The future for big data in medicine

With registration about to begin for the Oxford-based Big Data Science in Medicine Symposium, we asked Professor Christoph Meinel, President of Germany’s Hasso-Plattner-Institute, about the potential of big data in medicine and medical research.

‘In IT we often casually say that Big Data is exactly what we can’t do yet,’ computer science expert Professor Christoph Meinel said ruefully. ‘Big Data are huge volumes of data of very different heterogeneity, origin, quality and size – and it’s exactly these characteristics that pose a big challenge for evaluation, analysis and calculation because we are better versed at handling more uniformly structured data.

Asked to about the term Big Data he pointed out that there are many examples, including human genome data, data in hospital information systems, cancer registers, clinical studies, medical sensor data, image data, acoustic data and ultrasound data, as well as medical publications. ‘We are now trying to intelligently link these data sources to facilitate research and therefore the treatment of diseases.’

‘For example, the success rate of radio- and chemotherapy in cancer treatment is below 25%, meaning 75% of patients undergo agonising treatment for nothing. If the likelihood of determining the effectiveness of treatment based on findings of a patient’s respective genetic or molecular structure was higher, we could exclude certain types of treatment right from the start because they are not appropriate, and we could spare the patient this torurous treatment. Previously this required analyses that could sometimes take several months. Now, with the In-Memory-Technology which we developed together with SAP, we can reduce the time these evaluations take to mere seconds.’

The first product based on this technology is the SAP HANA Database. This type of database is ten thousand times faster than traditional ones. Why? The RAM of computers is becoming ever cheaper, and new computer architecture is now possible with huge RAMs. Entire databases can be stored in the RAM, meaning that data can be analysed immediately without time intensive transport of data from external data storage. This means the factor can be calculated ten thousand times faster and data from very different sources can be linked in real time.

The 2nd Big Data Science in Medicine Symposium, organised by the Biogerontology Research Foundation (BGRF) and Oxford Biotech, with Deep Knowledge Ventures and InSilico Medicine, is bringing Oxford international experts in artificial intelligence, biomedical science and regenerative medicine for discussions that aim to accelerate research in preventive medicine. ‘When cutting edge biomedical research meets state-of-the-art big data technologies, the extraordinary seems possible,’ the organisers state. ‘In the forefront of scientific innovation is the recognition that the diseases of ageing are not inevitable facts of life; instead they are biological challenges with real solutions. It is widely recognised that prevention is better than a cure – this event is an endorsement of that idea.’

Details: http://www.bigdatamed.org

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The study has highlighted that many EU countries have difficulties in retaining and recruiting health staff. These problems are frequently allied with the challenge of balancing the right number of healthcare staff with the right skills in the right geographical areas to meet the changing needs of populations and health systems. These difficulties in retaining and recruiting health staff need to be addressed by policy-makers, healthcare managers and healthcare workers because they are becoming increasingly urgent. As healthcare demands increase, the healthcare workforce shrinks – with many workers reaching retirement age – risking the future sustainability of Europe’s health systems. Whilst no ‘one size fits all’ solution can be found to these problems, there is a number of success factors like education opportunities, financial incentives and professional and personal support could help to attract and retain healthcare staff.

Recruitment and retention of Europe’s medics

Following a tender by the European Commission (EAHIC/2013/ Health/08), the European Health Management Association (EHMA) organised an expert consortium to carry out a study to identify and analyse effective strategies for recruiting and retaining health professionals in Europe.

A maths and computer sciences graduate from Humboldt University, Berlin, Christoph Meinel is president and CEO of the Hasso-Plattner-Institute, and professor for Internet Technologies and Systems at the University of Potsdam (Germany). He is a member of acatech, the national German Academy of Science and Engineering, Chairman of the German IP2 council, and serves on various advisory boards, e.g. SAP. His research focuses on IT and systems, and Design Thinking research.

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An online survey of 1001 French adults, which aimed to reveal public opinion on healthcare access and other perceptions regarding public hospitals, has been carried out by IFOP on behalf of the French Federation (Fédération Hospitalière de France- FHF).

The analysis of results has shown that, regardless of political affiliation, age, gender or social status, 89% of respondents think is a model worthy of introduction in other countries. They believe it to be efficient and performance of the latest in healthcare technology.

A subset of the 1001 French adults, 46% have direct access to the social security system with a ‘Carte Vitale’, and 87% have additional private insurance (mutuelle). However, among those polled, 95% have direct access to the social security system with a ‘Carte Vitale’ and 87% have additional private insurance (mutuelle). However, 46% think that the system – provided that it has been professionally developed and is continuously updated (see graphics). This results in clear findings as to opportunities for rationalisation and thus, in turn, clear cost benefits. In theory, anyway, in practice, many problems can arise because FM is not usually implemented right from the point of building design and construction. Introducing FM to existing premises is unlike- ly to be successful all across the board, and hospitals are so complex that even ‘old hands’ at FM only attempt partial introductions.

The ideal scenario is for FM to be incorporated during design and construction, Lennerts advised. ‘This facilitates primary as well as secondary process-oriented plan- ning. However, this is extremely dif- ficult because architects tend to lack the knowledge and the individual processes are extremely varied, and hospital operators who are striving to build exemplary hospitals and provide the opportunity for the integra- tion of FM into the design and construction of a new building, right from the beginning, are very limited in numbers.

Therefore, the strategy revolves mostly around upgrading and individu- al, particularly cost-intensive areas of the process with modern IT tools. The so-called ‘Building Information Modelling (BIM) is a new tool that can also be used for the design of virtual building models.’

One of these experts is Professor Kambert Lennerts of the Institute for Technology and Management in Construction in Karlsruhe. For a long time this facility manage- ment specialist was responsible for one of the most heterogeneous and comprehensive property portfolio in Germany – assets owned by Deutsche Bahn. European Hospital sought answers to three questions from the profes- sor, first asking how FM could save running costs in the hospitals.

The strategy, so far, has been all about developing blockbuster drugs that help as many people as possible, which aims to reduce expenses of around 10 to 30 percent – with- out causing any negative impact on the primary processes of healing and caring. Energy consumption is obviously a good starting point, with BIM also helping to achieve cost optimisation.

The IFHE Europe, i.e., the European branch of the International Federation for Hospital Engineering

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**Facility Management**

Reaching into the core of process rationalisation

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**Who are those data sets to be analysed actually Big Data?**

Yes, we can no longer access these differ- ent ‘pots’ of data stored in different silos and look for connections with the help of modern procedures, such as ‘Deep Machine Learning’ and neuronal networks, or respec- tively, if we can detect patterns and connections. This can lead to the discovery of connections that we had never even imagined. Full credit must go to the turning of the natural scientific principle, i.e., the estab- lishing of a theory and proving it with experiments. Now we throw large amounts of data into a pot and leave it to high performance computers to look for patterns and connections, often with surprising results. For example, if the analysis shows that many people suffering a certain illness benefit from one par- ticular medication out of a number of comparable drugs, then a doctor can most probably help his patient by prescribing this medication – even though he may not understand exactly why.

Could tests and images be cor- related in the context of Big Data Analyses?

This seems possible indeed. It is about attempting to bring images and tests together, i.e. mechanical recognition of semantics. Tests are now quite easy to understand, but how can I detect something in a video? You can describe the video with text, but we are looking for procedures that automatically rec- cognise what happens in a video at what point in time, to make retrieval of this information possible at a later stage.

If this goes well, where will we be with Big Data in five years’ time? What will we be able to find out then which we can’t do now?

We will certainly know a lot more about the structural design of humans, i.e. gene analysis, protein analysis, molecular analysis, and also about processes in the body, what triggers what and how. This will result in improved opportuni- ties to diagnose individual consti- tutions and in more appropriate treatment of diseases, i.e. person- alised medicine. However, this will also require quite large financial investments. For the pharmaceuti- cal industry this means the devel- opment of individualised medica- tions, which will revolutionise the industry - bearing in mind that the strategy, so far, has been all about developing blockbuster drugs that help as many people as possible.

Data protection

This is a key topic. Data obviously has to be protected, particularly where it is possible to draw conclu- sions as to personal information. However, neither the German data protection law, nor the proposed European data protection regula- tion, meet the level of data pro- tection required in the age of Big Data. Historically, the philosophical principle has been one of thinness with data. However, if we say that Big Data is the shape of the future, that will be at odds with the princi- ple of data thinness.

Additionally, there is the issue that all data sets will be managed for a previously defined, specific purpose, which may be even more problematic. Because this is the Big Data approach we where we initially just have a look and see, and only then make the best of it without prior knowl- edge of the purpose.

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**French fear for the future of healthcare**
they pay too much for their insurance by comparison with how they use it and, worryingly, 48% say they have refused further consultation or treatment because of the costs involved.

The survey also looked at attitudes to a potential restructuration of the current healthcare system to provide more equal care. Sixty-five percent consider healthcare as a priority for government spending another 35% consider it very important, but not the most pressing. The respondents were split 50:50 as to whether the health service could undergo financial reform without reducing the quality of care given. However, they are not resistant to change.

One area that has almost unanimous support is adoption of a geographical quota system for newly qualified doctors, which restricts choice as to where they can set up practice and bases it on the particular needs of a region. This is considered as a practical way of reducing the geographical inequality in access to care. Other positively received solutions to improve the financial burden on healthcare include charging a flat-rate fee to patients who use A&E services instead of visiting their family doctor, encouraging home hospitalisation for those with chronic illness, and reducing hospital stays by increasing the amount of day-surgery. Likewise, the adoption of new e-medicine technologies is considered a way to improve access and control costs. Many of the respondents (72%) are happy to be permanently satellite-tracked if they should have a chronic illness in order to receive rapid emergency care and 55% would consider sharing their medical data with, and receiving care/advice from their doctors via mobile telephone apps or similar e-health programmes.

Other reforms generally considered inevitable in order to maintain high quality healthcare under financial constraint were to increase the number of minor/routine procedures performed by nurses, giving more responsibility to pharmacists and bringing an end to rebates for medicines available without a prescription.

Conversely, any suggestion of changing the proportion of healthcare paid for by the social security and increasing the amount from private insurance is firmly resisted. However, despite this strong desire, in the long term many feel it is inevitable if high quality healthcare is to remain a feature in France.

Reference: Observatoire de l’égalité d’accès aux soins – Vague 2 – Mai 2015
Smart watch promises smarter medication

By Michael Krassnitzer

While Swatch and Rolex count the hours until their smart watches overwhelm the time market, medical informatics researchers have already been working on solutions to improve healthcare. Some demonstrated their work on a medication reminder application during the Medical Informatics Europe conference in Madrid.

However, research shows that those tools are not as effective as they should be, said research associate at the medical informatics department at Heidelberg University, Monika Pobiruchin, when presenting her team’s work on a multiple medication reminder solution during the conference. “People simply forget to look at their phones or to put the alarm on,” she said. “They sometimes miss the alarm, especially when their phone is at the bottom of their bags, and so on.”

In addition, smartphones are not appropriate for the digitally illiterate and many elderly people. Smart phones are complex, multi-purpose devices and readability and interaction concepts can become technological barriers for the non-modernized, such as the elderly, who are more likely to consume pills than any other population group.

On the contrary, wristband watches have been increasingly used since WWII and the elderly tend to wear such devices; smart watch-based solutions are therefore an ideal option for this group, according to Pobiruchin, whose work targets a large group of patients regardless of age or technical affinity. She and her colleagues evaluated several smart watch models, some of which are already on sale, such as Android Wear, Apple Watch, Gear S3, and smartwatches TrueSmart, LG GD910 and Samsung Gear S. They looked at whether the operating systems of the devices were open and whether apps could be developed, and also checked the watches’ battery capacity, autonomy, weight and size. “It doesn’t make sense to have to recharge your watch every ten hours, nor does it make sense to have an 18-hour-long autonomy only, as is the case for the Apple Watch,” Wiesner explained. The smart watch shouldn’t be bulky, but light to wear around your wrist, Martin Wiesner, Pobiruchin’s colleague, pointed out.

They singled the Samsung Gear S out as particularly handy because it works on a stand-alone mode, i.e., it doesn’t need to be connected to a computer or phone constantly. “The advantage is that you don’t need to pair it with a smartphone via a Bluetooth connection, so no extra device needs to be carried around,” Wiesner explained. A multiple medication reminder solution for the elderly is only the beginning, as smart watch-based applications could also be developed for diabetics to measure their blood glucose level, or as a simpler reminder for women to take their contraceptive pill. A discrete alarm could also remind users that they need to take a medication as well as warn them for instance for a computer or phone constantly. The advantage is that you don’t need to pair it with a smartphone via a Bluetooth connection, so no extra device needs to be carried around.

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The German IT security act

German hospitals, having ‘critical infrastructure’ components, are granted a two-year transition period to comply with the IT security act (ITSiG) the German Parliament adopted in June. Many hospitals are already bellyaching about the financial burden being too high with transition period too short. According to the recently published Hospital Rating Report 2015, every sixth hospital in the country faces insolvency. Is a hospital infarction imminent? Frederik Humpert-Vrielink, Managing Director of CETUS Consulting, believes misguided investment decisions are the real cause of the financial plight of many. He has developed a five-point plan to make compliance with ITSiG less painful.

Tighten the organisation – The first point in Vrielink’s five-point plan is tightening of the organisation of the IT environment and structures to ensure secure operations. ‘There are still many hospital IT departments that operate on an ad hoc basis without clearly defined responsibilities. Tightening organisation here means spreading the IT tasks across the team in such a way that each team member is assigned tasks that fit their qualifications and competencies,’ he explains, adding that he is increasingly seeing facilities where the IT team leaders and their deputies carry 90 percent of the operational responsibilities with the entire rest of the team carrying only 10 percent of the weight. This, he claims, is not only a waste of security resources; it wastes of economic resources.

Needs to focus on own role
Vrielink suggests creating different IT sub-teams based on department size, which are in charge of defined applications (HIS, RIS, PACS, etc.) or network in respect of infrastructure. Additionally, he underlines, ‘responsibilities of department or division heads must be adjusted: management has to manage more and leave operations to their staff’.

Documentation is another important issue. All activities should be documented following unambiguous standards so as to trace and manage changes. Vrielink favours role-specific task definitions with clearly defined qualifications because; This ensures each team member has or acquires appropriate qualifications and that new staff can be recruited according to actual need. Investments in competent staff with

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The five-point plan:
1. Increase the degree of organisation in the IT department and create structures that allow safe and secure operations.
2. Define responsibilities for documentation, operations and applications.
3. Invest in competent staff with an adequate professional background.
4. Quantify the resources required for secure IT operations.
5. Re-assess building and medical technology to identify new security risks.

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Continued on page 6
Discovering what causes what

Systems biology allows the mathematical visualisation through graphs and networks of complex body processes such as disease development. The aim is to improve understanding processes and triggers of diseases, so as to access and repair a damaged network. ‘We are still approaching this issue with a lot of naivety and underestimate the complexity of biological systems, and therefore of diseases,’ says Professor Rudi Balling, Director of the Luxembourg Centre for Systems Biomedicine at Luxembourg University.

‘Today, new approaches in systems medicine are crucial. Learning by doing or experiencing new analytical procedures and combining them with bio-informatics, we will be able to understand diseases and processes to an extent that allows us to intervene far better.’

Exactly who or what drives systems medicine forward?

‘Many of my colleagues are convinced that the new technology is the driver but, frankly, I don’t think that. As far as I’m concerned it’s the demographic change that prompts us to act. Our ageing population, which naturally means people are sick more frequently, and immense medical progress, create a pressure towards the development of affordable and feasible solutions. ‘What we’ll see in the future is a triangle of many patients, few payers and wide range of services possible made possible by medical progress. This triangle is a well-known insurmountable challenge for a healthcare system financed through solidarity-based mechanisms – if we don’t use modern technologies. One of these options is the systems medicine approach, which will lead to physicians being able to predict individual courses of disease better. Medicine will become much more precise and much more specific.’

Thus the importance of constant exchange between clinicians, IT people, physicists and mathematicians...

Exactly. The systems medicine approach requires cooperation between physicians, specialists in analytical procedures, such as proteome analyses, and experts who mediate between physicians and bio-informatics specialists. The potential resolution of these questions is enormous. More to come...

We’ll have to have in-depth discussions around the issue of data proprieties, who basically process data – the bio-informatics specialists. The success of systems medicine relies on the cooperation of these groups. Moreover, we need experts who deal with healthcare-related issues and cannot be solved within the healthcare field, such as legal or ethical issues regarding huge data volumes. ‘A secure management system also has significant social relevance. On the one hand it creates the preconditions for the segmentation of drug areas. The ageing population is too large to be able to participate in medical progress. On the other, we already see today how Big Data can change our lives. Point in case: the availability of huge amounts of data, for instance by mobile phones. ‘We know from the USA that the integration of these data into clinical systems can have a huge impact on the way physicians practice. ‘We will work mainly with non-invasive imaging procedures that will enable us to have an ever-improving resolution. In case: the availability of huge data volumes. ‘We will work mainly with non-invasive imaging procedures that will enable us to have an ever-improving resolution.

More to come...

EUROPEAN HOSPITAL Vol 24 Issue 4/15
Big Data may streamline epidemic control

Rudi Balling studied nutrition at the University of Rhode Island and Washington State University (USA) and gained a PhD in Human Nutrition from the University of Illinois in 1984. After several research posts, in 1993 he was appointed Director of the Institute of Mammalian Genetico at the GSF National Research Centre for Environment and Health in Munich. Then, in 2001, he joined the Helmholtz Centre for Infection Research in Braunschweig as its Scientific Director. Eight years later, Prof. Balling became the founding director of the Luxembourg Centre for Systems Biomedicine (LCSB).

Do you get secure Clouds? ‘This development will have a dramatic impact on the next generation because biomedicine cannot work without mathematics – it will therefore have to work safely with IT and large data volumes.’

How do you explain ‘Big Data’? Big Data refers to data sets that are either too large or too complex to be analysed by conventional means. Note that complexity here is even more of an issue than size; per- sonally I would classify Big Data in healthcare in three categories: Conventional Big Data, meaning information from genome or transcription analyses

1. Unstructured Big Data, meaning infor- mation that is being stored for regular healthcare purpose
2. Private Big Data, meaning data, such as those generated by smartphones, which potentially could be used for health monitoring purposes.

Is there European cooperation for this? ‘Many ideas are being discussed worldwide with regard to stand- ardisation. The USA’s government has created massive incentives and invested significantly in electronic patient records and is now in the process of ensuring interoperability. While there is a lively international debate on standards, in Germany, unfortunately, we are lagging miles behind. In healthcare IT, be it with regard to research or provision of care, there are only very few cooperation projects. We believe there will be an increasing awareness of this issue, since I am utterly convinced that these technologies will not be able to master the demographic change in the healthcare system.

‘We must change our idea of information technology. IT is a basic requirement for water management. Thus it should not be an item we have to apply for in our individual project applications. IT should be available anywhere and there has to be the will to use or to be allowed to use unexploited resources.

Are you afraid we will become transparent patients? ‘I recommend we don’t approach the issue driven by fear, but that we do a sensible and factual risk assessment: we recognise the posi- tive potential, the risks and the potential feedback, and we look at them carefully. At the end of the day it is a cost-benefit analysis. I think the benefits of using Big Data far outweigh potential drawbacks.’

Report: Sascha Keutel
It's a race against the clock, every hour counts in efforts to halt the spread of a disease, but identifying anyone with whom the infected patient has had contact is time-consuming, with Contact Officers generally collecting data on paper. In the background, complex processes run on cloud technology working with SAP's HANA database structure, which can handle information processes on Big Data level.

Pilot phase ends
After returning from a site visit during the field pilot in Nigeria, Krause reports, fortunately there are no Ebola cases in Nigeria currently. So we had to design a complex virtual environment in which we simulated an Ebola outbreak, but we carried out the simulation under field condi- tions in the close to 100 localities and staff that would normally have to cope with the outbreak.

The current funding of this research project from the German Ministry for Research and Education is scheduled for completion soon. In late August the data will be evaluated. Based on the results, the project partners will decide whether this approach will be pursued for further development and expansion. Summarising his initial impressions, Krause said: ‘SORMAS definitely has an enormous potential. People in the field want such a system and, as far as the technology is concerned, it’s feasible. The concept offers several advantages compared to other current approaches using mobile devices.’

Epidemiologists and a Surveillance Officer testing SORMAS in Nigeria

HPF. It combines Big Data tech- nologies with smart applications. Commercially available smartphones and tablet PCs, which can be used even in remote rural areas, are equipped with specialised apps for mobile data collection in the field. In the background, complex processes run on cloud technology working with SAP’s HANA database structure.

A medical graduate from the University of Mainz, with a research doctorate in tropical hygien from the University of Heidelberg, Gérard Krause worked as a physician and research associate in tropical hygie, internal medicine and hospital hygiene in different hospitals and universities. He was epidemi intelligence service officer at the Centers for Disease Control and Prevention in Atlanta, USA, before moving to the Robert Koch Institute (RKI), where and became director of the infectious dis- ease epidemiology department (2005-11). In 2011 Dr Krause became chair for infe- cious disease epidemiology at the Hannover Medical School and head of the epidemiol- ogy department at the Helmholtz Centre for Infection Research, Braunschweig.

Mobile technology
The system supports the different parties involved in epidemic surveil- lance, e.g. Contact Officers (COs) who visit those who may have had contact with infected persons. Whilst the COs previously collected data on a hard copy questionnaire, with SORMAS they enter detailed case data directly on to the mobile device and transfer these in real-time to the relevant authorities. The data are stored in a cloud to be accessed by all other authorized participants in the process. ‘Involvement’ is a key issue for the epidemiologists: From the outset, we designed SORMAS to integrate fully into existing national and international information pro- cesses and to comply with statutory requirements. We did not want to develop an additional and separate system but provide a tool to make the existing systems more efficient. SORMAS is based on in-memory database technology developed at
## Electronic medical records

**Patients wholly embrace EMR access**

When real medical records go live more than eight in ten users seeking information are patients, not their caregivers.

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Who really uses electronic medical records? At most European hospitals, even the physicians and nurses have trouble accessing paper-based or even electronic-recorded collections of mismatched data. Yet, once a hospital installs an EMR system that is truly robust and capable of reporting up-to-date information about patients, it turns out that the patients are looking at their records more than their medical caregivers - by a ratio of 8 to 2.

The report comes from the software firm Epic, which has surged ahead over the past five years as the preferred provider for e-health systems at major hospitals in the United States. Among the firm’s 354 customers are prestigious medical centres such as the Mayo Clinic, Johns Hopkins, the Cleveland Clinic, and Kaiser Permanente, to name just a few. The company claims that 56% of the American population has a digital record on one of its systems.

To gain a better understanding of patient portal usage patterns, Epic monitored the online traffic during 30 days among 12 of its participating medical centres. The results were staggering, according to Martin Antonius, Vice President of information in the Netherlands. "We saw something like 150,000 caregivers using the records, but when we looked at how many patients were accessing records, we saw there were 680,000,” he said. "We learned that, through the patient portal, patients are doing all kinds of things to participate in their treatment and to become more responsible for their health. We think that digital portals are extremely important, and do our customers, because patients not only embrace their role in healthcare but also, once they can be integrated into their healthcare, they become engaged in that care.”

"Looking at Europe as a whole, this is an area where there is potential for considerable growth,” the Vice President said.

Earlier this year the first European hospital to go live with a full Epic system for managing EMRs achieved the highest ranking for its ability to share complete patient records in real time among physicians and care-givers. Radboud University Medical Centre in Nijmegen, the Netherlands became only the third hospital in Europe to receive a Stage Seven Certification from HIMSS Analytics, based in Leipizig, Germany, a branch of the Healthcare Information and Management Systems Society based in Chicago. Radboud University Medical Centre, shares this distinction of Epic MyChart gives patients controlled access to the same Epic medical records their doctors use, via browser or mobile app.

### Applause for digital maturity

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**A senior consultant spearheading a UK hospital’s drive to become paper-free has stressed the importance of seeing the process as a clinical transformation, rather than merely an IT project.**

St George’s University Hospitals NHS Foundation Trust, London, has been recognised for the significant progress made towards paperless-ness and has been validated by the Healthcare Information and Management Systems Society (HIMSS) at Stage 6 of the Electronic Medical Record Adoption Model (EMRAM).

However, Dr Martin Gray, the Chief Clinical Information Officer at St George’s, said it was critical that clinicians were seen as being a key part of the process of the hospital becoming ‘digitally mature’.

Gray, who is also a paediatric intensive care consultant, said: ‘There are a large number of clinicians from this organisation without whom this project would not have succeeded. It does help having clinicians from varying roles bridging the gap between IT and change management, and the clinical ‘shop floor’.

St George’s, which has more than 1,000 beds and serves a population of two million, has become the second and largest trust in the UK to be validated at EMRAM Stage 6.

It is paperless in the paediatric intensive care unit – apart from consent and child safeguarding forms. In the renal, cardiac and neurosciences wards it is almost paper-free.

However, on general medical and surgical wards while patient administration and ordering of tests is paperless, much of the patient’s journey is still on paper.

‘For us, as a hospital, this accreditation puts us on the map,’ Gray added. ‘There has been a lot of hard work over a number of years by both clinical and non-clinical personnel within the organisation working to develop an Electronic Medical Record and digitise the hospital.

The recognition by an internationally-accredited body that we have reached that level of digital maturity is important; but it also helps to set the agenda for what we need to do to reach the next level.

The next phase sees the further extension of digitisation of healthcare throughout the hospital.

‘It’s also about opening up the digital records to enable patients to access their own electronic files and allowing cross agency working with GPs, community health, social services and with our network hospitals in South West London through inter-operability,” said Gray.

With consent forms, however, third party documents and referral systems and how you build a digital workflow for the delivery of care within the healthcare ecosystem. Gray admits there were challenges with clinical engagement, communication about the project and bringing all departments on board with the project, which began in 2010 with the implementation of the Cerner patient administration system.

Ordering and reporting diagnostic tests followed in 2012 and in 2014, St George’s moved to electronic prescribing, medicines administration, and clinical documentation.

Care digitisation has proved particularly effective with the Cerner Millennium closed loop medication management system, when medication is ordered electronically for a patient it is verified in the pharmacy by a clinical pharmacist, then dispensed automatically by robot and delivered to the ward and, at the point of administration, the right and only drug is identified by barcode technology.

The solution has resulted in increased accuracy of prescribing, fewer medication errors, improved drug savings in the future, time to complete the drug rounds.

‘One of the softer benefits is that nurses now have more time to explain to patients about the drug they are about to take,” Martin Gray gladly admitted.

UK hospital reaches Stage 6 of EMRAM

The system has also improved the efficiency of patient flow by cutting down the time patients spend waiting for drugs before discharge.

The centralised Electronic Patient Record system now has more than 5,500 users including nurses, consultants, doctors and administrators, and means access to documentation and notes is possible from anywhere in the hospital, or even remotely.

Gray’s conclusion: ‘While it’s still in the very early days of the project, we are starting to see efficiency savings and quality improvements.’
An innovative imaging technique, more commonly used in neurosurgery, is finding fresh applications within cardiovascular imaging. Diffusion tensor MRI is an evolving form of imaging that is offering new insights into tissue architecture, Mark Nicholls reports.

During a session focused on innovations in cardiovascular imaging, at the British Cardiovascular Society annual conference (Manchester in June), Professor Dudley Pennell, Director of the Cardiovascular Magnetic Resonance (CMR) Unit, and Director of Non-Invasive Cardiology at Royal Brompton and Harefield NHS Foundation Trust, outlined the background to diffusion tensor imaging (DTI).

He explained how the technology yields information on water diffusion in tissue and is widely used by neurologists. It allows the mapping of the diffusion process of water molecules in biological tissues, in vivo and non-invasively, with the water molecule diffusion patterns revealing microscopic details about tissue architecture, either normal or in a diseased state.

**Tractography**

Through seven individual measurements taken by MRI, the DTI can map out the path of neurons and myocytes using an imaging processing technique called tractography. ‘With brain tractography, the images are colour-coded for direction and it reveals amazing details in 3-D and is used by neurologists to map where the neurons are going,’ Pennell explained. ‘It also has an application for the heart and can image the organisation of myocardial cells.’

During the same session, Derek Hausslenoy, Professor of Cardiovascular Medicine at University College London and Duke-National University of Singapore, outlined the role of Hybrid PET/MR imaging in cardiac disease.

‘A technology that has only been available since 2011, he said it had the advantage in that the PET element images the biological process and MR the tissue characteristics. Hausslenoy: ‘Through that, we are gaining new pathophysiological insights into cardiac disease.’

**DTI has been around since the mid-1990s but until recently has been a slowly evolving technology.**

It has taken huge steps forward with the use of accelerated imaging, advanced technology, and high field magnets (3-Tesla). Within cardiology, it has an application for cardiomyopathy, myocardial infarction and congenital heart disease.

**The challenges**

‘There are, however, major challenges for cardiac DTI,’ the professor added. ‘Because of the movement, there is a need for advanced motion freezing techniques, for spatial and temporal resolution and the complexity of myocardial architecture also pose challenges.’

DTI is an evolving discipline and one that is revealing stunning images that will help in the diagnosis process, particularly with hypertrophic cardiomyopathy (HCM) and there may yet be a range of further cardiac applications that it may have a role in, Pennell suggested. She showed how abnormal contraction in hypertrophic cardiomyopathy has been shown to result from abnormally reduced rotation of blocks of myocytes, called sheetlets, which are organised contractile structures in the heart consisting of many myocytes.

‘With Cardiac DTI the current approaches appear promising and it is improving our understanding of normal cardiac structure,’ he concluded.

**PET/MR is promising**

PET/MR has long been studied for oncology but the technique also holds promise in cardiovascular applications, according to a panel of experts at the recent International Conference on Nuclear Cardiology and Cardiac CT (ICNCT), Mélisande Rouger reports.

A new kid on the block, PET/MR enables the acquisition of soft tissues definition and contrast unseen in PET/CT. The new hybrid combines both PET and MR strengths – excellent spatial resolution with molecular data – an alliance that has begun to tickle the interest of the cardiologist community.

‘What are we going to get when we put PET and MR together?’ asks Bristol-based cardiologist Dr Chiara Bucciarelli-Ducci, who has used MR extensively in her work. ‘Potentially a lot,’ she added, ‘but we still don’t know because it’s early days.’ Cardiac imaging, she believes, is still very much a niche for PET/MR, but its potential in myocardial function makes it an attractive option.

‘Although these machines were not developed for cardiac imaging, but rather oncology, their potential in myocardial infarction assessment represents an opportunity. Acute myocardial infarction is the nearer development and this is where cardiac MRI has really been worked on, to find some constraints that hopefully now, adding PET, we’ll be able to understand better.’ MR pictures of recent myocardial damage usually show a large scar with micro vascular structure on top. Adding PET to the formula, cardiologists can not only see a lack of metabolism in the damaged area itself, but also in surrounding segments.

‘What it means is still a bit unclear, but it offers unprecedented pathophysiological opportunities to understand these complex processes,’ Bucciarelli-Ducci said.

‘For the last few years, MR has been an exciting tool for interven-
Brilliant ‘bicycle spoke’ images may hold clues to myocardial infarction

Advanced imaging techniques reveal T-tubules

During her talk, ‘3-D views of a healthy heart cell’, Ashraf Kitmitto discussed how the spoke-like structures, called T-tubules, carry an electrical signal from the outside of the cell to the inside and are necessary for the coordinated transmission of the electrical impulse through the cell, enabling cardiac cells to contract and thus the heart to pump blood around the body.

However, following myocardial infarction, the T-tubules are lost in many areas and the electrical signal cannot be carried properly through the cells. The cardiac myocyte death triggers a healing response or remodelling with extracellular matrix, fibrous tissue deposition within the surviving myocardium. The remaining T-tubules appear to fuse and clump together forming a very large, but distorted, ‘super-tubules’.

Fundied by the British Heart Foundation (BHF), the research has offered what Kitmitto described as ‘the most detailed images of the T-tubule network to date’ – promising new insights into the structural changes that may contribute towards the development of heart failure and dangerous irregular heartbeats. The next step is to find out why this process happens following a heart attack and develop strategies to intervene to stop it from happening, for improved outcomes.

With an estimated 550,000 people in the UK living with heart failure following a heart attack, Kitmitto said: ‘We’ve made major advances in treating people following a heart attack, so more people are surviving, but the treatments don’t address changes to the structure of the heart.’ For the first time, we’ve been able to use PET/MR in many more applications.

Researchers hope they will be able to use PET/MR in many more applications. Bucciarelli-Ducci points out. The ambition for PET/MR is that it represents a one-stop shop where you can measure precisely myocardial function, but also viability assessment with FDG, which is the gold standard on top of tissue revascularisation and weak cardiac MR. Simultaneous acquisition by PET/MR is promising in cardiology and PET/MR equipment is scarce, and PET/MR studies is another advantage, since it facilitates workflow and image registration significantly.

Choosing PET/MR over PET/CT leads to a dose reduction of 80% by leaving CT alone – a strong argument in their system’s favour, especially in child imaging.

Although data on PET/CT or PET/MR for cardiac applications is almost non-existent, a paper published by Catalano et al in Radiology in 2015, can be used as a reference. The study compared the use of the two hybrids in cancer patients and concluded that data found by PET/MR revealed additional findings not similar to PET/CT in 41% of the patients. It’s very relevant because it did impact on clinical management in about 18% of patients, and influenced decisions on whether they should receive additional chemotherapy and surgery or not. She points out.

Despite numerous promises, a series of very real weaknesses continue to restrain development of the new hybrid. First, the price of the modality is dissuasive and means doctors will have to justify the cost. Then, PET/MR equipment is scarce, and only very few centres worldwide do cardiac PET/MR. Siemens recently published a map of its Biograph mMR (which enables to do 3-T) global distribution; Even if they were present on four continents as of January 2015, they only had about 60 machines in total.

Additionally, the level of expertise demanded by the modality is very high and remains an obstacle to its widespread use among cardiologists. Once you do PET/CT, it’s
Coronary artery disease (CAD) is the major killer worldwide. Its early detection can save the lives of many. Computed tomography (CT) has shown tremendous results in this area, but its advantage over more invasive techniques remains to be demonstrated, especially in patients with low to moderate risk. Across Europe, a large team of investigators decided to do just that through the new DISCHARGE study. Mélisande Rouger interviewed team member Marc Dewey, Professor of Radiology at the Charité University Hospital in Berlin, about the study’s aims and design.

Continued on page 12

Stable chest pain and suspected CAD

‘DISCHARGE is a large multicentre randomised trial that aims to determine whether CTA helps to reduce myocardial infarction, stroke and cardiovascular death,’ explained Professor Marc Dewey, a team member. The study is designed to answer the question of whether CTA can improve patient outcomes compared to standard-of-care care. The trial will recruit around 10,000 patients from across Europe, and will be conducted in multiple centres. The outcomes will be evaluated using various endpoints, including mortality, myocardial infarction, stroke, and hospital readmissions.

Basic research in cardiology

Dr Adzah Kitmitto is a Reader in the Institute of Cardiovascular Sciences, University of Manchester. Having established her own research group she worked on structural studies of proteins mediating excitation-contraction coupling, leading to the determination of the first 3-D structure for the L-type voltage-gated calcium channel. This research has now developed to encompass the morphological changes that occur to the cellular structure of the heart as cardiac failure develops, using state-of-the-art 3-D electron microscopy imaging methods.

Available to look, in 3-D, at the nano-architecture of the cells around the damaged area of the heart and see the changes following a heart attack. ‘The regular pattern of T-tubules – like spokes on a wheel – is really important because it means the whole heart cell can receive the same information and it can contract together. But, following a heart attack that regular structure is lost, so some parts of the cell will get the signal and other parts won’t.’ Now, we can see what’s going on; the next step is to find out why and how we can intervene to prevent heart failure development.’

BHF Associate Medical Director Dr Mike Knapton said: ‘This interesting research and the beautiful images may hold key clues to reducing the permanent damage caused by a heart attack.’

Other talks in the session included clinical imaging for vulnerable plaques: VH-IVUS, CT and OCT by Professor Martin Bennett; Materials Science in Cardiovascular Research: a new perspective (Dr Sergio Bertazzo); and how SICM microscopy/FRET reveals molecular and cellular basis of heart failure (Professor Julia Gorelik).

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Explore the new ECG world: SCHILLER’S CARDIOVIT FT-1

PET/MR is promising in cardiology

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Robert Gropler from St Louis, USA, who also spoke during the session, summed up the situation and outlined the perspectives for the near future. ‘PET MR is slowly being introduced in the clinic and it will remain slow for a while. It’s challenging but strategies are coming. We have to keep the industry involved. The most money is going to oncology, so we need to make it shift to cardiac.

Finally, radiation exposure is not trivial. CT strategies are reducing radiation but, in the US, you can see that risk areas, such as vaccines, food, etc. are getting pushed back. I could see that for radiation exposure as well,’ Gropler warned.
World-renowned cardiologists reviewed the latest trends and dose reduction strategies in cardiac CT during the International Conference on Nuclear Cardiology and Cardiac CT (INCNC) that unfolded in Madrid in May, Méliandou Bouger reports.

During this year’s International Conference on Nuclear Cardiology and Cardiac CT, Dr Marcio Bittencourt, from Sao Paulo, Brazil, offered an overview of the newest available technology, namely GE Healthcare’s Revolution, Siemens Flash, Toshiba’s Aquilion VISION, and Philips’ Brilliance and IQon Spectral Detector CT scanners.

New scanners must do four things: improve image quality, acquisition speed and coverage, and reduce radiation dose, Bittencourt explained.

Temporal resolution – the time needed to acquire one image – should be >15% of the cardiac cycle to minimise motion artefacts. Thus, acquisition time, a challenge in the cardiac setting, must be as low as possible. Faster rotation is one way to achieve that, and most new scanners have indeed increased speed up to 0.25s per rotation. Other options are: low source CT and multi-segment reconstruction.

To improve spatial resolution, users can either do sharper reconstruction, although some recent changes in detector technology and flying or dynamic focus spot have also improved spatial resolution. For 2-axis coverage, cardiac imaging usually required about 14 cm. Some new scanners now allow this to be performed in a single heartbeat, though this technology is not available for all vendors, Bittencourt pointed out.

New technology enables selection of the best scan mode and protocol for each individual examination, which contributes to reducing radiation dose. Besides protocols, other features, such as automated exposure control, reduced target noise and iterative reconstruction, may also lower dose significantly.

One recent technology, spectral energy imaging, has the potential to do calcium subtraction, myocardial perfusion or iodine map, and beam-hardening correction for perfusion. However, not all these options are necessary if users are not doing top-notch research, Bittencourt believes.

‘If you can’t afford newer technologies, any 64 detector scanner already on the market can provide a better quality for most patients. Anything newer will cost more. If you ask me whether any of the new scanners is better, I think they certainly have more advantages and spatial resolution, which are interesting and may allow evaluation of more complex patients. So, if you can pay for these new toys, my answer is yes, they are better. But if you ask if they are a cost-effective replacement for a 64 detector scanner, from a health perspective, the answer is ‘no’.

Dr Stephan Achenbach from Erlangen, Germany, focused on methods for low-dose coronary CTA. ‘CT made its way into European guidelines on stable coronary disease and acute coronary syndrome, so it should really be considered in patient management,’ he said.

There is tremendous potential for dose reduction. A 2007 study at 50 sites across Europe compared 1,965 CTA examinations in 2,000 individuals. It showed tremendous differences in estimated radiation dose associated with CT angiography, with some sites using doses of up to 15 mSv on average and others 1 mSv.

Image quality, however, did not correlate to dose. ‘This study from the past clearly shows that radiation dose can be lowered without sacrificing image quality, and today we

**Cardiac CT without CAD**

Does CT have diagnostic value in stable chest pain and suspected CAD?

ICA is an invasive technique. As a diagnostic tool for patients with suspected CAD, especially with a low to moderate risk (10-60%), alternative tests that are non-invasive might provide a better risk/benefit ratio in favour of the patient. However, CT because it is non-invasive, also grants potentially higher patient safety if used in appropriate clinical situations – but currently we do not know which ones.

Early detection and improvement characterised of coronary plaques in the entire coronary artery tree is possible with CT. Certain unique high-risk plaque features have been shown to predict subsequent events and outcomes if assessed by CT. However, it’s not known from a randomised trial whether such high-risk plaques should lead us to recommend intensified risk factor modification or certain medications.

Another advantage is that CT images the tissues surrounding the heart, whilst ICA is limited to the two improved spatial resolution. CT gives the possibility to check the lungs, oesophagus and spine, which may result in conclusions that explains chest pain and suggests appropriate treatment, but could be overlooked by ICA.

In conclusion, ICA is the best way to treat known CAD, but in a situation where ruling out diagnosis of CAD is likely, CT, with its tremendously improved image quality, might prove to be the best method available.

**Other imaging modalities to rule out CAD**

We also use imaging ischemia tests, such as stress MRI, PET/CT, SPECT, and echocardiography. These tests, while they allow the detection of CAD, are so-called functional tests and thus have a different purpose than CT.

These perfusion-imaging tests enable a search for stress-induced ischemic myocardial areas, which play an important role in clinical decision-making in case of anatomic coronary stenosis found by CT with unclear functional relevance.

**Cardiac CT with 3D reconstruction of the chest**

**Future promising techniques**

For all the above-mentioned non-invasive techniques (CT, MRI, PET/CT, SPECT, and echocardiography), dedicated research groups are working in Europe to further improve these diagnostic tests from a technical and clinical perspective.

64 mSv is the high diagnostic accuracy for stenosis detection and plaque visualisation, CT itself, which is broadly available, and more costly
Dose reduction strategies in cardiac CT have many more options to do,” Achenbach said.

The first strategy to limit exposure is to modify the mode of acquisition and to avoid spiral or helical scanning with continuous radiation exposure, which results in a dose in the 25-30 mSv range. “That is really inappropriate for most patients who undergo CTA and can easily be modified because, in most cases, we want image reconstruction only in diastole. Most technology enables limitation of the full output of the X-ray tube during the diastolic segment of the cardiac cycle, thanks to ECG-correlated tube current modulation, often called ECG pulsing,” he explained.

Achenbach recommends using ECG pulsing systematically when spiral/helical acquisition is performed, as this will lead to a dose reduction of 40 to 50%.

Prospectively ECG triggered acquisition avoids spiral acquisition and combines step-wise table movements with short periods of data acquisition, typically in diastole. Therefore the dose is low, between 3 and 5 mSv.

High-pitch spiral acquisition, sometimes called Flash mode, is a combination of spiral acquisitions and prospective ECG triggering. This is only possible with dual source scanners and spends low dose, between 1.5 and 2 mSv. However, it requires low and very regular heart rates.

Lowering tube voltage also helps to reduce dose. Traditionally 120 kV were used in cardiac CT, but in many cases this can be lowered to 100 kV. Doing so will reduce the dose by 40%, even in patients who have high body mass index (BMI), according to Achenbach。“100 kV should be used in patients less than 85 to 100 kg – some say with BMI < 30 or 25, some combine the two, there are no strict guidelines,” he pointed out. By combining 100 kV tube voltage with prospectively ECG triggered axial acquisition, dose can be lowered to 2.5 mSv, and to as low as 0.9 mSv with high-pitch acquisition. 80 kVp work in very thin patients (<70 kg), and can lower dose to 0.6 mSv.

Some studies have combined all possible modes for dose reduction and performed coronary CTA with doses as low as 0.1 mSv. However, image quality can be seriously hampered in such an approach.

‘Very low doses are possible, but I have to say I am not a fan for continuing this race for lower doses because we really risk sacrificing image quality and making misdiagnoses if we put too much weight on dose. Cardiac CT imaging is not a race to achieve the lowest possible dose; you always have to make sure you retain image quality to evaluate even those patients who have complex situations such as calcified plaque, etc.’

Marc Dewey MD is the Heisenberg Professor of Radiology and Vice Chair of the Department of Radiology at Charité University Hospital, Berlin, Germany. He studied medicine at Charite and Johns Hopkins universities. His research focused on non-invasive cardiovascular imaging, cardiac MRI and CT, radiation dose, experimental radiology, meta-analyses, cost-effectiveness and patient-centred imaging. Publications number over 150 and he has produced 65 original papers as first or last author, and given more than 70 invited lectures, including at the RSNA and ECR.

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1 Business Strategy: Analytics Leads, Accountable Care Investment Priority. IDC Health Insights, Cynthia Burghard, March 2013. Note: Please contact your sales representative to find out whether teamplay is available in your country.
Experts: Echocardiography is an invaluable tool

The challenges and advantages of using echocardiography as an invaluable tool in the assessment of Hypertrophic Cardiomyopathy have been highlighted at a major UK conference. A key benefit of echocardiography is its ability to accurately measure important aspects of cardiac structure and function related to hypertrophic cardiomyopathy (HCM), explained cardiac physician Dr Martin Stout.

"Cardiology ultrasound examination of the heart"

Speaking at the British Cardiovascular Society Conference held in Manchester this June, during a session that examined the use of cardiac ultrasound in diagnosis, Dr Stout looked at the advantages, challenges and factors in using echocardiography to assess HCM.

A primary disease of the myocardium, where a portion becomes abnormally thickened and fibrosed, HCM has a prevalence of 0.02-0.23% in adults and, in children, prevalence estimates are 0.3-0.5 per 1,000 – although data is more limited in this population.

Dr Stout: ‘Diagnosis in adults is a wall thickness of 15mm or above in one or more myocardial segments. Echocardiography plays a central role in diagnosis but both cardiac MR and cardiac CT may also be relevant.’

"Echocardiography: Ultrasound examination of the heart"

Giving different examples of phenotypic patterns of HCM, Stout explained the importance of using contrast media in patients where diagnosis with echocardiography alone was difficult, particularly for a better view of the apex in potential apical HCM. It’s very important in these cases to use contrast to aid diagnosis and there’s real benefit in patients with apical HCM, he added.

"Viewing from different imaging planes"

Working with current ESC 2014 guidelines on HCM, he stressed the importance of viewing from different imaging planes and the particular need to assess for right ventricular (RV) involvement and measure left atrial (LA) dimensions /volume (a particularly powerful indicator of prognosis).

With echocardiography in HCM, he pointed out, factors also to be aware of include mitral valve abnormalities and left ventricular outflow tract obstruction (LVOTO). He also added the importance of assessing LVOTV at rest, during valsalva manoeuvre (exhalation against a closed airway), and during exercise: ‘The problem,’ Stout warned, ‘is that not everyone will have outflow tract obstruction at rest: only one third of patients with HCM will have outflow obstruction at rest, and another third will have obstruction during provocative manoeuvres.’ However, he stressed that not only SAM (systolic anterior motion) might result in LVOTV in HCM. Other factors to consider are papillary muscle abnormalities and MV leaflet or apparatus abnormalities; so it remains important to rule out other causes of LVOTV.

According to Stout, there are additional challenges in using echocardiography for HCM.

"Monitoring LV diastolic function in children is not always that straightforward either, it’s difficult because of the phenotypic variation of hypertrophic cardiomyopathy that must use all available technologies including LA volume and assessment of PA systolic pressure. LV systolic function in HCM can be monitored using advanced strain technology to look at subtle aspects of LV mechanics, which he said was particularly important when ejection fraction is usually normal or supranormal in these patients.

"Strain imaging can help in the clinical management of a patient and is also useful in patients with apical HCM,’ he said. His Echo HCM ‘checklist’ includes: assess presence and distribution of hypertrophy; think about use of contrast agents; assess for LV involvement; assess LV systolic function in detail; LV diastolic function; LA volume; PA systolic pressure; LVOTV, LV and the extent of MR and papillary evaluation.

The session also heard from Paediatric Echo Cardiographer Dr Saleha Kabir, from the Evelina London Children’s Hospital, who highlighted the role of echocardiography in inherited conditions, in particular left ventricular non-compaction, which, although rare, is increasingly recognised primarily through advances in imaging technology.

Dr David Oxforshor, reader in cardiovascular physiology at John Moores University, Liverpool, discussed echocardiographic assessment of ARVC, a genetically determined heart disease. He said ECG is crucial for this diagnosis and stressed the importance of multi-angle views.

Music reaches the heart

The British Cardiovascular Society Conference set the tone during the opening ceremony, with his presentation ‘Where are we going with molecular cardiomyopathy?’ With the conference theme ‘Hearts to Genes’ a number of sessions focused on new genetic tests for cardiac disease and how these are being applied.

Among research presented was the discovery of a faulty gene that can cause fatal abnormal heart rhythms that are brought on by exercise, while another session suggested that fat surrounding blood vessels may actually help fight heart disease to reduce the risk of a cardiac attack.

The conference also offered unusual sessions, notably one by Professor Peter Sleight, from the University of Oxford, on music and the cardiovascular system, highlighting the therapeutic potential of music on the heart rate, blood pressure and wider well-being. This session attracted widespread national media interest in the UK.

Professor Garratt, who is also BCS vice president (education and research), said the increasing involvement of the British Heart Foundation (BHF) in the meeting was pivotal to its success and development: ‘The BHF is a key supporter of the meeting and had a number of sessions devoted to research that it funds,’ he pointed out.

This included a highlighted session of hypertrophic cardiomyopathy, which focused on research from a single clinical research department, showing how it works in terms of vision and scope. For that reason we were keen that the cardiologists who attend the meeting went along because soon they will be looking to see whether they are interested in cardiovascular research as a career, or part of their career, and the session gave them an insight into what might be involved,’ Garratt added.

The UK Genetic Testing Network (UKGTN) was involved in a session on the new genetic tests for cardiovascular disease that helps cardiologists to treat inherited conditions more efficiently while the Strickland Goodall Lecture, topic ‘wellness and its causes’, was given by Sir Harry Burns, professor of global public health at the University of Strathclyde and former Chief Medical Officer for Scotland.

Other highlight lectures covered issues such as the transplant cycle, the medico-legal minefield. There were also hands-on interactive training, popular hot topic sessions, a strong focus on cardiac imaging and expositions.

One of the more popular sessions, said Professor Garratt, was the 2015 hypertension update for cardiologists, which drew a large audience with discussions outlining why cardiologists should be interested in hypertension.

‘The aim of the British Cardiovascular Society Conference is to deliver the best basic and clinical science sessions in such a way that is relevant to everyone,’ Garratt concluded. ‘We think we have achieved it, but will continue to build on that for 2016’.

For the diary: 6-8 June 2016 BCS conference, Manchester, UK.

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Report: Mark Nicholls

Innovative presentations, groundbreaking science and inspirational lectures underlined the diversity of sessions at the British Cardiovascular Society 2015 conference held in Manchester this June.

Professor Cliff Garratt, the conference programme committee chair, pointed to an evolving programme as key to the event’s success. ‘From the perspective of cardiology, it has been very exciting and enlivening to see so many people in the cardiovascular community involved in various ways in the meeting.’

Renowned scientist and TV personality Professor Robert Winston set the tone during the opening ceremony, with his presentation ‘Where are we going with molecular medicine?’

With the conference theme ‘Hearts to Genes’ a number of sessions focused on new genetic tests for cardiac disease and how these are being applied.

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For the diary: 6-8 June 2016 BCS conference, Manchester, UK.
Transthoracic echocardiography

The role transthoracic echocardiography plays in a number of common clinical scenarios was discussed by leading cardiac imaging experts at this year’s British Cardiovascular Society Conference, Mark Nicholls reports.

Posing the question of when transthoracic echocardiography should be used, four senior figures in cardiovascular medicine and imaging, saw transthoracic echocardiography had a significant role to play in atrial fibrillation (AF). "AF, he said, is becoming more prevalent and echo is important and essential in the patient management pathway. Incidence is expected to double in the next 20 years and by 2030 there will be 15-20 million people in Europe with AF. "We have to do echo in AF for ejection fraction but it is important for choosing what rhythm control drug you may use or whether it’s safe to use rhythm control in the first place."

"Echo should be considered for all AF patients, as we are looking for LV function, risk of stroke, safety of rhythm control drugs and intervention support."

Within hypertension Professor Jamil Mayet – who heads the Surgery, Cardiovascular and Cancer clinical, educational and research programmes at Imperial College Healthcare NHS Trust in London – outlined how transthoracic echocardiography can be used to try to support patients, to decide which ones receive treatment and for risk stratification.

He explained that it can be used to assess whether there is left ventricular hypertrophy (LVH), diastolic dysfunction, LV systolic dysfunction, aortic valve issues or to assess myocardial ischemia.

Concluding that transthoracic echocardiography has a role to play in hypertension, he said: "With patients who have stage one hypertension, we need to decide whether to treat the risk factors, lifestyle, or with drugs, and we can use echo if we are going to change the management of patients."

"Patients who will benefit from referral for routine echocardiography are those with borderline blood pressure, where LVH may have an influence on the decision to treat; possibility of white coat hypertension; risk stratification in patients with multiple risk factors or routine reasons for echo, such as shortness of breath."

Dr Leonard Shapiro, consultant structural interventionist at Papworth Hospital, Cambridge, suggested that the use of transthoracic echocardiography was not critical in all cases of stroke, but had value if it made a contribution to the management of patients.

Dr Thomas Mathew, consultant cardiologist at Nottingham University Hospitals NHS Trust, discussed the role of transthoracic echocardiography in patients undergoing chemotherapy in the context of cardio-toxicity. With patients suffering cellular destruction, biopsy changes, cumulative dose-related effects and permanent damage as a result of chemotherapy, echocardiography had a role in their assessment.

"We should use the best form of echocardiography available and, on the evidence it is 3-D echo as 2-D echo fails to detect small changes in contractility. If 2-D echo has to be used, it should be with GLS or Troponin, which is the best biomarker in this context."

Mathew is concerned that all heart failure trials have excluded patients with cancer and there are no proper studies in this evaluation group. 'Using echocardiography is important,' he underlined. The main purpose is to decide whether to continue or stop chemotherapy because of the risk.
Test predicts myocardial infarction outcome

Researchers have identified a new test that can be used to predict the likelihood of a patient developing heart failure, or even dying following a heart attack, Mark Nichols reports.

Known as the index of microvascular resistance – or IMR – a new test to predict myocardial infarction outcome uses a pressure-sensitive and temperature-sensitive wire that can be inserted into a coronary artery. The extent of injury in a blood vessel supplying blood to the heart can then be measured.

Findings from a study at the University of Glasgow and funded by the British Heart Foundation (BHF) were presented at the British Cardiovascular Society (BCS) Conference, held in Manchester this June. The researchers showed that a wire inserted into the coronary artery, after someone has a heart attack, can predict if they will go on to develop heart failure.

Professor Colin Berry, lead researcher and cardiologist from the University of Glasgow and Golden Jubilee National Hospital, said: ‘Heart attacks lead to heart failure, which is a big problem in the UK, and whilst we can determine the extent of injury in the heart, an exact location of a cardiac event often cannot be determined. Th’s how we’ve come up with this test that can be used to determine the extent of injury in the heart, and how much cardiac blood vessel damage has occurred.

The Glasgow researchers now say the new wire technique can be used to work out the level of arterial damage, enabling doctors to quickly identify patients at a high risk of heart failure after their heart attack, based on damage to the arteries. Patients were enrolled in this new research at the Golden Jubilee National Hospital in Glasgow. All will have life-long follow-up to check whether the IMR result predicts survival in the long term.

Cardiac exploration gains tool to access hidden areas

The conventional 12-lead ECG has certainly proved its worth in displaying rhythm disorders or ischemia. Nevertheless, as the display possibilities of a 12-lead ECG are limited to only about 110 degrees of the heart, an exact location of a cardiac event often cannot be determined.

New mobile ECG gives 360-degree view

The conventional 12-lead ECG has certainly proved its worth in displaying rhythm disorders or ischemia. Nevertheless, as the display possibilities of a 12-lead ECG are limited to only about 110 degrees of the heart, an exact location of a cardiac event often cannot be determined.

CardioSecur pro ECG technology is a reduced electrodes system based on the EASI standard first developed in the 1960s and described by Dower in the 1980s. Numerous publications scientifically acknowledge that EASI is a highly precise alternative to conventional ECG systems, and a 360-degree view. Combined with the free CardioSecur pro app – and using only four electrodes – the mobile 22-lead ECG shows V7-V9 as well as VR5-VR9, in addition to all 12 standard leads. Thus it allows diagnosis of the left and right lateral as well as posterior cardiac wall.

CardioSecur pro also provides unrivalled communication and mobility options, the manufacturer points out.

Faster precise diagnosis

Distinguished in the Best Medical App contest at MEDICA 2014, the maker reports. ‘The outstanding quality and accuracy of CardioSecur pro has been validated in numerous clinical studies against conventional 12-lead ECG systems with 10 electrodes, and evidences a 99% plus match regarding specificity on the heart’s activity.

Personal MedSystems has produced a brand new combination of smartphone, or tablet PC, and ECG technology to reveal a significantly greater area of the heart. This is the next generation of ECG devices. A broader display is gained via ten supplementary leads, calculated for anatomies, is eradicated.’ The originality of the professional mobile ECG system lies in its mobility and simple communication system, the firm adds. Due to its small size and lightweight (50 grams), it can be taken anywhere easily, without taking up much space. Time saving.

‘Using only the four electrodes mitigates artefacts to a bare minimum ensuring maximum signal quality and exceptionally stable lead depiction. As the four electrodes are placed on very marked positions of the thorax lead misplacement, often consequential to highly diverse ECG readings with CardioSecur pro do not take up much space on a mobile device, as 10,000 minutes of ECG can be recorded per 1GB. Optionally, Personal MedSystems offers an automatic interpretation.

Details: www.mobile-ecg.com
www.cardiosensor.com
Ultrasound is at the heart of Spanish strategy

Chest pain units

Imaging modality complements a stress test in diagnosing the aetiology of chest pain, according to an expert speaking at the International Conference on Nuclear Cardiology and Cardiac CT (ICNC) held this May in Madrid.

Do we need to run?

In his presentation Rodriguez-Muñoz tried to answer the main questions a cardiologist faces in the CPU setting, the first and foremost being: Do we need to run?

Patients in shock, or presenting with myocardial infarction, or pulmonary embolism, are all situations in which physicians must act immediately: ‘We need to run whenever we believe that clinical symptoms and the ECG are suggestive of acute coronary syndrome.’

Echo will help to show whether the patient is suffering from hypoxic, cardiogenic or septic shock. Rodriguez-Muñoz recommends using echo when the suspicion of pulmonary embolism is high and the patient presents with shock or hypotension, or when CT can’t be performed.

Echo will also work for distinguishing cardiac vs. non-cardiac aetiology of dyspnoea when clinical and lab clues are ambiguous, and for guiding therapeutic option in patients with intermediate risk.

The next step is to determine whether the patient has angina or acute coronary syndrome, or not, by focusing on the negative predictive value of echo, i.e. by looking at regional wall motion abnormalities, depressed LV function, and other data. When the symptoms are atypical, a common situation in this setting, echo will also help to confirm or take decisions about where to refer the patient next. ‘We rely on echo to make the final call. In on-call shifts, we see many patients with chest pain that is non-suggestive, diabetic and obese man, so the patient is a 75-year-old hypertensive, diabetic and obese man, so the likelihood for coronary disease is low, but the symptoms are atypical and the EGG is normal.’

An increasing number of emergency physicians use US to assess patients in the emergency department, especially in small hospitals that may not have on-call cardiologists. Ramon y Cajal is one of Madrid’s largest hospitals, with 1,000 beds, including 50 in cardiology and 14 in the acute coronary unit. The CPU has an average two patients per on-call shift, amounting to 700 to 800 patients per year, Rodriguez-Muñoz estimates.

The number of patients referred for additional cardiac examination from the CPU is not very high. ‘When it’s clear that it’s acute coronary syndrome, patients go directly to the cath lab. Patients presenting with heart failure or other associated clinical problems that require further treatment, go directly to the cardiology ward – and, when there is highly suggestive clinical evidence that it’s not acute coronary syndrome, patients will undergo other tests in the emergency department.’

Spanish are unique

At the ICNC the panel concluded that most CPU strategies of detection of ischemia or coronary artery disease eventually include patients with very low probability of having acute coronary syndrome; around 95% of the tests are usually negative. Spanish CPU organisation is unique. Spain has not one but several regional healthcare systems managed by the comunidades autónomas, or regions. Protocols are not always the same and they may impact on patient care differently.

‘Each region’s network, resources and mortality rates are different. Studies on infarction showed that the mortality rate in Valencia was higher than in Madrid or Barcelona. This was relayed in the media and pushed the national government to issue measures to improve infarction prognosis. However, apart from that, the national Health Ministry has very little power,’ Nuñez pointed out.

There is a very different prevalence of coronary artery disease between Japan and the USA, so it makes sense to have different approaches there; but it doesn’t seem to make much sense to have different approaches in Andalusia, Madrid or Catalonia. It’s really an administrative and political issue,’ Muñoz believes.

However, Spanish hospitals tend to follow the European recommendations, which smooths out differences, experts suggested.

In 2009 Daniel Rodríguez-Muñoz qualified in medicine at the University of Málaga and later (2015) completed his residency at the Department of Cardiology, Ramón y Cajal University Hospital, in Madrid. Now a medical doctor at the Unit of Electrophysiology and Arrhythmias, at the same department, he is completing his work towards a Masters degree in medical education at the University of Barcelona and PhD on Intra-cardiac Flow Parameters to guide Anti- Ventricular Delay Optimisation in Reperfusion Therapy at the University of Alcalá de Henares, Madrid. With his experience in pre-education, formal/non-formal training, and design of training programmes, Rodriguez-Muñoz’s main interests are the design and development of projects and publications, and medical education.

Rodriguez-Muñoz recommends using drug-induced stress, ‘Our main strategies are CT; nuclear cardiology following either exercise or stress test with drugs, and exercise or stress dobutamine test using alterations in wall motion with echo detection,’ he continued. ‘In general, we choose echo when we have to use drug-induced stress. When the patient is obese, or a heavy smoker, the acoustic window may be bad and alter image quality, so you would rather use nuclear tests or CT.’
As new cardiac genetic testing panels become available, cardiologists have been warned not to lose sight of the importance of comprehensive clinical evaluation. While genetic testing is helping to identify more people at risk of inherited conditions, experts stress they are only part of the diagnostic toolkit.

This was outlined in a session entitled ‘The new cardiac genetic testing panels: implications for the clinical cardiologist’ held during the British Cardiovascular Society Conference in Manchester this June. With the emergence of new genetic tests for cardiac disease, Professor Cliff Garratt raised issues ‘the cardiologist needs to know’ in making the modern diagnosis.

Sanger Sequencing remains the standard to confirm a single-gene variant but new tests – next generation sequencing – which can be applied to a large number of genes, are now facilitating more testing, more cheaply and in the same timeframe with a small number of genes.

Garratt, who is Professor of Cardiology at the Institute of Cardiovascular Sciences, Professor of Cardiology at Manchester University and Hon Consultant Cardiologist at Central Manchester University Foundation Trust, explained: ‘We can have them highly targeted at 5-15 genes for LQRT, for example, or a less targeted panel for 20 genes, though the disadvantage of the panel approach is that you have the problem of background genetic noise’.

Advances in genetic and genomic technology are enabling many more patients with a rare disease to benefit from genetic tests, either to establish or confirm a diagnosis; or assess the genetic status of other family members and gene panel tests are now making it possible to test simultaneously all the genes known to be associated with a condition.

Despite having the benefits of genetic testing, Garratt issued a clear warning that, whilst genetic testing is proving valuable, it is not an alternative to making a clinical diagnosis. ‘It will not solve your clinical problems but will help management of patients who you have a proper diagnosis for,’ he said.

During the same session Dr Sheila Mohammed outlined the work of the UKGTN (United Kingdom Gene Testing Network) in the evaluation process for genetic tests.

The role of UKGTN is strategic; it involves healthcare commissioning and evaluating new genetic tests for clinical utility and validity with screening for 698 disorders, 872 genes and 46 panel tests. ‘It’s about promoting equity of access of genetic tests for individuals who have, or are at risk of genetic disorders,’ Mohammed explained.

UKGTN works with 30 member laboratories across the UK, many affiliated to regional genetic centres and some linked with specialist services and follows the ACCE model process for evaluating genetic tests. ‘The reasons for doing genetic testing is for diagnosis, treatment, prognosis and management, pre-symptomatic diagnostic testing and genetic risk assessment,’ Mohammed added. ‘The UKGTN promotes high quality, equitable and appropriately identified genetic tests.’ It has the capability to deliver effective cascade testing in inherited cardiac disorders.

Dr Kay Metcalfe, NHS Consultant Cardiologist at St Mary’s Hospital Manchester, discussed panel testing for Sudden Cardiac Death (SCD) syndromes.

Underlining Garratt’s point, she added: ‘Family screening helps identify those at risk, but the challenges of the exome and genome sequencing approach are the large amount of data generated. Genetic testing is probabilistic and forms part of a comprehensive clinical evaluation.’

Dr Paul Clift, from Queen Elizabeth Hospital, Birmingham, spoke about genetic testing in the context of Marfan syndrome and other familial thoracic aortic aneurysm syndromes but stressed the importance of physical and clinical assessment in such conditions in association with genetic testing.

According to Clift, Marfan remains a clinical diagnosis but fibrillin-1 (FBN1) gene testing aids that diagnosis and there are advantages with panel testing giving rapid genotyping allowing a detailed management strategy for patients.

‘Panel testing in aortopathy allows for early genotyping for suspected hereditary aortopathy, risk stratifies management strategy for patients and families.’

A ground-breaking genetic testing programme for an inherited and potentially-deadly high cholesterol condition has been extended to more United Kingdom health trusts, Mark Nicholls reports.

The faulty gene associated with Familial hypercholesterolaemia (FH) is found in an estimated one in 200 UK families – making this the country’s most common genetic mutation, with possibly as many as 320,000 UK families – making this the country’s most common genetic mutation, with 68,000 people under 18 years old.

FH is caused by a genetic fault that leaves people with abnormally high cholesterol, which significantly increases their risk of heart disease, including a heart attack and, on average, shorter life expectancy by 20 to 30 years if untreated. If one person in a family is found with FH, on average half of their brothers and sisters and half of their children will also have the faulty gene and be at high risk of early heart disease.

Most FH cases are diagnosed, putting them at significantly higher risk of dying young from a heart attack. New funding of over £490,000 from the British Heart Foundation (BHF) is enabling the availability of FH testing in five further UK areas. With a simple DNA blood test, a specialist nurse can identify whether an individual with a clinical diagnosis of FH carries the faulty gene. If discovered, they are then referred for family cascade testing with all immediate relatives also invited for testing and treatment at their local clinic.

If diagnosed, early statin treatment, lifestyle advice and careful monitoring, mean that an individual’s life expectancy goes up to match the average of the general population.

The additional FH cascade testing fund – extended to University Hospitals Birmingham, York Teaching Hospitals Foundation Trust, NHS Western Isles, Gloucestershire Hospitals NHS Foundation Trust, and the Royal Brompton & Harefield NHS Foundation Trust – was announced in June at the British Cardiovascular Society Conference.

They saw the initial roll-out across eight sites – Royal Free London NHS Foundation Trust, Guys and St Thomas National Health Service Foundation Trust, South Yorkshire Cardiothoracic Centre, Greater Manchester and Cheshire Cardiac and Stroke Network, University Hospitals Bristol NHS Foundation Trust, City Hospitals Sunderland NHS Foundation Trust, NHS Grampian / North of Scotland Cardiac Network, and University Hospital Southampton NHS Foundation Trust – which has already identified 500+ FH people.

Jo Whitmore, the FH Clinical Lead at the BHF, said: ‘If high cholesterol is left unchecked, fatty materials can build up in your arteries, increasing your risk of heart disease. The problem with FH is that it dramatically increases the LDL cholesterol in the person’s blood, causing a heart attack, commonly at a very young age. We know that cascade testing within families works, and the challenge is now to engage with NHS organisations and commissioners across Britain so that no family falls through the cracks.

‘FH is easily treated, so no family should have to go through the pain of seeing a loved one have a heart attack that could have been prevented.’

The National Institute for Health and Care Excellence (NICE) estimates that if 50% of the predicted relatives of people with FH are diagnosed and treated, the NHS could save £17 million per year on healthcare for heart disease by preventing cardiovascular events.

From a clinical commissioning perspective, FH has not been on the ‘radar’ of general healthcare commissioners, but has not been seen as small enough to do specialist commissioning either.

However, screening is a cost effective option, Whitmore confirms. ‘For the first person in the family identified the cost is about £200 for the DNA test but, once you’ve identified the gene you are looking for, the test comes down to £75 for other family members.’

The UKGTN is a strategic ‘radar’ of general healthcare commissioners, working alongside Public Health England, NHS England, Royal College of General Practitioners and the British Heart Foundation.
Evidence at last:

Cardiac surgeons have finally found what cardiologists had reported missing three years ago: a method to support the use of the oldest mechanical circulatory assist devices: IABP. Nevertheless, EH correspondent Holger Zorn expects the findings to have only limited impact.

A small study at the small University of Halle (Saale), Germany, triggered the most significant business kill of the current decade. Confirmed by a multi-centre study, the IABP Shock II trial, it prompted the worldwide revision of guidelines the recommendation regarding the use of intra-aortic counter-pulsation (IABP – intra-aortic balloon pump) was downgraded from a Class 1 ‘strong’ recommendation to a simple recommendation (see European Hospital, 4/2013 p. 20-21 and EH 4/2014 p. 14-15). Why? There was no difference in 30-day and one-year mortality between patients who had received IABP in addition to conventional therapy after infarction-induced cardiogenic shock and those who had not received IABP (56d, 40% vs. 41%, Ia, 52% vs. 51%). Consequently, in Germany, the number of implantations decreased by almost one third (see figure).

First, the sister clinical discipline cardiac surgery, where in the early 2000s significantly more IABPs had been implanted, made renewed efforts to assess the oldest and most easily implantable mechanical circulatory assist device and published a specific S3 guideline on the use of intra-aortic counter-pulsation in cardiac surgery (56d). The guideline ‘Leitlinie zum Einsatz der intraaortalen Ballongegendruckpumpe in der Herzchirurgie [Source: www.awmf.org/leitlinien/detail/ll/011-026.html, viewed 30.07.2015]’ clearly recommends the following:

- For haemodynamically stable patients with high surgery risk, IABP implantation is recommended, based on the second-highest evidence category IB.
- For patients with pre-surgical cardiac decompensation, implantation should be taken into consideration. This is a class B recommendation – just like the one mentioned above – however, evidence is three classes lower: class IV rather than I.
- Evidence is equally weak regarding the recommendation on the point in time of implantation: early if HLM weaning of the patient is difficult or impossible.
- Very strong evidence (IA) and strong recommendation – for the operation of IABP: Pre-surgery implantation is recommended for use during the actual cardiac surgery, to transform non-pulsatile flow of the HLM to pulsatile flow.
- Dr Kevin Pilarczyk, heart surgeon and coordinator of the guideline, which was drafted in cooperation with the national professional organisations for cardiology, intensive and trauma medicine and extra corporeal technologies, sums up the recent data: ‘The results of the IABP shock II trial, with patients who almost exclusively had received intervention treatment, cannot readily be applied to cardiac surgery patients.

Considering pathophysiological conditions

‘A patient in infarct-induced cardiogenic shock who has to undergo balloon dilatation or stent into conserva tation in the cardiac cath lab cannot be compared to a comparably stable non-surgery indication patient who has an increased perioperative risk profile due to reduced pump function. Surgery involving general anaesthesia, heart-lung machine and temporary cardiac arrest differs fundamentally from cardiac therapy. Such pathophysiological considerations are supported by a recent meta analysis assessing several randomised studies on preoperative IABP in high-risk cardiac surgery patients: it showed that aortic counter-pulsation is associated with reduced hospital mortality and reduced length of stay even when limited to more recent studies (DOI: 10.1093/eurjcc/ozv258). Data regarding the continuation of IABP-induced pulsatility during HLM are equally reliable (Source: Int J Artif Organs. 2009;32:50-61). In contrast, IABP in high-risk patients before stent implantation does not seem to have any benefits (DOI: 10.1016/j.ejcts.2012.02.027). Dr Pilarczyk concludes: “While there are no dedicated studies for this particular setting, we recommend considering IABP implantation in infarction-induced cardiogenic shock with surgical revascularisation due to the differences to cardiology.”

It remains to be seen to what extent these data will lead to an increase in implantations. Today, cardiologists are familiar with other, more difficult to implant systems – with remarkable results: attacked as business killers two years ago, they have now turned into business boosters. All other relevant systems – Impella, TandemHeart and ECLS – are significantly more expensive than IABP. The reimbursement a hospital receives for ECLS is at least ten times the amount reimbursed for IABP.

The implantation figures of all other systems totalled and projected into the future indicate that these other systems will overtake IABP in 2017 – despite the fact that, to date, no randomised study has demonstrated an advantage over – shown to be useless – IABP.
POC test detects myocardial infarction

Philips Minicare delivers rule-in/rule-out readings for heart attacks in 10 minutes. It takes a lot of hard work to make things easy, John Brosky reports.

Biomedical experts at Royal Philips have spent more than 10 years developing a simple test for the emergency department that in less than 10 minutes, may indicate whether a patient suffering chest pain has a heart attack.

The company’s new Minicare I-20 point-of-care (POC) system is now under field evaluation at six prominent European hospitals as part of Lab2Go, the three-year European Union-funded project. If successful, this handheld, bedside device would open a new pathway for rapid, reliable diagnosis that responds to a long hoped-for, critical need in emergency medicine.

Professor Volker Schramm, PhD, from the Catharina Hospital in Eindhoven, the Netherlands, presented the preliminary results of the Lab2Go evaluation to colleagues at EuroMedLab 2015. According to him, Minicare Acute has the potential to support near-patient testing, for people suffering acute coronary syndrome. These patients will arrive at the Emergency Department; and therefore would enable faster diagnosis or rule-out of CAD.

If it sounds simple so far, here comes the fun part – making it work. The widely accepted test for a rule-in/rule-out decision on heart attacks is the Troponin I (cTnI) assay. A physician draws a patient’s blood and the sample is sent to the central lab and after 60 minutes, the answer comes back. While the patient has to wait, often distressed, until the results return and the physician can then determine what treatment to provide.

To cut that window for treatment from 60 minutes to 10 minutes, Philips had to overcome a series of technical challenges. First, the simple finger prick to draw a droplet of blood for the POC test means drawing capillary blood, which is different from venous blood used in today’s lab tests. Would the results be comparable?

Second, to reduce work for emergency departments, the Philips POC test needs to be user friendly and reliable by relying on microfluidics and chemistry that require no additional steps for staff.

Third, the complexity of a laboratory instrument needs to be reduced to a handheld device that anyone can operate without special training. To solve the miniaturisation challenge, Philips brings together an unexpected combination of nanotechnology with a compact dice player. It turns out that the optics used for reading music and film, an early Philips invention, work with a precision and reliability that can be applied to chemical testing. By mixing magnetically charged nanoparticles in the blood sample, the optics can detect and quantify the prevalence of a given biomarker – in this case, the cTnI protein indicating acute coronary syndrome.

At Philips, the potential was discovered long ago. The work to create a handheld diagnostic reader instrument began in earnest in 2009 by looking at ways to enhance the sensitivity of the detection and reduce the sample concentration.

According to Michel Simons, Marketing Director of Philips Handheld Diagnostics in Eindhoven, ‘no one else can deliver high quality results from a finger-prick sample in less than 10 minutes.’

Looking beyond this first cardiac test, he sees a wider range of potential applications in the emergency department. ‘We will be able to measure all the different proteins in less than 10 minutes. We can do multiplexing on our device to test different param- eters so that, with one drop of blood on the same cartridge with a nano-dispersing technology, we will be able to conduct up to 20 different tests at the same time.’

Jos Rijntjes, who leads Commercial Operations for Philips Handheld Diagnostics said that with the success- ful implementation of this first assay for chest pain, we can go on to apply the same technology and methodologies to additional assays. In one square millimetre we might, for example, be able to load tests for high fever, trauma, brain injury, or mental disorders – offering a series of tests to help emergency physicians understand which patient needs immediate attention and treatment when rapid results are critical.

The second challenge for ease-of-use for the device is at the heart of the current test in the Lab2Go project. In addition to clinical results, the aim of the project is to gather evaluations of real-world use and identify where the workflow or usability is lacking. Rijntjes explains that the Minicare I-20 cartridge uses dry chemistry without the liquid reagents found in central laboratories. The only fluid in the disposable cartridge comes from the tiny drop of the patient’s blood.

Mechanical thrombectomy performs like a ‘corkscrew’

Cardiologists call for the establishment of 24/7 centres for rapid surgical interventions to remove blood clots in the brain, John Brosky reports

They did it for heart attacks. Can cardiologists now lead an effort to speed up the emergency medical response for stroke?

Over the past five years, the Stent for the Brain (SFA) trial published by interventional cardiologists has pushed major centres to assure 24/7 coverage for this type of treatment for patients suffering with severe chest pain.

Now, there’s new evidence that a mechanical intervention to pull out blood clots is more efficient and safe than the current standard of care – a procedure in the brain as well as the chest – and also offering potential for angioplasty and stenting procedures.

That number nearly doubled again so that, in 2014, there were 5,500 operations for angioplasty and stenting procedures. There are almost 13,000 interventional cardiologists attending the ESCR events in 2016.

New devices that are generating the excitement surrounding this procedure include the Solitaire revascularisation device from Covidien and the Trevo from Stryker Neurovascular.

Solute is a mechanical thrombectomy device used to retrieve a clot in patients experiencing acute ischemic stroke

Membership in EAPCI has grown rapidly since it was founded in 2006. In the five years 2,700 members have joined to attend for angioplasty and stenting procedures.

Those studies showed that rapid mechanical thrombectomy using a new generation of clot retrieval devices improves patient function after acute ischemic stroke.

Five clinical trials have been halted because the new technology is better, because it works; said Snyder. The current standard of care for stroke patients is an intravenous (IV) injection of a tissue plasminogen activator (t-PA) meant to dissolve a clot blocking blood circu- lation in the brain. The new procedure for mechanical thrombectomy is a surgical intervention, in which a device is used to pull out the blood clot immediately and directly. The procedure is performed without general anaesthesia as the patient is not aware of the cather snaking through blood vessels to arrive in the brain, where it deposits a device called simply a cork-screw.

Surgeons have reported that patients in some cases have sat up on the operating table after the clot was removed and began speaking with their family.

Catheter operators trained through EAPCI have the basic skill set need- ed for the procedure, and with addi- tional training could maintain the 24/7 coverage for this time-critical procedure, according to Fajadet.

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The full results of the evaluation from hospitals in Austria, France, Germany, Netherlands and the United Kingdom are not expected until 2016.

Meanwhile, Philips faces one more critical challenge, clinical tri- als that will put the Minicare Acute troponin assay up against laboratory results in a head-to-head compar- ison. Simons explained: ‘We plan to start in Europe, but aim to have parallel trials running in the US as soon as possible. Discussions are currently underway with the FDA (Food & Drug Administration) to determine what our clinical trial needs to look like. Several sites in the U.S. have already expressed interest in joining the trial.’

Jos Rijntjes, Head of Commercial Operations for Philips Handheld Diagnostics in Eindhoven

Michel Simons, Marketing Director of Philips Handheld Diagnostics, in Eindhoven
In recent years a number of hygiene incidents concerning medical practices or hospitals have worried patients across Europe. However, every incident has become a learning experience and heightened awareness of the importance of thorough hygiene.

Henry Schein, the world’s largest provider of healthcare products and services to more than one million dental, medical and animal health practitioners, is No 1 on FORTUNE’s list of the World’s Most Admired Companies in healthcare (wholesale category). The company often integrates consulting for efficient medical practice management, with hygiene among the focus topics. A unified hygiene standard, however, is by no means easy to achieve, as illustrated during a discussion, with Markus Bappert, Regional Director for Austria and Eastern Europe, Otto Wiechert, Sales Manager for Germany for Hygiene and QM, and Juan Molina, Managing Director of Henry Schein in Spain and Portugal, to take a comparative look at Spain, Austria and Germany.

Focusing on the importance of hygiene and infection prevention: Bappert: ‘Much is happening right now. Last summer we initiated a round table with leading experts and we launched an initiative that aims to put the spotlight on hygiene. In this context, OGHZ and Schein jointly organised a series of events that drew more than 1,200 participants.

‘This led to several companies expressing a strong interest in cooperating with us as well as supporting us with their expert hygiene knowledge.’

Wiechert: ‘In Germany, the situation is somewhat more complex. Whilst there is a national law, implementation and standards differ in the different German federal states. A multitude of government agencies audit medical practices, such as the healthcare authority, the trade inspection authority and regional government, with the latter sometimes “outsourcing” the audit to the German Medical Association, or the Regional Dental Chamber. In short: there is no unified national standard. As far as implementation is concerned this means that each agency or authority which audits a practice has a different focus.

‘Moreover the term “consultant” is unfortunately not a protected designation and consultants indeed apply different approaches to the implementation of hygiene measures. Consequently, a professional training event, such as the series that was organised in Austria, might make little sense on a national level in Germany; a presentation given in North Rhine Westphalia might not be valid in a different federal state.’

Molina: ‘In Spain, there are currently different initiatives, some launched by the government, others by professional associations. The most important one is arguably an initiative by the Spanish Federation of Health Technology Companies, which aims to reduce the number of healthcare-associated infections by 30 percent by the year 2020. We do have to raise awareness on all aspects of hygiene and infections in all healthcare facilities and we need to establish a hygiene control system and quality audit. Moreover, we need constant monitoring of all hygiene and disinfection measures in all facilities in order to effectively prevent infections.’

Should European countries all establish unified standards and require medical practices to use certain products?

Bappert: ‘Whilst indeed there are hygiene and non-hygiene products and systems, it’s not the products that are crucial, but the processes. On the one hand you can create sterility without equipment, using a manual procedure; the equipment simply facilitates the task. On the other hand, if you have the top of the line equipment but no adequate procedures, you do have a hygiene risk right there: Vice versa: simple equipment and the right process can be immensely effective in assuring superior hygiene without major capital investments.’

Wiechert: ‘In my opinion, it should be exactly the other way round: there should be a certain financial incentive for certain services that are to be guided by the health insurers. As the manager of a medical practice, for example, I’d have to obtain a “green light” label, which shows that I implemented certain measures – and only those practices that have obtained the label would be eligible for reimbursement by the health insurers. That would be the easiest approach for all parties concerned.’

Molina: ‘Spain has a very well developed network of public and private hospitals. We are currently working to make all facilities implement identical control mechanisms and protocols because we have to be even more effective in identifying potential problems with regard to hygiene and disinfection quality. This, as far as I am concerned, requires a unified quality assurance process and identical use of technology.’

A recently published European study indicated that, in Spain, the level of out-dated equipment is slightly above the European average. Therefore, I consider it very important for the decision makers in healthcare, and in government, to invest in adequate technology in order to ensure the required level of hygiene and infection prevention.

‘One of Spain’s strengths is clearly the quality of our excellently trained physicians. They play a crucial role in the assessment of the hygiene situation and can initiate improvements. I’m convinced we need a balance between professional training and the quality of the technology we use. We need safety guidelines and concrete work instructions and we have to further improve communication with the patients.’
Melisande Rouger reports on expert reviews of vaccines in the pipeline and the potential of nanomedicine given during the Spanish Society of Infectious Diseases and Clinical Microbiology (SEIMC) annual meeting in Seville.

Vaccination remains one of the most effective methods to prevent infectious diseases, often being the best protection against infections such as hepatitis B or influenza.

Vaccine science has evolved greatly over the past few years, according to Dr Carlos Martín from the Medical Faculty, University of Zaragoza: ‘There’s been a huge advance not only preventing infectious diseases but also chronic diseases such as cancer. The hepatitis B vaccine, for instance, has significantly lowered the incidence of liver carcinoma and, with the papilloma vaccine, we will see less and less cases of cervical cancer in the coming years.’

**Clinic trials**
Most commonly, new vaccines in development use viruses or new generation of adjuvants to improve immunisation. They can use adenoviruses such as MVA, virus-like particles, purified proteins or nanoparticles.

It is essential to conduct efficacy clinical trials and new technologies, such as transcriptomics, could be used as potential correlates of protection to accelerate the development of a new vaccine, Martin explained. ‘We usually have to wait 25 years for a vaccine to be developed and bringing it to the market costs between 500 and 900 million euros. In the 80s, the discovery phase was extremely long and clinical trials lasted about five years,’ he said. ‘We should be able to reduce the time of clinical trials with new technologies.

**Combined vaccines reduce HIV**
HIV is an important but complex area of innovation. Researchers have worked for the past 20 years on a prevention care for AIDS, first with inactivated viruses, and then with vaccines trying to improve T-cell response by using Adenovirus and Papilloma. According to Martin, recent studies have shown that combining those two vaccines reduced HIV infection by 30%.

Over 100 of malaria vaccine candidates, studied in animals, and dozens of clinical trials exist for malaria. Adjuvants are just as important in the equation. A study conducted in more than 15,000 infants and young children showed that malaria vaccine RTS S candidate reduced disease over four years of follow-up. Protection is low – only in about 30% of the vaccinated – and reduces within a year, but approval is under study. ‘That would be the first time that a protection vaccine against malaria would be brought to the market,’ he said. Due to the human challenge, the context of vaccine development for malaria has changed tremendously.

**TB: Respiratory transmission route**
Things are also changing for TB, a disease responsible for 1,000,000,000 deaths in the past two centuries, according to an article recently mentioned in Nature.

The BCG candidate has been around for over 100 years and is used worldwide. The problem is that TB’s main route of transmission is respiratory, which BCG does not cover. In 1993 a mycobacterium bovis triggered a very resistant TB epidemic in Spain. The strain is also highly transmissible by aerosol route. This spurred the creation of the MTBVAC candidate, following recommendations by the 2005 Geneva consensus criteria that two stable independent mutations (phoP and fadD26) should be used for live vaccines.

Some of the newest developments include vaccines against cytomegalovirus, dengue and Japanese encephalitis, BSV and, last but not least, Ebola. The latter actually serves as a model of accelerated vaccine development, according to Martin. This epidemic caught us by surprise because of its scale. But there were already candidates in masacus, so things went quickly.’ The rVSV-ZEBOV – recombinant vesicular stomatitis virus and the CHAd66-ZEBOV – chimpanzee adenovirus 3 had already been used in clinical trials in Switzerland, the USA and Germany before December 2014. There are now Vaccine Phase 3 efficacy trial designs in Liberia and Sierra Leone. ‘By comparison, we’ve been in the developing process of a malaria vaccine for over 25 years; and in Ebola we’ve shortened this period to one year!’ Martin said.

The multidisciplinary plan to tackle antibiotics resistance

Increasingly resistant bacteria are a global problem and require innovative action from all parties concerned, says Jesús Rodríguez-Baño, President of the Scientific Committee of the annual meeting of the Spanish Society of Infectious Diseases and Clinical Microbiology (SEIMC), which unfolded last May in Seville. Melisande Rouger asked him why the creation of a national plan has become necessary to tackle antibiotics resistance.

‘The plan is a consequence of a directive of the European Union and is coordinated by every country in Spain, the Spanish FDA is responsible for its management,’ explains Jesús Rodríguez-Baño. ‘It follows the concept of one health and includes a multidisciplinary plan involving doctors and pharmacists. The idea is to regroup all our actions because the problem is multi-factorial; therefore the solution must be factorial as well. ‘We aim to find a common solution to a global problem.

‘There are currently very important changes in our society. People travel more than any time of human history, not only for holidays or living, but also to receive healthcare. These migrations increase the risk of spreading diseases. ‘Of course, bacteria are present in our food. Antibiotics are used in animals to increase their weight and make them larger. This technique is banned, but it is hard to control. Antibiotics are also used as a prophylactic technique to make sure one sick animal doesn’t infect the others. Resistance develops here as well and the meat becomes contaminated. Importing food from a country where resistance is strong can bring this problem to other countries. Bacteria are also present in the water, which can contaminate vegetable and plants.

‘Furthermore, the global population is growing older; people need more care and the number of nursing homes is rising. These environments are highly favourable to the spread of bacteria. It’s no coincidence that resistance is coming now. It is a consequence of antibiotics use in humans and animals, the fast-paced development of many countries and ageing population. In a nutshell, it’s a consequence of globalisation. ‘We have to think of all these aspects and find new ways to address them. There’s no answer right now, we have to think outside the box.

What measures will Spain take?
Surveillance will be central to the plan. Surveillance is a complex task because resistance is not homogeneously spread. If you do something superficially, you will not realise that an outbreak is occurring somewhere and you might not be able to contain it. We need to be able to detect outbreaks anywhere to prevent them from spreading.

We are working towards having reference labs in different areas of Spain so that every single lab can rapidly isolate the bacteria and send results to obtain an answer within 48 hours. In Andalucia, for example, one hospital receives alarms from everywhere else in the region and provides answers quickly to control transmission as early as possible.

‘As you know, Spain is very heterogeneous and this is why harmonising surveillance is an important part of the plan. The problem with having different communities is that an impact differs from one region to another.’

Do you expect improvements after November’s general election?
We have a very interesting situation right now in Spain. There
Dr Eduard Torrents from the Catalan Bioengineering Institute observed the potential role of nanotechnology, which applies nanotechnology tools such as atomic force microscopy, scanning tunnelling microscopy and dip pen nanolithography to infectious diseases.

**Nano-delivery products are helpful**

Nanoparticles (NPs) are particularly helpful in drug delivery because they are soluble and bio available, and decrease immunological reactions, Torrents explained. They deliver a predetermined dose while decreasing the frequency of administration, enabling drugs delivery locally and precisely, and minimise secondary effects, and liberate two or more components in combined therapies.

There are currently 44 nano-delivery products on the market, including some for fungal infections and oral and perioral infections, as well as 18 pharmaceutical products, one of which is designed for fungal infections. This figure is expected to grow as labs express an increased interest in the field. The nanotechnology market represented 73 billion dollars in 2011 and is expected to grow to 151 billion in 2016, at a rate of +12.5% a year. In 2016 nano products will represent 10% of all sales in pharma industry.

To advance NPs use, Torrents recommended that nano scientists should get away from the evidence concept, understand that pharmacokinetic concepts in NPs are different and conduct infection trials in animal models. There should be functional and safety studies, which shouldn’t follow the patterns of classical pharmacology studies.

‘Challenges remain in the detection of infectious agents, penetration of the hematocerephalic barrier and antibiotics resistance. Metallic NPs are very promising,’ he concluded, ‘and we hope to be able to use them for vaccination, and open the oral and pulmonary routes for drug delivery.’

Carlos Martin is Professor of Microbiology at the Faculty of Medicine, University of Zaragoza, and a member of the Advisory Committee of Tuberculosis Vaccine Initiative (TBVI). With more than 25 years of experience in mycobacterial genetics he, and his team, aim to develop novel TB vaccines and vaccination strategies to improve protection against pulmonary TB. He is currently working in collaborative TB research projects with research groups in Europe and Latin America. Previously, Martin worked as permanent researcher at the Pasteur Institute in Paris, and he has published more than 100 international publications on TB. Since 1992 his TB research has continuously received national and European Union funding. The professor also belongs to CIBERE, a research network on respiratory diseases of the Spanish Ministry of Health (Instituto de Salud Carlos III).
CAD in pathology

Danish Experience

A national digital pathology system across Denmark has helped to significantly improve efficiency and raise levels of patient safety, Mark Nicholls reports.

Significant steps are achieved

Research in his department – undertaken mainly using a Panoramic P250 scanner from Budapest-based firm 3DHistech with all pattern recognition software developed by the group – has achieved significant steps in the last couple of years in developing advanced pattern recognition algorithms that can work on entire ‘whole slide images’ (WSI), in contrast to much research still being conducted on small image regions. ‘We also aim to use standard H&E staining whenever possible. This means that the software we develop will work in any lab, without special adjustments, and with hardly any user interaction.’ However, although the introduction of CAD in pathology is much closer than many people realise, he acknowledges that the availability of material from large cohorts of patients with treatment and follow-up data is needed. ‘Trained pathologists are also needed to help identify regions of interest and to study how we can best integrate our algorithms in the diagnostic workflow.’

These requirements are challenging because pathologists frequently suffer high workload, and well-defined cohorts are often hard to acquire. A next step is for his group to study the benefit of developed algorithms in a routine diagnostic setting.

Yet, if implemented, CAD in pathology could have benefits for pathologists in making routine tasks easier. Advanced quantification of histopathological patterns will add valuable information to the diagnostic process, he said.

Patients will benefit because diagnostic processes can become more accurate and personalised, and surgeons and oncologists may also benefit from increased speed and accuracy of diagnostics and prognostics.

A national digital pathology system

Denmark has used advanced computer software systems and created a countrywide database to optimise the assessment of patients’ specimens. The development and success of the system will be highlighted at the Digital Pathology Conference in London (3-4 December) where Professor Ben Vainer will lead the session ‘How Digitisation Can Improve Pathology Service – The Danish Experience’.

Vainer, a consultant in the Pathology Department at Rigshospitalet, University of Copenhagen, will focus on the Danish civil registry database and other national databases connected to this, and the use of the same LIS in all pathology departments in the entire country with access to the national pathology database of all pathology reports in Denmark since at least 1998.

He will also discuss the important links between LIS and patient medical records in hospitals and in private practice (e.g. general practitioners), and how computerisation of the entire laboratory flow, from ordering the pathology service to specimen presentation to the ordering physician, has helped ensure patient safety and eliminate time-consuming manual steps.

Vainer: ‘Pathology departments in Denmark have, through close collaboration, been able to build a national pathology system, where each individual pathology department serves as a sort of “branch office”.

All steps of the specimen are followed through the pathology department, which gives a good global view of the departmental activities and the possibility to trace individual specimens. For the managers this also provides good measures of operational objectives. The “users” – ordering physicians – are provided with a clear overview of their patients’ specimens during the assessment process, and patients have full access to reports on their own tissue, he added.

Digitisation of laboratory processes and the implementation of whole slide imaging, plus national pathology database, opens up the opportunity for image automatic interpretation, digital image analysis and transfer of whole slide images, in cases where a second opinion is not available without compromising either patient safety or the international data acts.

Vainer believes other countries can learn several points from this system: ‘In large pathology labs the large number of specimens is often a hindrance to efficient handling and fast patient assessment without time-consuming steps. Such steps can be turned digital, releasing valuable staff resources. However, most important is that digitisation opens up for the implementation of new imaging techniques, which are necessary to provide each patient with the correct assessment of diagnosis and biomarker expression profile.’

The system is fully implemented, with automated image analysis and the option for second opinions using whole slide images currently being tested.

There are also a number of patient benefits from the Danish system. Vainer: ‘The risk of specimen mix-ups are minimised, and application of national pathology databases linked to national person-identification databases ensures that the pathologist always has access to previous tests performed on the patient. This increases the quality of the pathology assessment and hence the final diagnosis.

Denmark’s next step is to introduce new digitisation procedures such as automated image analysis and substitution of conventional light microscopies with whole slide images, including possibilities to implement a second opinion without delays when using shipment of glass slides by postal services.’

Automated image analysis will further increase the pathology assessment quality by eliminating subjective readings of biomarker expression, for example, in addition to elimination of the risk of patient case mix-ups.

Learning from the Danish experience
Big data histopathology

Unlocking imaging potential

Report: Mark Nicholls

Automated image analysis shows significant potential within histopathology to help identify novel and subtle prognostic features.

UK expert Dr Peter Caie also believes such image analysis can turn aspects of histopathology from a traditionally semi-quantitative field into a fully quantifiable and standardised science. However, he also points out that challenges remain before the full potential is seen within digital pathology.

During the Digital Pathology Conference to be held this December in London, Caie will outline the advances in the ‘Profiling Big Data Histopathology through Image Analysis’ session.

As a Senior Research Fellow working on Digital and Systems Pathology at the University of St Andrews in Scotland, Dr Caie’s aim is to demonstrate how complex image analysis of digital pathology specimens can now create robust hierarchical ‘big data’.

‘That big data must then be mined with appropriate bioinformatics to identify the significant prognostic or predictive parameters, or combination of parameters, to stratify the patient population in question,’ he pointed out.

‘This emerging field is termed ‘Tissue Phenomics’, a phrase first coined by Gerd Binning, Nobel Prize winner and founder of the image analysis software company Definiens. However, Caie acknowledges that there are multiple challenges in digital pathology and image analysis. Reproducibility and validation are key to standardised quality big data histopathology, he said, and stressed that the image analysis algorithms themselves must be of a high enough quality to deal with complex and heterogeneous tissue, whereas simple algorithms may report back false results or classifications due to heterogeneous cell populations.

Similarly when quantifying histopathological features in the complex tumour microenvironment, image analysis may also report false positives or inaccurate parameters due to non-specific staining or autofluorescence within the tissue,’ he added.

Other challenges include the need for fast IT infrastructure to enable digital pathology to be routinely used, as well as large and secure data stores to archive the digital specimens and their associated analysis.

Another challenge, he said, is for the traditional field of pathology to accept the novel field of image analysis and ‘tissue phenomics’ and allow it to be implemented into routine clinical use.

Big data pathology has a range of benefits for clinicians and patients. Caie: ‘Image analysis allows reproducible and standardised reporting of biomarkers or histopathological features that negate observer variability. It can also free up a pathologist’s time to concentrate on complex cases if the quantification of histopathological features in more routine cases becomes automated.’

Image analysis can quantify fluorescence in situ hybridisation (FISH) and proteins across a dynamic range with the application of fluorescence, leading to more accurate patient results, as big data pathology can identify subtle or complex patterns within the tissue section which may be difficult to reproducibly identify by eye.

‘Therefore,’ Caie pointed out, ‘it can provide the clinician with novel and significant new biomarkers to aid in clinical decision making, and the patient can receive a more personalised and informed answer to their individual case.’

The next step in big data histopathology, he suggests, is to validate the technology in large retrospective and prospective clinical trials to demonstrate its full potential.

Big data histopathology will increase in power as technology evolves. This includes multiplexing many biomarkers, which can be used to map entire pathways within a single cell.

Caie concludes: ‘Co-registering multi-omics, such as single cell transcriptomics, genomics and histopathological data, with protein biomarkers onto the same tissue section will also make for a more informative and powerful big data pathology, which again will provide insight into disease progression and biomarkers for predictive studies and drug trials.’

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Date for the diary
25-28 May, Berlin, Germany
13th European Congress on Digital Pathology
www.digitalpathology2016.org

Methodological Changes in microscopic techniques, imaging, molecular pathology, genetics and bioinformatics are the drivers of digital pathology. The programme of the ECPD in Paris last year with insights in several new technologies will find its continuation in Berlin.

www.nanozoomer.com
The world’s largest microbiology event

The European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), the largest conference of its kind, drew 10,697 specialists and companies from around 110 countries to Copenhagen for its 25th annual event. Over 200 sessions were delivered, including an in-the-pipeline gathering, keynote lectures, symposia, oral sessions, educational workshops, meeting with experts, and around 2,500 poster presentations – plus some 3,000 abstracts presented by international experts.

Inevitably, antimicrobial resistance continues to lead the agenda of the European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), with a general consensus among delegates that big pharma will provide answers to antimicrobial resistance, but the keys to finding the solution will be found by universities and small medium enterprises (SMEs). A new addition to the congress is the pipeline corner, which gave SMEs a chance to present what they have in terms of new mechanisms and approaches.

An interesting, recurrent theme was the search for a very narrow spectrum of pathogen-specific antibiotics, working on the premise that it is promising to exploit specific differences in physiology, or virulence mechanisms – an approach that might contribute to personalised treatments and one drug for one bug. A key theme for ECCMID is the importance of innovation and new discoveries – for example, for the late-breaker session more than 50 abstracts are submitted annually, the society selects only the top five for presentation.

2015’s late-breakers included evidence on the efficacy of a new herpes zoster vaccine, a study on renal failure rates, as well as advances on the treatments of bacterial urinary tract and intra-abdominal infections. A possible threat from Ebola engendered considerable international discussions – and also medical heroes. At ECCMID the organisation Médecins Sans Frontières was honoured with a special excellence award in recognition of their recent work against this disease in Africa, as well as decades of international efforts to treat people in other areas of disaster.

As mentioned, ECCMID is now the world’s largest scientific event in clinical microbiology and infectious diseases. Over the last decade, attendance numbers have doubled and are expected to rise again at ECCMID 2016 in Istanbul.

Diagnostics and life sciences firm gains ID/AST gold standard

At Europe’s largest meeting for clinical laboratories, Beckman Coulter stepped forward to welcome a new class of customers looking for familiar and reliable instruments, John Brosky reports.

In January this year, Beckman Coulter acquired the entire microbiology business of Siemens, including the world-leading line of MicroScan analysers for microbial identification and antibiotic sensitivity testing. (ID/AST). With an installed base of over 6,000 instruments worldwide the company enters this segment of clinical laboratories for the first time, yet already as the undisputed global leader.

At EuroMedLab in Paris, at the front and centre on the Beckman Coulter stand was the fourth generation MicroScan WalkAway plus system freshly dressed with the company’s logo, and backed by the same experts, including Senior Marketing Manager for the business unit in Europe, Philippe Arowas. ‘The MicroScan system is the key test for identifying and controlling, and potentially reducing the prescription of antibiotics, he told European Hospital.

The quantitative measures of a bacteria’s resistance with the analys-er helps physicians to know which specific antibiotics they might use to treat a patient and, perhaps more importantly, which ones they should not use.

There are some 300 types of bacteria, with new ones appearing suddenly. He cites the example of the New Delhi Metallo (NDM) that showed up in 2008 and spread so quickly that a year later it was found in India, Pakistan, the UK, USA, Canada and Japan. NDM proved to be highly resistant to a broad range of antibiotics, including an entire new of drugs designed specifically for the treatment of antibiotic-resistant bacterial infections. Capturing the results of MicroScan analysis with Beckman Coulter’s LabPro Information Manager and LabPro Connect helps clinical labs share data for epidemiology studies to identify trends in pathogen resistance and to track the spread of such infections better.

Patients can also share resistance to a bacteria as well as the bacterial infection itself, Arowas pointed out. ‘The patient samples to be tested might come from any infected part of the body, he said, whether it is an organ, skin, hair, or bone.

After creating a culture, the MicroScan panel is inoculated by introducing the bacteria to the array of wells, each containing different concentrations of an antibiotic.

The technician can literally walk away from the instrument, returning after an overnight analysis and learn where the bacteria continued to flourish or where a specific concentration of antibiotic was effective in killing the pathogen.

Beckman Coulter takes over what Arowas estimates to be a 40% of the market share in the world for ID/AST. In some countries, such as Japan, the installed base accounts for 70% of the market, in Spain it is 60%, he said. The main competitor in this segment is bioMérieux, while Becton Dickinson holds a less significant footprint.

Testing for infectious disease is a steadily growing area in clinical laboratory, he said, and the former Siemens group now makes up a new core business for Beckman Coulter.

The company acquired these products because it intends to invest in the science and develop new products, Arowas added. MicroScan is a first step, but we will see more and more product solutions developed for microbiology. Already we have seen how strong this interest is, though we just started in January.’

This combination, he suggested, means that Beckman Coulter is not only well-positioned to maintain its lead position in microbiology, but holds unique capabilities for advancing its portfolio of products.

Giant aims to inflate microbiology

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19 NOVEMBER 2015
DÜSSELDORF GERMANY
The LAW of the Lab

First they fixed the cables to hardwire a faster data transfers from laboratory instruments. Now a coalition of the largest manufacturers of lab equipment for patient diagnostic tests have agreed on shared protocols for how software should report results. This is the first update to international standards in 20 years.

Past standards left too much room for interpretation and had a Baskin-Robbins 31 Flavours outcome, where each vendor had a different implementation," said Serge Jonnaert, from the sponsoring organisation the IVD Industry Connectivity Consortium (IICC).

The resulting set of standards, called the Laboratory Analytical Workflow (LAW), has been documented and published by the non-profit, open platform association Integrating the Healthcare Enterprise (IHE). The new LAW integration profiles are recently tested for true interoperability of data sets among diverse vendors at the IHE Connectathon 2015 held in Chicago. Lab vendors who have certified their equipment conforms to the new standards include Abbott Diagnostics, Beckman Coulter, Impeco, OmmiLab, Orchard Software, and Siemens Healthcare.

`We expect more vendors to come online as customers demand conformance to the IHE LAW profile.' Jonnaert said.

Members of the consortium who will test IVD analysers at upcoming Connectathons in Europe, Japan or North America include Becton Dickinson, bioMérieux, Data Innovations, Hitachi, Ortho Clinical Diagnostics, Roche Diagnostics, Samsung, Sunquest Information Systems, and Sysmex Technologies.

After grinding its way through five years of arcane processes with IT engineers, the new lab standards promise a new era of open exchanges of data with plug-and-play connectivity among analysers, middleware and laboratory information systems.

A key piece in this puzzle was the first milestone marked by the ICC, at the European Connectathon 2012 in Bern, Switzerland, when companies demonstrated a successful switch from serial cables for transmitting data to a transmission control protocol (TCP) internet protocol (IP) communication port.

Most lab instruments to that point, and many still today, were running on what some may remember as the chunky 9-pin printer cables that had to be screwed onto the back of a computer. In most cases laboratory results were being communicated at the extremely low-bandwidth rate of 9600 baud, for those who remember what a baud is. Now instruments can send data at the blistering speeds that TCP/IP allows.

Thanks to the successful testing of the interoperability profile at the Connectathon in 2015, in July, the Clinical and Laboratory Standards Institute (CLSI) said it had begun development of a standard on next generation in vitro diagnostic (IVD) instrument interface.

The new standard, to be called AUTOHIT, based on the IICC/IHE work around the LAW profile, will improve IVD instrument connectivity by defining an interface that is more consistent across instruments and leverages the faster connectivity protocols and network technologies.

The Institute specifically highlighted the deep work undertaken by the consortium of manufacturers with IHE to develop the necessary data exchanges, demonstrations, and Health Level Seven (HL7) messaging conventions and definitions.

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