

A question of connectivity

On 26 April, medical equipment healthcare professionals assembled at the Milton Keynes DoubleTree Hilton Hotel for the ninth EBME Innovations Seminar. A lively series of talks highlighted the importance of sensible healthcare technology management by using technology to improve patient outcomes.

Healthcare professionals responsible for the management of medical equipment were treated to a series of best practice seminars designed to enhance patient safety and improve hospitals' efficiencies, despite increasing budgetary constraints.

The event is made possible thanks to the sponsorship of exhibitors, enabling the organisers to provide top level seminars, refreshments, lunch and prize draw to both delegates and exhibitors.

The overriding focus of this year's seminars was connectivity of devices, particularly as a driver for evidence based, precise care and the delivery of patient generated health data.

EBME chairman Dr John Sandham CEng, FIHEEM, MIET, opened proceedings by welcoming delegates to the ninth EBME Innovations Seminar, adding that this year's event had received an unprecedented number of visitors. As a result of this success, John announced that next year's event will be increased to two days, and move to a larger venue. "We are taking the views of the delegates and exhibitors into consideration and moving to the Milton Keynes Arena on 3 and 4 April 2019, for our 10th year, to allow more exhibitors and delegates to attend,"

he explained. "With a new logo – EBME Expo – this expansion will provide a platform for more IT systems and medical systems."

John introduced the first speaker, David Mulvey, who has extensive medical engineering experience and has worked within the NHS as both a technical trainer and technical support engineer. In recent years, David's engineering experience has broadened with roles in Pathology and Imaging (MR, CT and X-Ray). His talk examined vital signs in anaesthesia via analysis of breathing waveforms. "If you check a car and monitor the exhaust, you get a good idea of the performance," he observed. "In humans, it's equally important to check CO₂ and by analysing this gas we can look further down into the system. Capnography allows us to monitor the concentration or partial pressure of CO₂ in the respiratory gases.

"Using EtCO₂ to control ventilation we can monitor CO₂ in two ways: one, pull a small flow from a patient's ET, or: two, inline CO₂ monitors. The costs are high – and the equipment often gets kicked around!"

Citing a carbon gas measurement bench, which can be analysed in real time, David demonstrated how to establish the causes of

sudden disappearances of CO₂ wave forms from one breath to the next. "The most common cause is a ventilator disconnect, while others include esophageal intubation, patients 'fighting' against the ventilator and raising the reading level," he advised.

"In theatres there are so many elements that need to work together; the patients, the surgeons, the anaesthetists and the equipment. When there's a problem, everyone needs to see what's going on."

Debbie Pope, country manager (UK & Ireland) for Qualcomm Life presented her talk, "Delivering 'precision medicine' through connected care," by providing an understanding of how connected patient data can fuel predictive care models and improve outcomes. "Smart phones have revolutionised connectivity in just a few years," Debbie observed. "By 2022 all cars will incorporate smart technology and data is the new fuel. It also saves lives!"

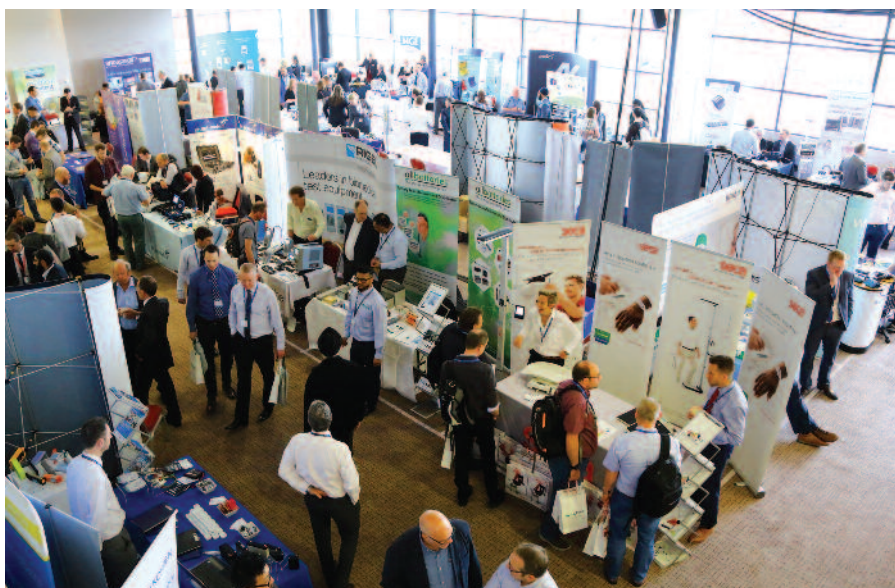
Debbie noted how the usage of sensors and connected intelligence in healthcare is increasing. "By 2020 around 40% of IOT will be related to the health sector," she said. "We need to use this technology better in order to save lives. Until recently, we thought EPR was the answer, by providing an electronic record of periodic healthcare of a single individual, but it can't take all of the data required to monitor patients.

"Data overload in the ICU puts pressure on staff and we write down information coming from devices on to paper. When a nurse transcribes, approximately one in five times the data will contain an error – this is human nature and inevitable, but provides inaccurate information."

Debbie believes intelligent care starts with data. "Moving patients out and sending them home to monitor, makes them feel less stressed and having a platform to analyse real time data – such as heart rate – means we can identify if we need to get the patient back in via data capture and aggregation."

"Integration is always going to be an issue," she noted. "When training staff, any





Debbie Pope, country manager (UK & Ireland) for Qualcomm Life

change is difficult within the NHS – it takes time. But, once integrated, using software as a medical device will both save time when transcribing data and ensure higher accuracy. Predictive analytics is the future.”

Technology in healthcare

Connectivity was a key theme throughout the conference and David Stanger, global business unit manager for obstetric specialist, Huntleigh, examined advances in electronic foetal heart rate monitoring.

David has worked for the organisation for more than 35 years and, since the company acquired Sonicaid in 2005, he has worked at Oxford University on Dawes-Redman CTG analysis, with Professor Redman *et al.*

Citing the Dawes-Redman CTG analysis, David discussed foetal heart rate (FHR) monitoring. “If there is a problem with a pregnancy, although you can examine the patient and talk to them, you’re interacting with two lives, but can only communicate with one of them,” he asserted.

“Dawes-Redman CTG analysis is the best system we have today and a cardiocograph (CTG) is all we have to work with. This is all based around sensors on the mother’s

stomach and we are presented with printouts and data. But the problem is how do we understand readings and interpret these against guidelines? The results are dependent on a clinician’s subjective opinion. With so many things to look for: baseline accelerations; variability in foetal movement and no decelerations, it’s not always so easy to read as some traces are difficult to interpret.”

Explaining how other signals will often swamp a foetal signal, David reflected on Dawes-Redman CTG analysis and the ability to examine signals in more detail.

“The traditional method is based on opinion, open to error and can provide bad outcomes,” he continued. “Over a 10 year period the NHS paid £6 billion in litigation costs, so it’s important to replace opinion with measurement.

“While Dawes-Redman CTG analysis is not a new concept, it enables opinion to be replaced by measurement. The CTG interpretation’s primary output is “criteria met” or “criteria not met” and this is backed up by a comprehensive set of data. Results can be achieved in less than 10 minutes. Think of a software driven algorithm as an

expert assistant. A typical clinician may see 1000 traces per annum and over 10 years this totals 10,000 – a sizeable knowledge base. But how many can they remember? Can they remember the outcomes?”

Advances in asset management

As an active member of the Institute of Asset Management, with a BSc in Medical Physics Technology, Lesley Sneddon shared her expertise by exploring ISO 55001 and quality/asset management in healthcare technology.

Lesley is currently quality manager for Medical Equipment Management in GG&C, based in the Queen Elizabeth University Hospital, Cardiff. The department is certified to ISO 9001:2008, however this year there are plans to replace it with successful certification of ISO 55001. The definition of ISO Asset Management is ‘coordinated activity of an organisation to realise value from assets’ and Lesley highlighted that this approach was more simply defined as an “organisational strategic objective.”

“With the new standard we get to design a system for ourselves, making it more relevant to the organisation,” she explained. ▶



Lesley Sneddon



David Mulvey



David Stanger

“ISO 55001 provides a framework showing how all activities align with overall objectives and it encourages us to use data as evidence to support decisions to be based on risk, cost and performance. By creating a greater engagement of the workforce, it also encourages cross departmental working.”

Once a dedicated steering group had been set up, six steps were taken in order to establish a workable system: 1) an asset management policy was developed; 2) objectives were identified; 3) plans, resources and targets were selected; 4) implementation plans were put in place; 5) measuring and monitoring was enhanced; 6) a focus on continual improvement was established via employees’ comments and customer satisfaction.

“Initially, it was difficult to get my head round,” Lesley noted. “Would this mean more paperwork? Would it be beneficial? However, we’ve now passed our stage one audit which already shows that we have a robust asset management system in force.”

“Will ISO 55001 save us money? Possibly not, however, it will reduce silos and put data to use resulting in informed decision making and performance monitoring. It also means the objectives we work to are aligned with the overall organisational strategy. Ultimately, it provides us with the flexibility to engage with our customers and they have confidence in us.”

Data debate

An open debate, chaired by David Mulvey, provided delegates with the opportunity to interact with John Sandham, Lesley Sneddon and David Stanger. When asked about the next step for data and asset management, connected health was a key topic. David observed: “Connectivity is a big part of foetal management and robust data. However, there are not currently any standards and this is a big problem.”

A delegate noted that their Trust doesn’t yet have the IT infrastructure to utilise new connectivity technology, while another added its data is hardwired rather than wireless, and the quotes for setting up Wi Fi were ‘ridiculously high’. “Clinicians should be IT savvy,” he asserted. “They should be fully trained in information technology and it’s not an insurmountable task, as most people understand how their mobile phones work!”

David Stanger added: “We’ve been involved in connectivity since the mid-1980s, although it never really took off. Hospital networks can be horrendous and we’ve had a number of issues with wireless.”

With the use of artificial intelligence (AI) rising in healthcare, concerns were raised as to whether this could result in the deskilling of nurses. John Sandham contended that AI will actually upskill staff, noting: “We should be embracing all technology, including AI, as it will help clinicians and to make their decisions feel safer. With a shortage of staff, so we could also upskill auxiliary nurses.”

Lesley Sneddon concurred: “It’s about changing the mentality. There is a critical



Mala Soccalingame



Dr Stuart Watson, Salford Royal NHS Foundation Trust

need to work closer with IT and procurement departments to provide improved organisation. Year on year, we receive less money, so connectivity is important if we’re to provide more value with the little we get.”

Mala Soccalingame has a biomedical engineering background and is also passionate about innovative medical technologies that improve medical practices, quality of life and lives of patients around the world. As senior product manager for the SpyGlass DS system at Boston Scientific in EMEA, Mala described how the technology enables clinicians to effectively solve biliary-pancreatic diseases, including faster cancer diagnosis, or complex stones clearance, for which the traditional techniques, such as Endoscopic Ultrasound, MRCP or ERCP, don’t provide acceptable success rates.

“Before colonoscopy, there were

barium enemas,” Mala observed. “After colonoscopy we’re in the same process with 2D cholangiography. Now cholangiopancreatography, with the SpyGlass DS system, is opening up a brand new field in the medical world. There are 35 UK hospitals using SpyGlass and there are no other comparable single use devices.”

Simon Pike has a background in electromechanical engineering, starting work as an engineer for a dental supply company in the mid 1990s – initially servicing autoclaves, suction pumps, ultrasonic cleaners and any equipment a dentist used that could be repaired. Simon moved on to more technical products and started working on the film based X-ray systems, dental chairs and units. As digital X-ray was being introduced to the market, Simon installed the first Planmeca digital OPG in 1999, and when Planmeca developed a scanning Ceph he installed the first one in 2001. Simon became the technical manager and set up a training, digital installation and support team. He currently works for Xograph Healthcare as a product manager for its dental and maxillofacial imaging products, encapsulating both 2D and 3D X-ray systems; presenting the company’s products to surgeons, radiographers and managers. He is also responsible for applications training with the radiographers and surgeons.

Describing the advances in 3D cone beam CT, Simon said: “With regard to maxillofacial imaging, the future is CBCT technology. It can provide a stroboscopic effect, with images taken using short X-ray pulses during the scan. Between 400 to 600 images can be taken during the scan and the cumulative exposure time is just 2.8 to 12 seconds for an 18 second scan, which means a reduced radiation dose for the patient.

“Image manipulation is flexible, as the software enables rotation and zooming, allowing implant planning in 3D. The software allows you to select an implant and, if there is a collision with a nerve ending, you can reselect and reposition. It even tells you the quality of the bone being drilled into to select the correct drill from the drill guide. 3D printing from this data means the implant is the correct fitting for the patient.”

Clinical engineering R&D

Dr Stuart Watson is head of R&D Services in the Dept of Medical Physics, Salford Royal NHS Foundation Trust, managing a team of engineers providing clinical research instrumentation and bespoke clinical devices development, calibration services and the delivery of a specialist photobiology diagnostic service. Stuart believes clinical engineers have a major role to play within the NHS in driving the effective adoption of new technology to both improve healthcare outcomes and control costs.

Providing a number of case studies, Stewart described one in which a maxillofacial prosthetics team wanted to introduce 3D printing to its workflow.

“This requirement was in order to speed up fabrication of noses, ears and masks,” he explained. “It would also help to improve prosthetics design and enable new services to be provided, such as surgical planning models and templates.

“A business case was put together to purchase items such as software and a 3D printer, but the costs were extremely high – with software priced at £17,000 per annum and a printer at £35,000. To achieve a successful business case, the unit needed to demonstrate its capability to use 3D printing and the applications, for better outcomes.

“The solution was to source free software which is capable of doing the job, of which there are several, and to receive relevant training material on how to use it. We delivered the software, training manuals and a suitable PC to the MaxFac team, and sourced local – and cheap – external 3D printing resources. We also produced test prints and case studies which demonstrated the potential for improved services and strengthened the business case, as well as dramatically reducing the costs.”

Concluding his talk, Stewart said: “NHS clinical engineers have a major role in developing relevant medical devices. With the growth of medical 3D printing, telehealth and medical device development, a clinical engineering department should be the first port of call for any clinical staff.”

Stewart believes the future will be reliant on connected technology, with asset management and maintenance being replaced by real time data transfer, better outcomes, lower organisational costs through better use of data and increased revenues. However, he warned: “Clinical engineering R&D is essential for the adoption of new medical technologies in the NHS and cutting back on this capability – not having staff, workshops or lab facilities – is a luxury the NHS can’t afford.”

Connectivity and data – the future?

Following the seminar, John Sandham reflected on the event: “We are delighted to have had the largest ever turnout of delegates and exhibitors at the 2018 EBME Seminar. The conference hall was completely full and all the speakers gave excellent, innovative and forward looking presentations.

“The theme for 2019 will be medical equipment innovation on day one, and healthcare technology management and procurement on day two.”

The 9th EBME Innovations Seminar demonstrated how connectivity and improved data can help scale precision medicine, by giving providers a comprehensive and continuous view of patient data that will guide preventative care and chronic disease management.

CSJ



Simon Pike



John Sandham

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