shortness of breath, coughing, breathlessness – can also be caused by other diseases with a similar clinical picture, for instance by tumours such as carcinoids in the tracheobronchial system, or by aspirated foreign bodies. Therefore, bronchial asthma patients who do not respond to asthma medication are examined with X-ray or CT to investigate symptoms further.

In patients with known allergic asthma whose condition is clinically deteriorating, a chest X-ray can show whether or not there may be a concomitant disease, which could explain an aggravation of the symptoms, such as pneumonia, pneumothorax or atelectasis. Atelectasis resulting from an obstruction of the bronchial tubes due to retained secretions is particularly easy to diagnose in this way: 'CT is then also important for the clarification of the same issues,' says Prosch.



Coronary CT of a 16-year-old patient suffering an asthma attack. Most noticeable are areas in both lungs affected by air trapping – evidence of diseased small airways

Furthermore, CT is also used to diagnose other concomitant diseases such as allergic bronchopulmonary aspergillosis or eosinophilic lung diseases with similar symptoms.

In fact, 'Asthma and imaging' is a red-hot research topic, as Prosch

reports: Currently some international research groups are investigating to what extent MRI, Single Photon Emission Computed Tomography (SPECT) and the hybrid procedure consisting of Positron Emission Tomography and CT (PET/CT) can be

utilised to monitor treatment success.

CT can, for example, help to quantify so-called air trapping – a phenomenon that occurs in asthmatic patients, where air cannot be expelled because of narrowing of the small airways. 'Measuring lung function does



Assistant Professor Helmut Prosch heads the Thoracic Radiology Department at the University Clinic for Radiology and Nuclear Medicine, in Vienna's Medical University. Having gained his medical degree in Brixen, South Tyrol, he became a research assistant at the Research Institute for Children with Cancerous Diseases at St. Anna Children's Hospital, Vienna. Following radiology training, in 2010 he was appointed head of department at the University Clinic for Radiology and Nuclear Medicine, where he wrote his habilitation in radiology. Dr Prosch's focus is on the diagnosis and staging of lung cancer, tuberculosis and pulmonary fibrosis.

not always reflect regional differences in the lungs,' Prosch explains. CT can also be used to quantify the widening of bronchial walls in the large airways, which is associated with asthma.

With the help of suitable sequences and contrast gases, which have to be inhaled (hyperpolarised helium, xenon), MRI can quantify ventilation differences in the lungs. 'It allows us to examine how these ventilation differences correlate with regional differences in perfusion,' the Austrian radiologist explains. These differences can be used to check if and where inhaled medication has an effect. ■

UK's first Specialist Emergency Care Hospital takes shape

Report: Mark Nicholls

The UK's first Specialist Emergency Care Hospital is on target to open for the first patients in 2015. The new 210-bed hospital, in northeast England, will be the country's first dedicated to providing emergency care, with A&E consultants tending seriously ill or injured patients 24/7, from among the 500,000 people of North Tyneside and Northumberland.

Run by Northumbria Healthcare NHS Foundation Trust (and part of the trust's £200 million healthcare investment), a consultant will see a patient on arrival at the hospital.

Diagnosics are located within the emergency care department, enabling consultants to obtain test results quickly and then transfer the patient to a specialist in their condition.

Once a patient's condition improves, they will be either sent home or transferred to a nearby district general hospital for on-going treatment. It is expected that there will be 40 to 70 Major Emergency Centres across the UK as part of a process that has also seen the creation of a network of Major Trauma Centres across the country.

Recently, Sir Bruce Keogh, NHS Medical Director and author of the recent Urgent and Emergency Care



NHS Medical Director Sir Bruce Keogh in front of the Northumbria Specialist Emergency Care Hospital construction



Review, performed the topping out ceremony by sealing the hospital roof, a facility in line with his Urgent and Emergency Care vision. This called for larger Major Emergency Centres with the right facilities and

expertise to maximise chances of survival and good recovery.

There are still walk-in A&E units at Northumbria's smaller hospitals and a top tier of the Major Trauma Unit in Newcastle, while patients

with specific suspected conditions, such as heart attack, go direct to units offering percutaneous coronary intervention (PCI).

The trust runs six district general hospitals and six community hospitals, with 1,100 beds spread over a wide geographical area.

Separating emergency care from planned operations and tests will benefit patients attending Northumbria's general hospitals and could result in fewer elective procedures being cancelled due to emergency admissions.

As David Evans, Medical Director of Northumbria Healthcare NHS Foundation Trust, explained, 'Our existing hospitals were in completely the wrong place for the modern service we wanted to provide, so we decided the way forward was to build something different and look at different ways of working. The new hospital is a product of our geography.'

'The move has also allowed us to redevelop our existing hospitals from six- to four-bed bays with en suite facilities and extra single rooms and to redevelop community hospitals.'

'We will have the same number of beds, but they'll be distributed differently and used more efficiently.'

'Our specialists are already working seven days a week,' Dr Evans



David Evans, medical director of surgery and a practicing consultant obstetrician for Northumbria Healthcare NHS Foundation Trust, was previously clinical director of obstetrics and gynaecology. He is also the trust's lead for risk management and an assessor for the National Clinical Assessment Authority

explained. 'This new hospital provides us with an opportunity to further develop our seven-day working model.'

Construction began in 2012 and the hospital will have a state-of-the-art A&E unit, hi-tech diagnostics, critical care, short-stay paediatric unit and a consultant and midwife-led maternity unit.

Representatives from several other UK hospital trusts have visited the site and are following progress. ■

Ultrasound use in airway management

Ultrasound is playing an increasing role in the management of the upper and lower airways, particularly in interventional procedures and emergency situations. It is also used to enhance patient safety, **Mark Nicholls reports**

Dr Michael S Kristensen, Head of Anaesthesia for ENT and maxillo-facial surgery at Denmark's Rigshospitalet, is pioneering the new and expanding role of ultrasonography in clinical decision-making, intervention and management of the upper and lower airways in a way that is clinically relevant, up-to-date and practically useful for clinicians.

Dr Kristensen has shown how ultrasound is becoming essential in the management of the upper and lower airways; its use can identify tracheal structures and it is offering a primary diagnostic approach in the suspicion of intraoperative pneumothorax.

'A few years ago, ultrasound was not applied at all for airway management. Now, it is used for a whole range of activities,' he explained.

These include screening and prediction of difficult airway management; diagnosing pathology that can affect airway management; identification of the cricothyroid membrane; measuring gastric content prior to airway management; airway related nerve blocks, and prediction of the appropriate diameter of endotracheal, endobronchial or tracheostomy tubes.

Tracheal and oesophageal intubation

Other areas where ultrasound has shown airway management value is in differentiating between tracheal and oesophageal intubation; differentiating between tracheal and endobronchial intubation; confirmation of gastric tube placement; differentiating between different causes of dyspnoea/hypoxia and pulmonary oedema; and prediction of successful weaning from ventilator treatment.

'In interventional procedures or emergency situations the major roles of ultrasound include the localisation of the trachea and the cricothyroid membrane *before* anaesthesia, so that the clinician will know exactly *where* to perform an emergency cricothyrotomy/tracheostomy in case that becomes necessary, and confirming or ruling out a suspicion of an intraoperative pneumothorax before the placement of a pleural drain-tube.'

Ultrasound also confirms whether the endotracheal tube actually enters the trachea or accidentally enters the oesophagus, evaluates

stomach contents and lung-pathology to distinguish between which treatment modalities that are needed and identifies the localisation of the appropriate tracheal level for dilatational tracheostomy or surgical tracheostomy.

The fastest method for pneumothorax

Ultrasound is essential in upper and lower airways management because several indications cannot be per-

formed in a clinically acceptable way, he explained. 'For the primary suspicion of a pneumothorax, ultrasound is by far the fastest method, and it has a much higher sensitivity than an anterior-posterior X-ray in the supine patient. A CT-scan is slightly more precise but is often delayed and is almost impossible to obtain in the intraoperative setting,' he pointed out.

'For clinicians, the benefits are an immediate diagnosis and hands-on

guidance in real time, whilst for patients it means faster and safer diagnosis and treatment in relation to airway management.'

For hospitals, ultrasound in airway management is faster and cheaper than X-ray and CT and can lead to better outcome of dilatational tracheostomy and better outcome and potentially lower mortality when the patient needs emergency surgical airway management.



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Dr Wendy Teoh (left) and Dr Michael Kristensen pioneer ultrasound use in airway management through research, publications, lectures and hands on training internationally

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ALOKA
illuminate the change

UK researchers focus on ventilator weaning techniques

Report: Mark Nicholls

Research being conducted in the United Kingdom is focusing on techniques to help improve the weaning process for patients coming off mechanical ventilation in hospital intensive care units.

Weaning is a fundamental part of intensive care practice for patients that required intubation but while hospitals across the UK have individual strategies for weaning, there are at present no defined national guidelines.

Dr Andrew Bentley, consultant in intensive care and respiratory medicine at University Hospital South Manchester National Health Service (NHS) Trust, said: 'many of those local guidelines will be similar, but there are different strategies and approaches to reduce support from ventilation. 'A factor behind there being no definitive national guideline within the UK is because we still need to understand the position of various aspects of interventions within the weaning process.'

However, research projects are examining ways to improve outcomes and reduce the time it takes for patients to come off ventilation, explained Dr Bentley, who is chair of the Intensive Care Society (ICS) Research Committee. The ICS is the representative organisation in the UK for intensive care professionals as well as patients.

One ICS supported study is BREATHE, which is a pragmatic, multi-centre randomised controlled trial led by Professor Gavin Perkins of Warwick University, Coventry, and designed to evaluate the clinical benefits and cost effectiveness of non-invasive weaning.

Invasive versus non-invasive ventilation

That follows a systematic review in 2009 which suggested use of non-invasive ventilation to wean critically ill adults off invasive ventilation was associated with decreased mortality and other clinical benefits, however, the net clinical and cost effectiveness compared to other weaning strategies remained uncertain.

Dr Bentley suggested there is some evidence that non-invasive ventilation – delivered through a mask rather than an endotracheal tube or tracheostomy – has benefits for groups with underlying respiratory conditions such as chronic obstructive pulmonary disease.

Patients with acute respiratory failure often require invasive ventilation to unload the respiratory muscles and support gas exchange, though invasive ventilation used over a prolonged period of time might lead to complications including ventilator associated pneumonia and increased morbidity. Resulting from that experience, a clinicians

aim to minimise the duration of invasive ventilation.

The consensus document

A 2007 consensus document from the European Respiratory Journal on 'weaning from mechanical ventilation' divides patients into 'simple, difficult or prolonged' withdrawal from ventilation and recommends weaning should be considered as early as possible and that a spontaneous breathing trial be used as the major diagnostic test to determine whether patients can be successfully extubated. Within the United Kingdom there is a common recognition of the document, despite variations in approach, and NHS England has also recognised the need for specialist weaning units for those patients who are difficult to wean within an acute intensive care environment.

Weaning in UK practice

Dr Bentley pointed out: 'By far the majority of patients in an intensive care unit are weaned relatively quickly, within the first few days, and the percentage left on prolonged ventilation is relatively small, about 10-15%, but they are the patients that take up a huge amount of resource.' He said the key challenge for clinicians is in understanding the pathophysiology of the weaning process, recognising the underlying co-morbidities and starting the

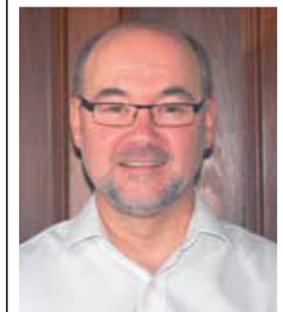
weaning process as early as possible, following resolution of the underlying presenting condition to intensive care.

'Patients that are usually more difficult to wean are those with pre-existing co-morbidities such as cardiac conditions or respiratory disease and those who develop critical illness acquired weakness affecting peripheral nerves and muscles. That is why it is important to have a multi-disciplinary approach through the medical, nursing and allied health professionals within the ICU to address the weaning process.'

Dr Bentley acknowledged that intensive care practices have evolved and improved over recent years, but research supported by the ICS is helping specialists to understand more fully how to manage and improve outcomes better for their patients in intensive care, for example, those with severe sepsis and ARDS (acute respiratory distress syndrome).

Multi-disciplinary approach

The introduction of a ventilator care bundle aims to reduce ventilator-associated pneumonia, associated morbidity, mortality and length of time spent on a ventilator. It includes a number of interventions that when used together can improve outcomes for patients. These include elevation of the head of the bed, daily sedation breaks



Dr Andrew Bentley is a consultant in intensive care and respiratory medicine with the University Hospital South Manchester NHS Trust and Honorary Senior Lecturer at the University of Manchester, sits on the Intensive Care Society (www.ics.ac.uk) council, and is chairman of its research committee. His respiratory research includes involvement in the BREATHE study and a number of other multi-centre intensive care trials, and he is involved in an on-going study looking at diaphragmatic pacing for patients with Motor Neurone Disease (DiPALS).

and assessment of readiness to wean/extubate, deep vein thrombosis and peptic ulcer prophylaxis and daily oral care. Regular screening for respiratory infection, early recognition of ventilator associated pneumonia, and daily assessment of sedation and readiness to wean can reduce the length of time spent on ventilation, he said. ■

Aerogen's drug delivery system aids patients in inhalation therapy

ICU-quality respiratory technology enters home care

John Power is breathing easier after agreeing to let the Philips Home Healthcare deal with the complex and competitive consumer market for medical technology.

With a sharp focus on providing nebulisers in respiratory ventilators for intensive care units (ICUs), the CEO of Aerogen (Galway, Ireland) said he was never really enthusiastic about the home care market.

For customers in the pharmacy, 'we are just another box on the shelf without a recognised brand name. Customers do not know about our company or why this nebuliser is better,' said Power. Now with Philips, they will have better product knowledge as well as a powerful brand name they trust, he added.

The therapeutic benefit of Aerogen

According to Brent Shafer, the CEO for Home Healthcare at Philips, 'Inhalation therapy plays a key role in treating chronic respiratory problems, and I believe that with Aerogen's technology we are further expanding on our promise to improve people's lives through meaningful innovation.'

Nebulisers, the devices that produce a spray to help inhale medication, often use compressed air or ultrasonic waves to break up drugs into small droplets that can



John Power, CEO of Aerogen

be inhaled from the mouthpiece of the device. Aerogen nebulisers, however, have a vibrating mesh that turns liquid medication into a fine particle mist, to gently deliver drugs to the lungs of critically ill patients.

This novel technology can be found on ventilator platforms for critical care in more than sixty-four countries, from companies such as GE Healthcare, Draeger, Covidien and Philips.

'Virtually all major manufacturers of ventilators have the Aeron nebuliser as part of their new systems,' Aerogen's CEO pointed out. 'Today we are recognised as the gold standard for aerosol delivery in acute care ventilation.' Unlike customers in a pharmacy looking for inhalation devices, he added, ICU clinicians understand the therapeutic benefit

of Aerogen technology for patients.

In November 2013, Aerogen received the prestigious Zenith Award presented by the American Association of Respiratory Care (AARC), in recognition that the company's patented technology has revolutionised aerosol delivery, reducing drug costs and improving patient care.

Important new products for acute care coming up

The technology licensing agreement will allow Aerogen to leave the challenging consumer marketplace to consumer products giant Philips and better focus on its goal of expanding its core work in the acute care setting. Power explained that the company has several important new products to release in 2014.

Meanwhile, Shafer at Philips Home Healthcare, said the agreement would expand its range of home care nebulisers, with Aerogen technology an important component of advanced nebulisers. For Philips the aim is consistency for respiratory patients from critical care in hospital to their homes.

Previously, Aerogen and Philips collaborated to develop NIVO, a customised application of the vibrating mesh nebuliser to use with Philips' oro-nasal masks as a non-invasive ventilation technique. ■

Hygiene management

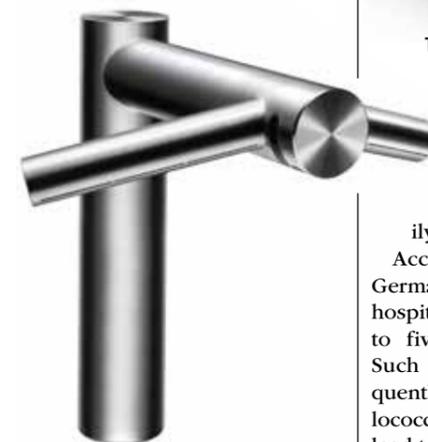
Studies show turbo hot air dryers are a 'potent

Report: Anja Behringer

'Better hygiene' is the frequently and loudly recommended panacea in the intensifying struggle against hospital-acquired infections (HAIs). However there are currently no evidence-based studies that evaluate the efficacy of additional hygiene measures. In view of fragmented research and ambiguous results, hospitals stick to the tried and trusted: strict hand hygiene. Nevertheless, while theoretically the importance of hand hygiene to avoid spreading bacteria has been known for decades, in practice it somehow has failed to become anchored in people's minds. With



The latest product line: Dyson Airblade Tap (left), Dyson Airblade V (top) and Dyson Airblade dB (right)



the known results: infections occur that could easily have been prevented.

According to recent studies, German hospitals have to expect hospital-acquired infections in three to five percent of their patients. Such nosocomial infections, frequently with multi-resistant staphylococcus aureus (MRSA), not only lead to longer hospital stays but also

Blown Away!

Studies show turbo hot air dryers are a 'potential disaster'

Even though a lot of us don't do it, let's say you know that washing your hands is the first, and the best thing, you can do to stop sharing nasty bugs that are especially dangerous for patients.

And you know you should use soap, right? Because more than half the people who actually do rinse their hands in the washroom don't bother using soap.

Congratulations if you know this, and thanks for your help on the front lines of infection control.

Now Roberto Berardi would like to tell you something you may not know. Drying your hands is not only the last step in this exercise, it is critically important way to be sure deadly pathogens do not leave the washroom when you do.

He will also tell you to step away from those high-tech jet-speed hand dryers, which he calls bluntly, 'a disaster for hand hygiene'.

'The first principle is that paper towels absorb pathogens, dryers spread pathogens,' he said. 'This is not a matter of opinion. Once your hands are wet, the water has to go somewhere. Either it goes into a tissue that absorbs it, or it is partly dried by a jet of air that necessarily blows away micro droplets that need to go somewhere. They go off your hands and into the air!'

Berardi is the Chairman for a group with the curious name European Tissue Symposium (ETS) that studies how people wash up after using the toilet. If you have seen people



in white lab coats standing around the washrooms taking notes, that was the team from the University of Westminster who carried out a study on hand washing and drying behavior in public washrooms.

'It is not simple to measure adherence to guidelines on hand hygiene,' Berardi told *European Hospital*. 'There is direct observation, of course, which remains the gold standard. We can conduct surveys. We can also measure how much soap has been consumed or the amount of paper towels used. Each of them has some merit, but there is also a lot of interpretation.'

Recently he introduced a more scientific approach for ETS by shifting its focus from people to the patho-

gens they rinse off in the sink. At the ISSA/INTERCLEAN Trade Fair for Cleaning Professionals in Amsterdam this Spring two leading microbiologists specialised in healthcare associated infection delivered their findings from a pair of studies commissioned by ETS.

Mark Wilcox MD, Professor of Medical Microbiology at the University of Leeds & Leeds Teaching Hospitals, and Keith Redway from the Department of Biomedical Sciences at the University of Westminster, revealed the number of bacteria that remain on people's hands after washing is markedly higher and that high-speed jet dryers contaminate the washrooms where they are installed.

Both studies have been submit-

ted to peer-reviewed journals. As a result, Berardi said ETS is not able to yet share detailed findings from the studies. He did release some of the top level data in an announcement.

- Drying hands with conventional warm air dryers, the total number of bacteria actually was found to increase on average on the finger pads by 194% and on the palms by 254%.
- With jet-air dryers bacteria count increased on average on the finger pads by 42% and on the palms by 15%.
- Drying hands with a paper towel, the total number of bacteria was reduced on average on the finger pads by up to 76% and on the palms by up to 77%.

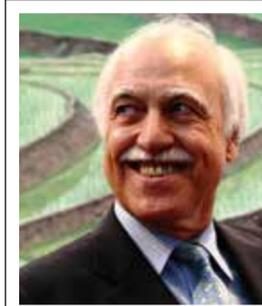
Blasting air at speeds of up to 500 kilometers per hour, jet air dryers blew micro droplets carrying micro-organisms up to two meters away. The model used to simulate viruses showed transmission from the hands up to three meters away.

Conventional warm air hand dryers spread airborne micro-organisms up to 25 centimeters from the dryer while paper towels showed no significant spread of micro-organisms, according to ETS.

Prof. Redway studied what he called vertical height dispersal patterns for hot air dryers where Zone One was at the level of an adult's head.

'We found that most of the contamination occurred in Zones Three and Four, which is where a child might be standing if it were waiting for its mother or father to dry their hands,' he said.

ETS is continuing to support research in an effort to clear up what Berardi calls misconceptions about hand hygiene. As an example he cites a survey that showed men in England believe hot air is the most hygienic



Roberto Berardi, Chairman of the European Tissue Symposium (ETS)

method because only clean air touches their hands after washing.

Hand washing is integral to breaking the cycle of transmission of harmful pathogens in healthcare from hospitals to nursing facilities to patient care at home, he said.

'People say that they don't have time to wash up before seeing patients, but the demands on their time will only increase if there is a cross contamination among patients,' he said. 'This excuse is far from acceptable. We need greater awareness, a fuller understanding of not adhering to these standards.'

Education is not a strong enough word for what Berardi would like healthcare administrators to do.

'We need continuous internal marketing, posters everywhere inside the hospital,' he said. 'There is a good awareness among people working directly with patients, yet other people inside the hospital may need more convincing of the importance of this issue and that guidelines have been established.'

'After that we need to monitor adherence, feedback on everything that is measured. What is not measured is not done,' he added.

So watch for the people in the white coats, coming soon to a washroom near you.

Awareness must rise and people's habits change

ers are not enough

ial disaster' in infection control

increasingly cause sepsis, an often fatal condition, also associated with significant economic damage.

According to Jena University Hospital, 154,000 new cases of sepsis are reported annually in Germany alone and, with 60,000 patients who die of sepsis, the condition ranks third in causes of death, after cardio-vascular diseases and cancer.

Worldwide a patient dies from sepsis every three to four seconds, it kills more than six million infants and young children and 100,000 new mothers every year (www.world-sepsis-day.org). And, particularly disconcerting: during the last ten years, the number of hospitalisations for sepsis doubled as the US Centres for Disease Control reports.

Studies have shown that 20 to 30 percent of these infections could have been avoided by carefully designing workflows and by adequate hygiene measures.

While there are no statistics on the number of chronically ill

patients also carrying MRSA upon hospital admission, studies do indicate that this is significant. Due to the multimorbidity of an ageing population, with frequent hospital stays, there are hygiene-relevant relationships between the patients' different locations.

New techniques show hygiene flaws

Today microbiology and hygiene are inseparable. Be it in healthcare facilities or restaurants, hospital wards or kitchens, the body of rules and regulations is ever growing and has led to the development of the profession of 'hygiene manager', who supervises compliance in care homes and hospitals.

In a hospital, the hygiene manager's job description entails developing policies and guidelines, training and advising staff and controlling crucial workflows and procedures in order to reduce the number of hospital-acquired infections.

The aim is to decrease the number of cases of pneumonia, wound infections, sepsis and urinary tract infections, which all contribute significantly to extended hospital stays and rising costs. Therefore, strict hospital hygiene not only makes medical sense, but also makes financial sense – a must in the era of DRG. Hygiene is part of a hospital's quality management and thus

should be communicated clearly on the hospital website and in other institutional publications.

About 70 hygiene managers cover roughly 2,000 German hospitals. According to the new Infection Protection Act, which has been in force since 2011, their task is to develop and implement hygiene plans. Qualification and certification, however, remain major unresolved issues.

Hygiene has been on the healthcare agenda for a long time and theoretically everybody knows what needs to be done. However, as long as handshakes are common and the most basic hygiene measure are not implemented due to lack of time and personnel, the best certification won't help. The German Hospital Federation responded to an inquiry with a terse statement: 'We do not see how the number of hygiene managers needed can be trained in the immediate future.'

To raise infection awareness, the hygiene manager at the Teaching Hospital of the University Witten/Herdecke founded a hygiene working group. A hygiene specialist monitors compliance with the guidelines, from the quantity of disinfectants used, to strict uniform regulations, particularly in the intensive care unit and operating theatres, and the isolation and antibacterial care of MRSA patients.

In Germany, comprehensive recommendations on effective

hygiene measures are urgently needed. Hospital hygiene managers in Baden-Württemberg suggested developing different hygiene standards depending on the type and level of resistance and type of in-patient care being provided. Categories could include standard hygiene measures, second-level hygiene measures covering white coats, gloves, patient-related care utensils and private washrooms (isolation) and single-occupancy room and cohort isolation. Responsible administration of antibiotics plays as much a role in such scenarios as strict hand hygiene compliance.

Modern devices also help all parties to maintain hygiene standards. For example, Dyson, the British manufacturer, offers a new generation hand dryer that complies with the strict HACCP bacteriological rules. The touch-free 'hands-in' Airblade, launched this year, features new technology that removes bacteria, avoids spray water, is fast (15 seconds) and dries hands in a skin-friendly way. The Airblade does not blow contaminated air into the washroom and, unlike paper towels, does not generate wet and used towels in open bins, which emit additional bacteria. EH asked Richard Mallett, Managing Director of HACCP Europe, whether the Dyson Airblade complies with highest hygiene standards. 'The device is fitted with a HEPA filter, a bacteria filter that captures bacteria from the air before it's blown onto the hands. Thus the air that's used to dry the hands is of better microbiological quality than the ambient air sucked in by the device. Moreover, hand



Richard Mallett, Managing Director HACCP Europe

dryers that do not warm up the air might have an additional advantage: they reduce the likelihood of bacteria proliferating inside the device. And surfaces that are treated with an antibacterial coating significantly reduce bacterial colonisation.'

Current hygiene standards

'The EU rules do not prescribe a certain procedure to dry hands; they only require hands to be washed and dried in a hygienic manner with drying being the important factor, since wet hands lead to further contamination,' Mallett explained. 'Conventional hand dryers have a lower air volume and weak air rush.'

Time, EH pointed out, is an issue. Grabbing a paper towel is quicker than using an air dryer, Mallett: 'We examined and evaluated different devices and materials for use in sensitive hygiene environments, inter alia hand dryers. To date, we have issued a single worldwide approval for hand dryers: for the high speed Dyson Airblade, which uses non-heated, HEPA-filtered air to dry hands in 10 to 12 seconds.'

HIAs could kill around 37,000 Europeans this year

Nosocomial infections

Pay-for-

Report: Moira Mizzi

More than four million people acquire a healthcare associated infection (HAI) in the European Union (EU) annually; of these 37,000 die as a direct consequence of the infection, according to a European Centre for Disease Control 2008 estimate.

The core competencies that infection control and hospital hygiene managers need centre around programme management, quality improvement, surveillance and investigation of HAIs and infection control activities, such as decontamination and sterilisation of medical equipment, implementation of infection control procedures, reduction of antimicrobial resistance (AMR) and control of environmental sources of infections.

The implementation of such protocols has produced tangible results in many medical centres throughout the EU, but has also unearthed evidence of malpractice in others.

In England and Wales, the national cleanyourhands campaign, rolled out in 2005 in 187 National Health Service (NHS) Trusts, reduced MRSA and *Clostridium difficile* infections by half; the installation of antimicrobial copper touch surfaces in the Centre Hospitalier de Rambouillet in Paris, three years ago, also aimed at reducing such infections, especially in high risk areas such as paediatric wards and intensive care units.

However, a 2012 survey to measure current methods and attitudes around surveillance of healthcare worker hand hygiene behaviour showed adverse reactions. Carried out by DebMed, the healthcare programme of the Deb Group (a skin care specialist based in Derbyshire, UK), found that direct observation used to monitor hand hygiene compliance yielded a 34% 'not satisfied



Small hospitals face major challenges in infection control

at all' return, and 60% were just 'somewhat satisfied' with the data accuracy.

The company advocated a more sophisticated electronic hand hygiene compliance monitoring system in line with the World Health Organisation's 'Five Moments for Hand Hygiene' strategy.

Dr Alex Portelli, principal medical officer (PMO) in a private 60 bed-hospital in Malta outlines the advantages and the limitations of adopting these infection control and hygiene protocols in such a setting. 'In larger hospitals these preventive measures are the core competency and responsibility of a trained group of professionals (one professional per 400 patients) supported by state of the art laboratories and information technology,' he explains. 'On the other hand, in our hospital such quality assurance is carried out by professionals who have other roles in the same hospital; I, for one, am also the PMO in charge of the administration and logistics of the medical staff and all Libyan patients who are admitted under our care.

Initially the hospital attempted at employing a part-time nurse with the aid of relevant link professionals to support her but, unfortunately, the idea did not take off.'

This state of affairs poses a strict limitation on the quality of the infection control strategy, especially where surveillance is concerned. 'Although all our staff are regularly drilled in relevant induction and refresher courses, it's very difficult for us, the quality assurance (QA) team, to monitor that these safe practices are actually done correctly,' he explains sadly. (* The team: Dr Portelli, a quality assurance nurse, hospital pharmacist and another nurse).

'Although the hospital produces regular annual reports about the number and type of HAI cases, and the particular setting in which these occurred, we do not have the necessary link to valid laboratory data and this drastically reduces our signal capacity,' he concludes.

Libyan patients, in particular, posed a specific threat to the HAI control system last year. 'There was

an influx of such patients in the past two years, both as a result of war-inflicted injuries and the non-availability of the necessary treatments in their country,' Portelli recalls.

'Unfortunately most of them were colonised with EBSL (extended spectrum B-lactam) species, probably due to the gross misuse of antibiotics, unfortunately so rampant in this Northern African country. Luckily we never had an outbreak or cross-infection to other vulnerable patients, both as a result of increased surveillance on healthcare professionals and appropriate screening, and strict segregation of such patients in one hospital wing, as well as limiting the number of visitors; the fact that all our hospital wards have single rooms also limited the risk of spread.'

The hospital's infection control system actually revolves around contact precautions, mainly hand washing and personal protective equipment (PPE), cohorting, isolation and surveillance, especially in high risk patients such as the mentioned Libyan cohort, and patients who have been in Mater Dei hospital (the local public hospital) in the last six months, the elderly residing in homes and patients with a past history of MRSA.

The challenges posed by the logistics reality of small hospitals and clinics is a factor that can undermine, even if in small doses, the strategy aimed at keeping HAIs, and the risk of related deaths, at bay.

Taking this into account, both at a national and European level, could be a way forward to ensure that our hospitals are completely safe, whatever their size, logistics and budget.

After all, no price is high enough if it can safeguard the value of a human life. ■

USA - Although nosocomial infections and medical accidents have declined, over 750 hospitals with the highest number of such cases now face penalties - amounting to an estimated \$330 million a year - issued by Medicare.

The Hospital-Acquired Condition (HAC) Reduction System, created as the third of the federal 2010 health law's major mandatory pay-for-performance programmes for hospitals, levies penalties against hospitals with high readmission rates. In the second system, bonuses or penalties were based on 12 top quality measures.

However, in 2012, one in eight in-patients countrywide fell victim to a complication considered avoidable, according to a US government estimate.

Yes, infection cases are decreasing. However, their drop is less than the targets set by healthcare officials. Additionally, the appearance of new antibiotic-resistant bacteria that are considerably harder to combat, is causing more concern.

Last April, in a preliminary evaluation, federal officials identified 761 hospitals that show unacceptably high levels of these problem

System detected in less than

The rapid identification of colonisation by a

The GenSPEED Test System developed by Greiner Bio-One combines crude lysis of bacteria with multiplex-PCR before the final automated analysis of PCR-products in the new GenSPEED R2 device. One specific test to run on this system is a

The UK's unacceptable levels of nosocomial infection

NICE sets new guidelines

Report: Mark Nicholls

Pointing out that it is unacceptable that some 300,000 people become adversely infected while being in the care of the UK's National Health Service every year, the National Institute for Health and Care Excellence (NICE), which provides national guidance and advice to improve health and social care, has launched a new set of quality standards.

Professor Gillian Leng, NICE Deputy Chief Executive and Director of Health and Social Care, said: 'It is unacceptable that infection rates are still so high within the NHS. Infections are a costly and avoidable burden. They hinder a patient's recovery, can make underlying conditions worse, and reduce quality of life.'

The standards include guidance for improved hand-washing and catheter insertion. All healthcare professionals are told to follow simple actions, particularly cleaning their hands immediately before and after seeing every patient.

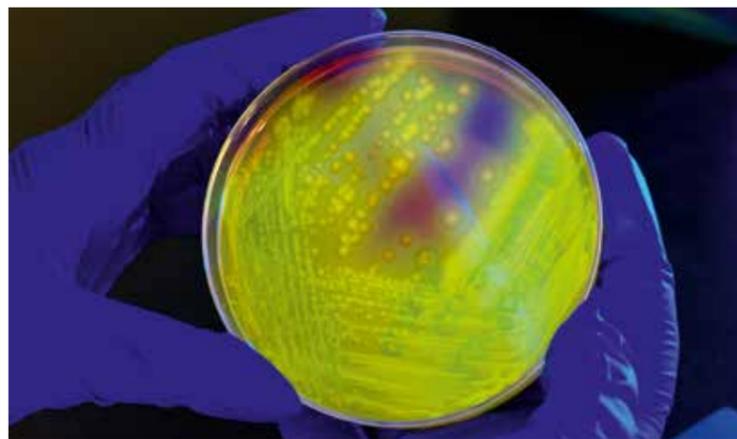
Additionally, NICE points out that

infections can occur in otherwise healthy people, especially if invasive procedures or devices like urinary catheters or vascular access devices are used. These infections can also be passed on to healthcare workers, family members and other carers.

The organisation's latest set of specific, concise and measurable statements to cut infections are based on the institute's own guidance and other guidance accredited by NICE.

If these are delivered collectively as quality care standards, NICE believes there should be improvements in the effectiveness, quality, safety and experience of care that people receive.

The quality standards advise that antibiotics are prescribed in accordance with local antibiotic formularies, as part of a system to stem resistance of infections to antibiotics; also, as stated, patients are tended only after medics immediate hand washing, which must be repeated immediately after the contact; and healthcare workers must minimise the risk of infection to patients needing a urinary catheter or a vascular access device, by following procedures to



Clostridium difficile is one of the most frequently appearing nosocomial germs

ensure they are inserted, looked after and removed correctly and safely.

Professor Leng added: 'Although there have been major improvements within the NHS in infection control, particularly in relation to *C. difficile* and MRSA bloodstream infections in the last few years, HAIs are still a very real threat to patients, their families and carers and staff. This quality standard gives primary, community and secondary care services the most

up-to-date advice on the best ways to minimise infection risks.'

Carol Pellowe, from Guy's & St Thomas' NHS Foundation Trust and a member of the committee that developed the standards, said: 'This quality standard will promote best practice in infection prevention and control and, by providing key areas for action, encourage organisations to sustain their efforts in ensuring patient safety.' ■



Professor Gillian Leng is Deputy Chief Executive at NICE, the Director of Health and Social Care, and a visiting professor at King's College London. Having trained in medicine at Leeds, she spent several years researching the epidemiology of peripheral vascular disease at Edinburgh University. Involved in the Cochrane Collaboration from the beginning, as an editor she still contributes to the EPOC Group (Effective Practice and Organisation of Care). Also a specialist in public health medicine, the professor has worked as a consultant before moving to NICE in 2001. At the organisation, she has been responsible for the initial set up and running of the clinical guidelines programme; establishing the NICE implementation function; setting up NHS Evidence, and for new work on quality standards across health and social care.

Fines for hospitals with high accident or nosocomial infection rates

Performance bites deep

cases. It has been reported that this list may grow longer, given that Medicare will examine overall performances over a longer period.

This autumn, around 25% of US hospitals showing the worst infection or medical accident rates will be penalised by having to reduce each Medicare reimbursement by one percent for one year; and, with the three programmes in place, hospitals might lose as much as 5.4% of their Medicare reimbursements.

Over the first year, Medicare will observe three issues –

- The frequency of bloodstream infections among patients catheterised into a main artery to deliver antibiotics, nutrients, chemotherapy or other treatments.
- The cost of infections from bladder catheterization to drain urine.
- Potentially avoidable adverse conditions, such as bedsores, hip fractures, blood clots and accidental lung punctures.

Assessments are to be based on infections in 2012 and 2013.

Finally, avoidable patient safety problems that occurred from July 2011 to June 2013, including bedsores, hip fractures, blood clots and accidental lung punctures, will be included.

Over the next few years, Medicare will also consider infections in surgical wounds and the ultimate

costs of infections by *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus* (MRSA).

Dr Ashish Jha, a professor at the Harvard College of Public Health, carried out an analysis of the preliminary penalties for Kaiser Overall Health News. Prof. Jha discovered that publicly-owned hospitals and

those that treat large numbers of low-income sufferers are far more likely to be face penalties, as are huge, urban hospitals or those in the West or Northeast.

Medicare records reveal that preliminary penalties were assigned to far more than a third of hospitals in Alaska, Colorado, Connecticut,

the District of Columbia, Nevada, Oregon, Utah, Wisconsin and Wyoming.

Surprisingly, 54% of the nation's significant teaching hospitals were listed for preliminary penalties, according to Prof. Jha.

Clearly hospitals must decrease avoidable harm to patients and therefore costs. In 2008 Medicare began to refuse hospital reimbursement for the care of in-patients who had suffered avoidable complications.

Detects MRSA in 90 minutes

Detecting all pathogens is vital



DNA-based *in-vitro* diagnostic tool to detect MRSA within 75 minutes from human nasal and pharyngeal smears, targeting both resistance genes *mecA* and *mecC*, the company explains.

Another is to rapidly identify toxigenic *C. difficile* by detecting genes for glutamate dehydrogenase (GDH), toxin A, toxin B and binary toxin in one step. The firm reports that this is achieved in less than 90 minutes. Greiner Bio-One also points out that this one-step procedure outdates the sequential diagnostic procedure (two-step method according to ESCMID-guidelines) that uses at least two different test systems, e.g. a GDH antigen assay followed by a toxin assay.

In general, the test system scores points for speed and high sensitivity at a reasonable price, says Greiner. 'Analyses of individual samples are possible at any time. Three controls (for DNA amplification, hybridisation, as well as a negative control) on the Test Chip offer great reliability. The compact and maintenance free system was designed for optimal ease of use. Pre-filled reagents and the automated GenSPEED R2 device reduce the number of process steps to a minimum.'



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Copper surfaces could help to beat outbreaks

Metal attacks norovirus head on

Southampton study shows how to destroy norovirus rapidly

Report: Mark Nicholls

The Norovirus, which affects around 267 million people and is attributed to cause over 200,000 deaths annually (usually among the very young, elderly or immune-suppressed, or in 3rd world areas) can be rapidly destroyed by copper and copper alloys, scientists at the United Kingdom's University of Southampton confirm.

There is no specific treatment or vaccine against norovirus, which is contracted via contaminated food or water, person-to-person contact, or contact with contaminated surfaces. Thus outbreaks in hospitals result in ward closures as well as expensive deep cleaning.

Designed to simulate wet fomite and fingertip-touch contamination of surfaces, the Southampton study, showed norovirus was rap-

idly destroyed on copper and its alloys, with those containing more than 60% copper proving particularly effective.

Rapid contamination of the environment

Lead author Sarah Warnes, from the university's Centre for Biological Sciences, said: 'A single individual infected with norovirus can rapidly contaminate the local environment with billions of virus particles from diarrhoea and especially the explosive vomiting associated with this disease.'

'The virus is able to persist in an infectious state, even after cleaning, and because the infectious dose is so low, ingestion of only a few virus particles can result in infection. Norovirus outbreaks have often originated from people touching contaminated surfaces.'

The team's research suggests that the replacement of conventional non-biocidal hard surfaces with copper alloys in high-risk areas within hospital wards or communal facilities may help to reduce the spread of norovirus infection, she said, adding: 'Infection transmission by touching contaminated surfaces is far more important than previously understood. Studies in our laboratory, and from other groups worldwide, have demonstrated that many bacterial and fungal pathogens, including those responsible for food-borne illness and hospital-acquired infections, are rapidly killed on copper alloy surfaces.'

'The implications of this study, and others we have done, are that incorporation of copper alloy surfaces in hospitals could help to prevent the spread of many pathogenic microorganisms that are a challenge to healthcare today, including the norovirus.'

Cleaning effectively inactivates norovirus

Researchers acknowledge that containing norovirus outbreaks will always be difficult and require a combination of measures to limit infection spread – in combination with the incorporation of antimicrobial copper surfaces in high-risk areas – including cohorting and

Norovirus costs the UK's National Health Service alone at least £100 million per year in times of high incidence

isolating patients, minimising movements of patients and staff within the hospital and care with food handling and reagents for hand hygiene

and environmental cleaning that effectively inactivate norovirus but are safe to use.

'Copper alloys, although they

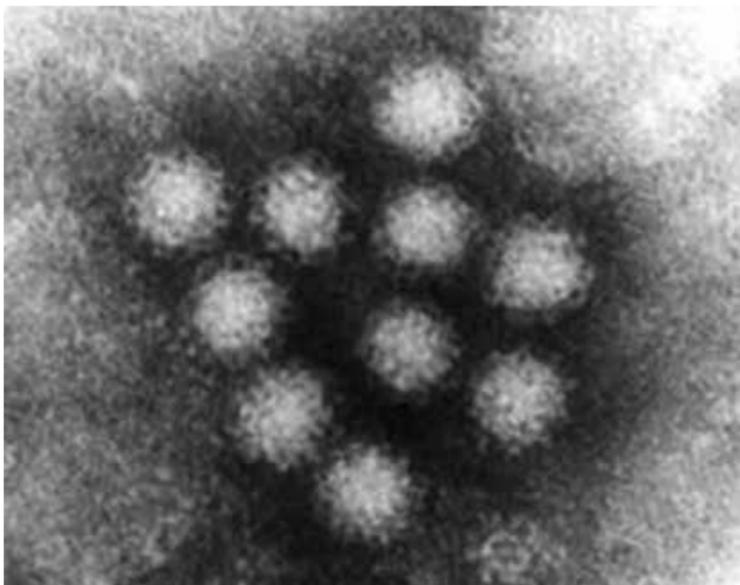
provide a constant killing surface, should always be used in conjunction with regular and efficient cleaning and decontamination regimes using non-chelating reagents that could inhibit the copper ion activity,' she stressed.

However, further laboratory studies and large-scale clinical trials are needed to investigate whether copper surfaces can limit the number of norovirus outbreaks in the long term, Sarah Warnes pointed out.

Her team, which includes her supervisor Professor Bill Keevil, Chair in Environmental Healthcare at the University of Southampton, is conducting further research, which includes study of the efficacy of copper against respiratory viral pathogens that are also spread not only from coughs and sneezes but also by contact with contaminated surfaces.



Sarah Warnes with Professor Bill Keevil noted the power of the reddish-brown metal over the pathogen



Negative-stain Transmission Electron Microscopy (Bar = 50 nanometers)

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Sarah Warnes has been a Research Fellow in the Environmental Healthcare Unit at the University of Southampton since 2008. Her interests include viral glycoproteins; development of diagnostic kits to detect microbial pathogens; the use of antimicrobial surfaces in high-risk clinical and community environments to reduce infection spread; the mechanism of dry surface copper toxicity against microbial pathogens, and norovirus persistence in the environment.

Artilysin – a name to note

Multi-resistant pathogens face a potentially formidable foe

Report: Anja Behringer

Artilysin may prove to be an effective alternative to antibiotics, according to its manufacturer Lysando AG, based in Regensburg, Germany, a technological leader in antimicrobial proteins. The company has been developing designer proteins in partnerships with international scientists since 2009, the firm reports that artilysin can be used to specifically develop substances and medicines against pathogenic – gram-negative as well as gram-positive – bacteria, including bacteria resistant to antibiotics and persistent pathogens.

The artilysin, which consist of amino acids, can permeate and open the bacterial cell walls in all types of bacteria. They are effective through enzymes with lytic activity, which recognise their target bacteria and destroy the basic structure of the cell wall in such a way that the bacteria literally burst. Advantage: 'They do not interact with the metabolism of the pathogens, which offers a larger contact surface for the development of resistances,' explains Dr Kristin Hasselt, Lysando's Assistant Research Director.

Professor Rob Lavigne, head of the Laboratory of Gene Technology at Leuven Catholic University, in Belgium, and scientific adviser at Lysando, describes the potential: 'Due to the effectiveness of the artilysin against persistent bacteria, they can also be used to treat chronic diseases.'

Current research is on their use to treat gonorrhoea and cystic fibrosis. According to reports, research into the use of artilysin in the fight against pseudomonas, campylobacter and acinetobacter has been successfully completed, meaning that Artilysin-175, designed to work against pseudomonas aeruginosa, can successfully eliminate 99.9% of the bacteria within minutes. Based on mice experiments, the technology also works not only fast and with specificity, is not cytotoxic or allergenic, and is also completely

biodegradable and has a high stability against resistance.

Three questions for the CEO
This technology is also suitable for other areas in terms of sustainability and the food cycle. Co-founder and company owner Markus Matuschka von Greiffenclau places great emphasis on this. European

Hospital asked him three questions about this new technology platform.

Are the products ready for to sell?
Von Greiffenclau: 'We are licensing Artilysin to business partners in different sectors. The technology platform is ready for the market, but we will not be manufacturing our own products.'

Which product will be available when and from whom?

'In the healthcare sector a business partner from the world of pharmaceuticals is planning to introduce a substance against decubitus ulcers next year. The contracts are just being signed. This partner will be responsible for the galenics and clinical patient trials.'

Do artilysin suit other sectors?

'Apart from medicine, areas particularly affected by resistant pathogens are veterinary, medical technology, infection prevention control, pharmaceuticals, agriculture, animal husbandry, the food industry and catering. If we can consistently eliminate the pathogens, we should be able to breathe a sigh of relief for the next thirty to forty years, until new resistances occur.'

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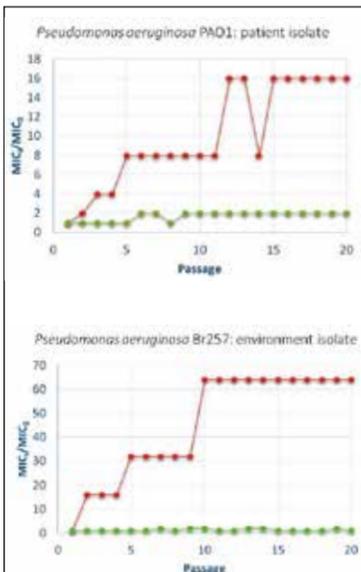
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S.haemolyticus



Under industrial standard conditions (serial MIC based on bacteria incubated each with sub-MIC concentrations by Artilysin) it was not possible to scale any developing resistance in a clinical or also environmental isolate. The control by Ciprofloxacin (Standard-Antibiotic, red) shows a significant developing resistance under identic conditions: 16x (PAO1) respectively 64x (Br257) surge of the MIC.

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Sepsis cases are rising

Delayed diagnoses result in high mortality

Report: Walter Depner

Sepsis kills around a hundred and thirty patients daily in Germany alone. This systemic disease is mostly caused by bacterial pathogens, and less frequently by fungal organisms or parasites. Professor Dr Frank M Brunkhorst of the Centre of Sepsis Control and Care (CSCC), at Jena University Hospital, Germany, is seeking strategies to combat such scary figures.

With regard to cause, spreading and consequences, in 2011 over 175,000 sepsis cases, with an average age of 67.5 years, were treated in this country's hospitals. 87,150 of those cases were classified as sepsis, 69,016 as severe sepsis and 18,885 were classified as septic shock, which amounts to an incidence of 106/100,000 (sepsis), 84/100,000 (severe sepsis) and 23/100,000 (septic shock).

The numbers are rising – a trend that Brunkhorst attributes inter alia to the fact that medical progress in many areas has been leading towards more diagnostic and therapeutic interventions in increasingly older patients. Today, the number of new cases of severe sepsis and septic shock is many times higher than the number of new HIV/AIDS, colon or breast cancer cases.

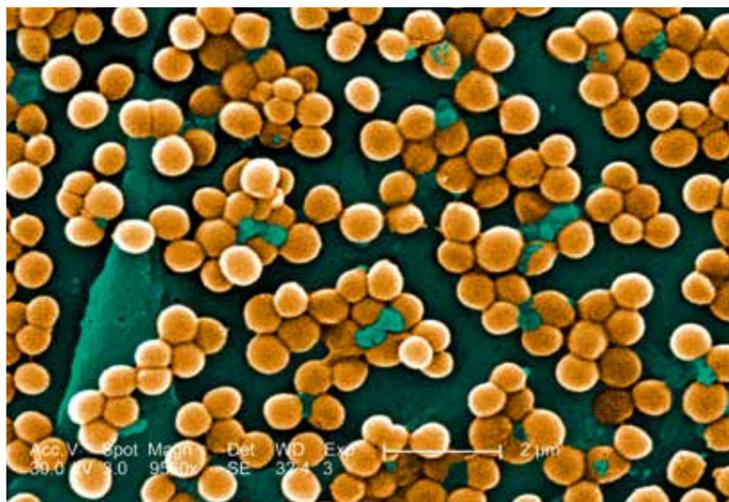
A major German health insurer serving approximately thirteen million clients, analysed their data to calculate the hospital-related costs

for patients suffering severe sepsis. The result: an average €59,118 per case for surviving patients and €52,101 per case for those patients who died.

However, as Prof. Brunkhorst points out, the increase of therapeutic or diagnostic interventions in older patients is not the only factor. Equally important, he underlines, are current weaknesses in microbiological diagnostic procedures and in the adequate antimicrobial therapy. The so-called SepNet prevalence study of 2004 indicated that only 55% of the infections were confirmed microbiologically, despite the presence of clinical symptoms, and a mere 9.6% of the cases were documented by a positive blood culture.

While 100 to 200 blood culture sets per 1,000 patient days are recommended; the Antimicrobial Resistance Surveillance in Europe (EARS) Report 2012 (<http://www.ecdc.europa.eu>) shows that, in German hospitals, only 16.6 blood culture sets are taken per 1,000 patient days – a rather poor performance compared to other European countries.

The professor suggests improving sepsis diagnostics already in the pre-analytic phase (sampling technique, transportation times, and so on), as well as increasing the blood culture rate. Very often, severe sepsis is diagnosed too late, because the transition from a localised infection to severe sepsis is very difficult



Staphylococcus aureus infection is a frequent cause of sepsis

to predict.

Early diagnosis with sensitive and specific biomarkers might help reduce mortality and morbidity. The good news is that, while many of these sepsis markers are still being researched, some were evaluated in clinical studies and have found their way into clinical routine.

Professor Mitchell M Levy, of Rhode Island Hospital in Providence, USA, has presented a further disturbing fact about sepsis. His research indicates that, in Europe, sepsis causes more deaths than in the United States, not necessarily due to poorer European quality of care, but caused by certain structural problems that delay the identification and treatment of the disease.

According to Levy, high mortal-

ity, at least in Germany, is caused by sepsis being recognised and treated too late. He points out that up to 40% of the sepsis cases develop at home, but general practitioners rarely consider sepsis as a possible scenario and thus the patients are sent to hospital too late. Additionally, the hospital structure, with the emergency department as first point of contact, also delays ICU admission.

Professor Konrad Reinhart, Director of the Clinic of Anaesthesiology and Intensive Therapy at Jena University Hospital, corroborates this interpretation and demands 'better training of hospital and out-patient physicians to enable them to recognise and treat sepsis quickly'.

More vis

Association for Pathology

Report: Cynthia E. Keen

For several decades pathologists worldwide have been under increasing pressure to handle a steady increase in laboratory tests with a steady decrease in finance and staff. The importance of pathology informatics is evident when you add in the escalating volume of increasingly complex, sophisticated testing.

The Association for Pathology Informatics (API) held its annual Pathology Informatics Summit in Pittsburgh, Pennsylvania, this May. This is the only conference of its kind that discusses innovation and problems that informatics technology may have the potential to resolve.

In 1990, *European Hospital* interviewed the man who coined the term 'pathology informatics' – Dr Bruce A Friedman, emeritus professor of pathology at the University of Michigan Medical School, in Ann Arbor. He explained that the conference, which ran over three and half days and covered a wide swath of topics, and focused on six major areas.

Among these, the key theme was the burden of decreasing resources and escalating workloads. Several speakers urged attendees to speak out to their healthcare administrators about the power of clinical laboratory testing and anatomic pathology services to deliver big

Nanoelectronics

Innovation: UK hand-held device could challenge ELISA's position

On the cards: Printed circuit board technology for same-day disease diagnosis

UK scientists are developing a hand-held testing device for use at the point of care and provide a disease diagnosis on the same day. The device will use disposable cartridges and utilise printed circuit board technology (PCB) to enable a fast low-cost diagnosis.

Initially, the machine will diag-

nose tuberculosis (TB), but the researchers report that the technology is versatile and later on will be used for other conditions, using DNA from the patient's blood or saliva samples.

According to the University of Southampton research team, the new device could replace the cur-

rent conventional diagnostic method of enzyme-linked immunosorbent assay (ELISA), which monitors proteins such as cytokines to identify a disease and measure its progression. However, this is lengthy and limited to single point measurements, due to the prohibitive costs and sample volumes required, preventing continuous monitoring of disease progression.

Leading the research to develop the hybrid technology using electronic components as chemical sensors on PCBs is Dr Themis Prodrumakis, a Reader in Nanoelectronics and EPSRC (Engineering and Physical Sciences Research Council) Fellow at the University of Southampton.

The device can carry out diagnosis on the same day and at the point-of-care – potentially avoiding the need to send protein samples to labs for chemical assessment and diagnosis. Consequently, it could lead to health benefits in reducing time to treatment and reducing costs in diagnosis and late-diagnosis treatments.

Dr Prodrumakis explained: 'A project of this nature is the perfect illustration of how academia, manufacturing and the end user can come together to pool knowledge and experience to make a real and valuable change. There's a real opportunity for this new diagnostic

tool to make a tangible difference to healthcare in international markets.'

Although at a preliminary stage, it is hoped that the test will become available in hospitals, GP surgeries or even for diagnoses in the home.

In the three-year project researchers in the Department of Infection and Immunity at Imperial College Healthcare NHS will carry out all clinical trials, and collaborate with Newbury Electronics, a British PCBs manufacturer of PCBs, which contributes extensive knowledge of manufacturing techniques and materials to the work.

Philip King, a director at Newbury Electronics, said Dr Prodrumakis and team have come up with an 'exciting' alternative to more traditional diagnostic methods. 'It's now our job, as the expert manufacturers, to help transform this idea into a feasible product,' he said. 'The inclusion of Imperial College as the clinicians to demonstrate the relevance of this research ensures that valid input from all sides is incorporated right from the initial stages.'

The research is funded by £1m (€800,000) awarded by the EPSRC. Presently, Prodrumakis and team are working with Newbury Electronics to gain a better understanding of the printed circuit board manufacturing process and how to refine and amend this to use alternative materi-



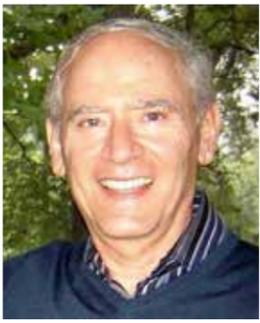
als and to finer degrees of accuracy. The team's aim is for the first prototypes to be available for initial testing by 2015.



Themis Prodrumakis and Philip King

Responsibility for pathologists

Informatics conference addresses trends



Bruce A Friedman MD, emeritus professor of pathology, University of Michigan Medical School, Ann Arbor

is a particularly exploding field. The ability to identify abnormalities and defects in a cancer's DNA can be used to help identify the therapeutic agents that exploit the tumour's genetic weaknesses.

Companion diagnostics is also attracting increased attention because healthcare payers want to know that extremely expensive

drugs – some can cost as much as \$100,000 annually – are effective for the diseases for which they are being used. Testing for efficacy for expensive chemotherapeutic agents will become the norm, Friedman predicts, because as much as 50% of these treatments are not successful. Healthcare payers, he said, are becoming more demanding in

wanting to know whether expensive drugs are appropriately prescribed.

Finally, with POC testing a fact of life and increasingly being demanded by physicians who want rapid test results, pathologists need to find ways to have managerial control over decentralised testing – a challenge also discussed at great length at the summit.

The API is considering whether to make its 2015 summit an international event. 'Pathologists throughout the world are increasingly turning to pathology informatics as a means to provide quality and cost-effective diagnostic services,' Friedman concluded. 'We think it is time to make this meeting global in scope.'



gains in patient outcomes and the associated costs of care. Friedman noted that pathology laboratories at a typical hospital cost about 5-6% of the annual budget, but that about 75% of patient treatment is based on findings from laboratory tests. The consensus among the session speakers was that clinical pathologists need to make themselves, and the importance of this specialty, more visible.

Laboratory information system (LIS) functionality continues to be under close scrutiny by pathology informaticists. In the USA, LIS software was for years dominated by a handful of specialised best-of-breed vendors. With the US government push for the national adoption of electronic health records (EHR), EHR vendors are adding LIS modules to their offerings. According to Dr Friedman, many of these are not robust enough, nor provide vitally important broad functionality. To offset this, the API developed a LIS Functionality Assessment Toolkit (LIS-FAT).

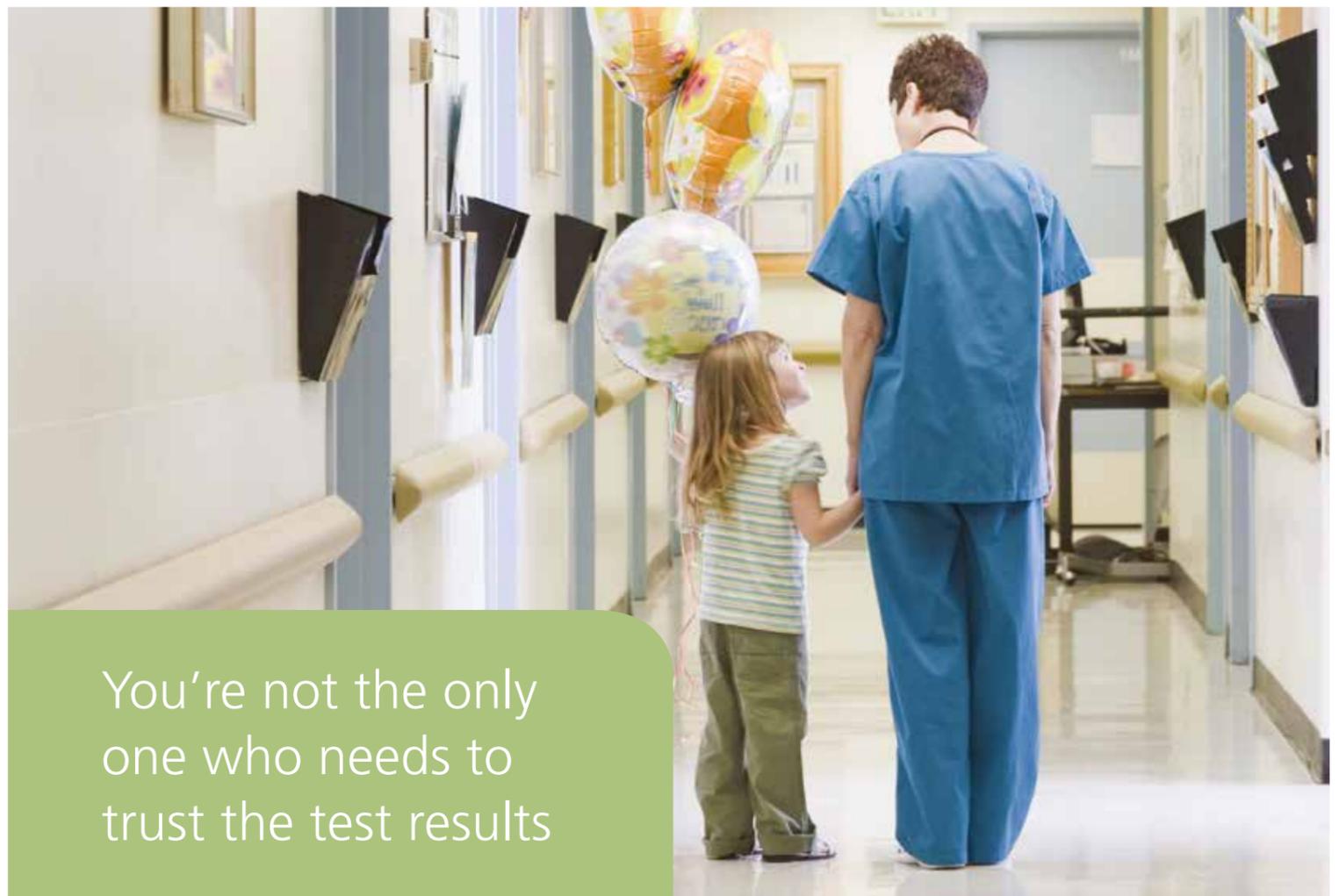
The toolkit contains a list of 850 functionality statements that can be used to determine, in detail, a metric to measure whether specific functionalities are absent or present in any LIS. As of mid-June, the free-of-charge toolkit has been downloaded approximately 2,000 times (www.pathologyinformatics.org/toolkit). 'With this degree of acceptance, the toolkit is taking on some of the characteristics of a quasi-standard,' Friedman said. 'Some LIS vendors are even developing their individual responses to the 850 statements and making them available to clients. We are going to take advantage of this opportunity and add more functionality statements to make the toolkit in order for it to more closely resemble an IT standard.'

The broad deployment of digital pathology has been held back by US federal regulatory issues, so the field has not evolved as rapidly as initially envisioned.

One data-intensive field that is increasingly gaining attention is lab analytics. The lab analytic of business intelligence software enables the lab professional to better understand managerial and clinical changes in their labs using various dashboards. Anatomic pathology dashboards, for example, can display turnaround time for urgent biopsies, or specimens that were held up for various reasons. The goal for lab analytics is to provide faster, better, and less expensive services.

Other areas of growing interest are computational pathology, cancer genomics, and support for point-of-care (POC) testing. Cancer genomics

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DNA sequencing shift to point-of-care testing

Health analysts have predicted that DNA sequencing will shift from a laboratory-based setup to (POC) care testing within the next five years

Report: Mark Nicholls

Analysis from Frost & Sullivan suggests that the Western European next-generation sequencing (NGS) market is poised for steady growth with the emergence of new applications, such as non-invasive prenatal testing and comprehensive oncology panels.

Driving that scenario will be increased demand and uptake of more personalised healthcare, according to Frost & Sullivan Healthcare Senior Industry Analyst Divyaa Ravishankar. 'Given the recent technology advancements in Europe, the future of DNA sequencing will move away from a laboratory-based setup to point of care testing,' she predicts. 'We expect NGS to become an area of interest to all market leaders within the point of care testing domain, as they strive to bring sequencing from "bench to bedside".'

NGS manufacturers are further tapping into this space by forming partnerships with molecular diagnostic companies to quicken NGS adoption in clinics, particularly for oncology-based testing.

With the Western European next-generation sequencing markets earning revenues of \$381.9 million in 2013 – and estimated to reach \$697.3 million in 2018 – major growth areas will include pre-implantation genetic diagnosis, oncology testing, infectious disease testing, human leukocyte antigen typing, and companion diagnostics.

'Companies within the space of personalised healthcare are designing instruments to target specific needs across the clinical diagnostic spectrum, therefore adding NGS capabilities to their portfolios,' Ravishankar reports. 'As long as the genomic era interfaces with personalised medicine, NGS uptake will continue.'

Several NGS companies, such as Genapsys, GnuBio (recently acquired by Biorad), and Genia (recently acquired by Roche) have innovative technologies in the pipeline with a focus on iPad/chip-size devices using semiconductor technology giving out results within a short turnaround time, she explains. NGS will be offered in a physician setting, it's just a matter of time, but, she believes, they will be more used as complimentary tests, not as conclusive tests.

'These tests can lead to the first step in diagnosis and then the patient can be subjected to rigorous testing which could be more extensive and expensive in nature. Also, POC testing minimises the use and expenditure on reagents.'

The POC mode of sequencing will provide simplified handling, enable fast accurate results, reduced sample volumes and reagent and produce minimal waste, she stresses. Non-

skilled personnel can also perform the tests, which will initially be in areas such as infectious disease testing, preliminary oncology testing, IVF clinics, and pathogen testing in the food industry.

However, the F&S report suggests challenges to the shift could lie in physician acceptance, established and proven clinical significance of these tests, reimbursement challenges for labs/physician, cost of hardware for data infrastructure and file size.

'As much as the progress made in sequencing instruments, the data handling capacity has not yet made its giant leap,' Ravishankar adds.

'Until last year the NGS platforms were more preferred as discovery tools to provide whole genome coverage, but it would require so many days to sequence it. Today, in the clinical area, we are looking at diagnostic platforms that can provide a fraction of the coverage but will produce results within few hours of sequencing.'

There will be long-term savings



Divyaa Ravishankar is a Senior Industry Analyst in the Global Healthcare Practice at the Frost & Sullivan consultancy. With diverse expertise within healthcare IT and Lifesciences, which mainly constitute laboratory research and management consulting, she also has industry experience of a broad range of sectors, leveraging long-standing working relationships with leading industry participants in areas such as in vitro diagnostics, pharmaceutical and biotech companies.

owing to NGS being more sensitive, and experimental advantages will include elimination of in vivo cloning, transformation or colony picking, reduced turnaround time as DNA based tests are more sensitive than immunoassays.

'With effective diagnosis in a single visit, and as sequencing gets cheaper, there will be more willingness from patients to undergo these tests,' Ravishankar concludes.

Tandem MS accurately measures 25OH D₂ and D₃

Misdiagnoses of vitamin D deficiencies

Most clinical laboratories use immunoassays routinely to measure 25-hydroxyvitamin D (25OH D) in serum. The metabolites of vitamin D are important in the regulation of calcium and bone metabolism. Immunoassays are high throughput,

and relatively cheap and easy to use, but have some important limitations. It has been found that immunoassays have problems recognising vitamin D₂ after it has been ingested, giving a significant underestimation of the concentration of

25OH D₂. (*Ann. Clin. Biochem.* 43: 23-30). This has an impact on the total 25OH D measured, potentially leading to misdiagnosis.

Professor of Medicine Bill Fraser and his research team at Norwich Medical School have published many papers on vitamin D deficiencies and associated pathologies. Over the last decade, they have made advances in tandem mass spectrometry (MS) techniques that can be used to measure vitamin D.

The professor described the importance of being able to measure individual contributions of vitamin D₂ and vitamin D₃: 'Unlike vitamin D₃, the body does not produce vitamin D₂. It is only present when it has been given in food or as a supplement. Therefore, patients who have been given vitamin D₂ supplements may have sufficient levels of 25OH D₂, which may not

be detected by some immunoassays'. Tandem MS on the other hand can accurately measure 25OH D₂ and D₃, giving separate values for both forms (*Mass Matters.* 62: 13-14).

Recently introduced systems, such as the IVD-M Analyser and IVD-MS Kits (SCIEX), provide simple, robust MS solutions for routine clinical diagnostics such as 25OH D testing.

Tandem MS methods to measure 25OH D are generally more reliable and offer greater sensitivity than immunoassays. One perceived issue with the use of tandem MS methods in clinical laboratories is that of capacity. Prof Fraser supports the use of tandem MS, and said, 'The capacity of tandem MS can be increased by running samples overnight, or on two HPLC systems at a time. Immunoassays are able to accommodate a larger number of



Prof. Bill Fraser, Norwich Medical School, University of East Anglia

samples per assay but, because of their limited accuracy, there may be a requirement for the immunoassay to be repeated.'

To increase the throughput and sensitivity of the MS method further, the Fraser team has been working on improving the method for extracting 25OH D, as well as automation and semi-automation of the front-end of the mass spectrometer.

Another issue relevant to both platforms is that of variability, which, in 25OH D measurements, is observed between assays, between platforms and between laboratories (*Ann. Clin. Biochem.* 46: 3-4).

Attempts have been made by the Centres for Disease Control and Prevention (CDC) to find a reference material that can be used to standardise immunoassays and tandem MS methods for 25OH D measurement. A standard reference material known as SRM 972 has been used for calibrating assays. This standard is suitable for liquid chromatography (LC)-MS/MS methods but is not ideal for immunoassays. Therefore, a tandem MS derived value has been used to standardise some immunoassays. This can further increase the potential for error and decrease the accuracy of immunoassays compared with MS.

Given the advantages of tandem MS methods over immunoassays, Professor Fraser hopes to see tandem MS methods to measure 25OH D become routine in clinical laboratories.



Example of MS platforms developed for routine clinical testing

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Streamlining testing without loss of quality

As many laboratories face demands to turn around faster, more accurate patient test results against a backdrop of increasingly stringent quality control and tighter budgets, the search is on for tools to help meet ever-stretching targets. Streamlining is the answer – and, for laboratories, products are available to help streamline without loss of precision and test results accuracy.



By switching to consolidated clinical chemistry controls, laboratories can now carry out highly accurate QA using one quality control product

Randox Laboratories, a quality control provider, reports the development of multi-analyte quality controls, explaining: 'Where previously large multifunctional laboratories may have had to routinely run thirty or more controls, it is now possible to produce highly accurate test results using ten or less controls, in formats suitable for a range of analysers.'

For example, in routine clinical chemistry testing where laboratories are testing patient samples for as many as 100 biomarkers, including cardiac, lipids, proteins, therapeutic drugs and hormones, many laboratories may previously have had to run multiple, and often costly, single controls. However, if they switch to consolidated clinical chemistry controls labs can now carry out highly accurate quality control by, using just one quality control product.

'Randox's Liquid Assayed Chemistry Premium Plus control contains 100 analytes, all at clinically relevant concentrations and in line with internationally recommended cut off levels,' the firm confirms. 'In a handy liquid format and with open vial stability for seven days, laboratories are getting more for less, helping save time and money.'

Similarly, in immunoassay testing, the Randox Immunoassay Premium Plus control contains 52 analytes including fertility and thyroid hormones, tumour and cardiac markers, kidney function tests and vitamins, including Vitamin D.

Quality control in maternal screening is also simplified with consolidated controls, the company reports. 'Whereas previously laboratories may have had to run three or more controls, accurate QC can now be achieved with one control, covering all six key parameters used during first and second trimester screening of Down's Syndrome and Spina Bifida, including PAPP-A and Inhibin-A.'

Additionally, laboratories can combine the benefits of consolidated controls with the analytical power of a web-based inter-laboratory data management system, Randox adds. 'This will help users to manage, interpret and compare QC data to potentially thousands of laboratories across the globe that are running the same test. If a laboratory is not using a peer group reporting package, they may not know they have a problem until the next cycle of proficiency testing, by which time many inaccurate patient results may have been reported.'

An inter-laboratory data management system could significantly help labs improve analytical performance, enabling them to identify trends, system errors or reagent issues as soon as they arise, the firm points out. 'When used in conjunction with consolidated controls, laboratories have a powerful streamlining solution delivering highly accurate results quickly, saving labs time and money.'

New laboratory challenges require new thinking



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A complex constellation of lab operations requires doing more with fewer people

Laboratory automation

On the leading edge of automation for medical laboratory testing, Siemens Healthcare rolled out an impressive suite of new products at IFCC WorldLab 2014 in Istanbul, Turkey that are 'exactly aligned, and even anticipate, customer needs in central lab operations,' according to Franz Walt, CEO for the Chemistry, Immunoassay, Automation and Diagnostics IT business unit within Siemens' Diagnostics Division.

Managers for centralised medical laboratories are under a lot of pressure today, he said. Under-staffing and a shortage of available candidates for open positions is one of the most frequent concerns he hears speaking with customers.

The demands on lab technicians is more demanding than ever while economic pressures are also putting the squeeze on managers' ability to optimally run their operations as they are repeatedly asked to do more with less funding and fewer people.

According to Walt, 'these are the forces that are driving labs toward automation. You cannot substitute

with a machine the need for people to be part of the process, but we are helping labs cope with these pressures by doing more with fewer people.'

'With these new products we have taken the concerns of customers very seriously to improve functionality and to give an overall workflow optimisation. This is the first line of instruments truly built for automation and they are ready to go without extra robotics needed to connect them,' said Walt.

'We are making a significant contribution to increasing productivity and to assuring very predictable turn-around times for lab tests. Also, by minimising the need for manual steps, we reduce the opportunity for error,' he said.

New products added to the company's portfolio include the ADVIA Chemistry XPT System and ADVIA Centaur XPT Immunoassay System, designed to enable continuous operations, facilitate delivery of timely, accurate results, and ease training. Also presented in Istanbul were Siemens' new analysers for the

Laboratory Haematology sector, the Sysmex CS-5100 Haemostasis System and ADVIA 2120i Haematology System.

These front-line systems connect with the enhanced data flow capabilities in Siemens' CentraLink Data Management System and Aptio Automation, key components for integrating an advanced track-based automation system. At the IFCC congress, the new Tube Inspection Module was linked with Aptio Automation to demonstrate how labs can reduce pre-analytical errors and minimise the risk for tube mismatch. The key word that pulls together the portfolio is multi-disciplinary, said CEO Walt.

'To this point our efforts have been in meeting requirements for the main line applications in routine testing. With these new products we have moved with our customers to

the next level of more comprehensive, multi-disciplinary testing,' he explained.

New instruments for haemostasis and haematology complete the portfolio for analysis, while expanded capabilities of software and middleware enables the multi-disciplined management of the total workflow for central lab operations.

'Lab analysis is a complex constellation where instrument automation is only one part of the solution. The other key element is information technology. The CentraLink system version for 2015 supports paperless workflow and embraces the multi-disciplined approach by bringing together haematology, chemistry and immunoassay analytics,' Walt said.

'There is also something we call SLIM [syngo Laboratory Inventory Management] that assists automation efforts by tracking a customer's inventory, including both Siemens' products and third party products. It will also propose suggestions for reordering and can connect to e-commerce sources to help with that.'

'Through all of these components operations become increasingly integrated. We not only optimise workflow but reach beyond to data automation and add connectivity to the rest of the constellation in the lab,' said Walt.

Moving beyond the Siemens' universe of products in the complex constellation of lab automation, the company's new line of instruments and the middleware linking the machines to information technology conform to newly adopted standards developed through the non-profit group, Integrating the Healthcare Enterprise (IHE).

Rather than competing with each other using proprietary codes for data sharing, lab instrument manufacturers agreed to form a consortium called the IVD Industry Connectivity Consortium (IICC) and

The ADVIA Centaur CP Immunoassay System is a mid-volume, high-throughput bench top system that enhances the in-house test capability



Franz Walt brings 25 years of experience in healthcare to his responsibilities as head of the Chemistry Automation Immunoassay business unit for Siemens Healthcare Diagnostics. His career has covered assignments in pharmaceuticals, diagnostics, and medical devices across a mix of customer groups in Asia Pacific, Iberia, Latin America, Europe and North America.

to work through IHE to develop open standards.

The IICC membership is impressive, including the top makers of clinical instruments such as Abbott Diagnostics, Beckman Coulter, Becton Dickinson, bioMérieux, Data Innovations, Orchard Software, Ortho Clinical Diagnostics, Roche Diagnostics, Siemens, and SysTelab Technologies.

A key change resulting from this collaboration is an upgrade to a piece of hardware that removes what had become a bottleneck to high-speed data transfer. Up to this point, and even today on legacy instruments, vital patient information from blood work ups and molecular diagnostic assays ran through the old 9-pin cables that are now hard to find on the back of computers. (See *European Hospital Issue 03, 2012*)

Some of these lab analysis instruments transfer data at the extremely low-bandwidth rate of 9600 baud, requiring 15 minutes to upload one megabyte, where today most smartphones can transfer the same data in one second.

According to CEO Walt, the Siemens' CentraLink Data Management is a system capable of connectivity to multiple lab instruments and is flexible to accommodate a range of connectivity requirements.

'This kind of optimisation is the name of the game today, and Siemens is absolutely leading the market,' he said.

IT firm helps with strategy, quality management and science

Software for key tasks

No provider has yet been able to cover all IT topics and processes in laboratory software. The solutions currently marketed either support key lab tasks, from requests down to results, or they cover topics such as quality assurance and billing, according to Dr Markus Neumann MD of Dr Neumann & Kindler. Beyond that, any other available solutions, such as software for 'numerical methods' – for strategy, quality management and science in the laboratory – is not supplied by laboratory software specialists but by other software and consultancy providers.

Numerical analysis and visualisation of the results is the key focus of the Excel-Apps offered by this Bochum-based company. One example: 'Laboratories are obliged



to determine their own reference values in the context of accreditation guidelines. This is the only way that patient populations individual to each respective laboratory can be taken into consideration for the results specification,' Neumann

explained. 'This statistics-based determination can only be achieved with intelligent software to keep the costs involved manageable.'

Therefore what is the key feature of these Apps and what requirements do they cover? 'Clinical chem-

istry and microbiology under one user interface and they simplify the use of algorithms, which are normally only used by very experienced laboratory staff. Apart from reference ranges the Apps can also help to identify decision boundaries between "healthy" and "sick" in the context of distribution curves, and to identify patient populations with their measurement profiles.'

The App reads measurements from the laboratory information system database via an interface. Results are then determined with the help of different algorithms, which can then be graphically visualised in Excel. 'Excel is a particularly suitable base because of its presentation options, which is why our software is also based on Excel 2010,' Neumann pointed out.



Dr Markus Neumann, managing director, Labcore, Bochum, Germany

'At the moment, we are extending our range of suitable algorithms in partnership with others, so that the customer can compile the modules individually in the context of the licensing model.' The user maintains the full functioning of Excel, such as the programming language, VisualBasic for Applications, to automate the evaluation process.

Neumann: 'We're looking forward to as many laboratory colleagues as possible making further algorithms available to develop a large community for users and providers.'

Redefining diagnostics

Report: Mark Nicholls

New molecular technologies to screen drug-resistant TB are replacing, for example, culture-based tests that are slow, require experienced personnel, and need stringent microbiological safety precautions. In addition, new diagnostic devices are changing the way tests are conducted and are affecting healthcare expenditure.

The expanding diagnostics market for infectious diseases such as tuberculosis (TB), and viruses such as HIV, hepatitis C and human papilloma, is giving rise to commercial opportunities especially in the developing economies of Asia, Africa and Latin America, according to the latest analysis.

Measures by governments to minimise healthcare expenditure, owing to economic and political pressures, are driving the demand, particularly for high-throughput automated diagnostic platforms and point-of-care (POC) testing devices.

New analysis from Frost & Sullivan, *Emerging Technologies in Infectious Diseases Diagnostics*, has found that the market is characterised by the constant introduction of improved devices and technologies due to their short lifecycle.

Technical Insights Senior Research Analyst Dr Cecilia Van Cauwenberghe said: "The penetration rate of cutting-edge technologies, such as micro- and nano-electromechanical systems, robotic technology, smart factories, and advancement in micro-manufacturing techniques, are consistently shaping infectious disease diagnostics worldwide.

'Molecular nanotechnology platforms constitute promising tools due to their ability to conform structures and devices at atomic scale precision and accuracy.

'Integrated nanobiosensors indicating the presence of particular molecules or biological structures in micro-devices represent improved capabilities for life sciences and healthcare. Indeed, health monitoring experiences a dramatic change from the emergence of nanobio-devices.

'The periodic evaluation of physiological variables in a cost and time effective manner, also facilitate comfort and building capabilities. Novel POC devices significantly help address current issues around healthcare burden, aging population and personalised medicine, among many others.'

Clear advantages, such as less reagent consumption, reduced starting specimen, and on-chip processing and biosensors enable greater sensitivity, specificity, portability, and sensor density, which integrate into lab-on-a-chip (LoC) device and enable the integration of more processes in a smaller area, she pointed out.

Sustainable local manufacturing of infectious diagnostic products still remains a challenge for emerg-

ing nations but F&S note that it requires adequate skills infrastructure at each process stage, as well as a conscious assessment of quality, safety and regulatory issues. Another key challenge is funding. Despite its crucial role in disease control, diagnostics research for infectious diseases receives surprisingly little funding compared to other translational research areas, such as drug and vaccine development.

Research to build diagnostic tests along with a robust detection system also needs predictive markers to be identified and validated.

Such a process demands multidisciplinary research groups ranging from life scientists for biomarkers discovery to physicists and engineers for instrument design.

Van Cauwenberghe: "Testing efficiency is improved by developing novel solutions that continually

enhance the lab testing in terms of speed, accuracy and reliability. As a result, improved medical value consisting of the concentration of efforts on exploiting advanced scientific knowledge and technological progress to increase medical value is obtained."

The trend has seen new business models associated with commercial health management emerge, with partnerships and alliance models being formed. One example of the emerging business models is the Hybrid non-profit/biotech (Diagnostics For All), which

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Dr Cecilia Van Cauwenberghe is Principal Analyst for Life Sciences and Biotech with market research and analysis firm Frost & Sullivan, which also provides growth strategy consulting and corporate training services for industries such as IT firms, the car industry, and healthcare. The firm employs 1,800 analysts, growth consultants, and forecasters at its HQ in Mountain View California and offices based in more than 40 countries.

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CSC's LabCentre helps scientists, technicians and management staff to track samples and testing processes, communicate results to other health professionals, and monitor costs and reporting

used information standards and protocols in the industry, it helps to connect laboratory employees with people throughout the healthcare ecosystem.

LabCentre includes dedicated functionality for every laboratory discipline, and each module of the software has been designed to allow users to create intelligent workflows, helping them to complete laboratory tasks in the most efficient way.

One important factor behind this widespread uptake is the flexibility of the software. Managers can customise the product to function exactly as their organisations require, while individual users can modify specific functions to suit the processes within a particular laboratory environment. LabCentre has a modular construction so organisations can choose to roll out the product in stages. Many laboratories prefer to deploy one module at a time, ensuring a smooth transition process from legacy systems.

All laboratory organisations understand that healthcare technology ultimately has a single purpose: to improve patient care. By increasing the speed and efficiency of laboratories, LabCentre helps institutions to do just that.

Redefining diagnostics

Continued from page 23

combines elements of a non-profit organisation with the activities of a biotech company to create simple, inexpensive and ease-of-use diagnostic devices based on cutting-edge technologies coming from academic development. The main characteristics rely on portability, simplicity and robustness to use in places beyond the hospital. The analyst added that these new technologies directly influence performance, price, reliability, quality, affordability, low cost ownership and service availability. Additionally, most of the technology platforms enable improved interoperability and multi-functionality.

There is also high demand for the diagnostic technologies to be robust in varying environmental conditions with high sensitivity and specificity. Smartphones are expanding their mobile healthcare footprint with new capabilities to become real-time diagnostic tools.

'The rapid evolution of imaging technologies in smartphones,' she said, 'is paving the way of infectious disease diagnosis in real-time with no cost associated.'



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