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1. UniCel DxH 900 Coulter Cellular Analysis System Early Sepsis Indicator (ESId) Application AddendumPN C42014AA.

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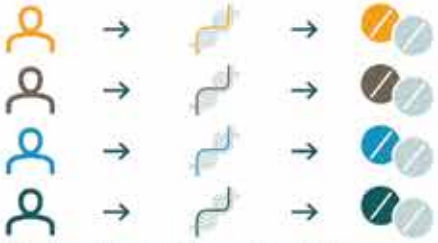

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Prognosis

Keeping patient data secure

The UAE Federal Government promulgated Federal Law No. 2 of 2019 – Using IT and Telecommunications in the Healthcare Sector – in February 2019. It covers the whole of the Emirates and has broad application which will impact many sectors in the healthcare industry. In an exclusive article for *Middle East Health*, Simon Isgar, a legal expert in this field, notes that some healthcare organisations in the UAE may not clearly understand their obligations with respect to this law and provides clarity on the impact of these important regulations. He advises that organisations that process patient data carry out a healthcare data impact assessment to check their risk of breaching these new regulations.

The effects of climate change are starting to be felt around the world. Ahead of the crucial global COP26 meeting on climate change in November, more than 200 health journals have simultaneously published an editorial calling on world leaders to tackle climate change to prevent 'catastrophic harm'. It is a strong and vital statement in which they urge world leaders to make 2021 the year that the world finally changes course. Read the report on the editorial in this issue.

Also in this issue, we look at some of the latest developments in healthcare research. One, which comes from researchers at RCSI University of Medicine and Health Sciences, shows that breast milk consumption has a significantly beneficial effect on cardiovascular health and early cardiovascular development in premature infants. Another, an early preprint from the RECOVERY-RS trial, shows that CPAP reduces the need for invasive ventilation in hospitalised Covid-19 patients. Read about these and other research that is bound to have an important impact on clinical practice.

In our UK report, Paul Benton, Managing Director, International, at the Association of British HealthTech Industries, writes about the newly launched UK Healthcare Pavilion – a virtual platform which provides a gateway into the UK for the Middle East healthcare industry.

Remember to keep a check on our newly enhanced website – *www.MiddleEastHealth.com* – for news, research developments and industry updates from the region.

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Middle East Health is published by Hurst Publishing FZE, Creative City Fujairah, Licence Number: 3910/2013 FBCC.

UAE National Media Council - Approval Number: 2207

Middle East Health online
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Middle East Health is printed by Atlas Printing Press.
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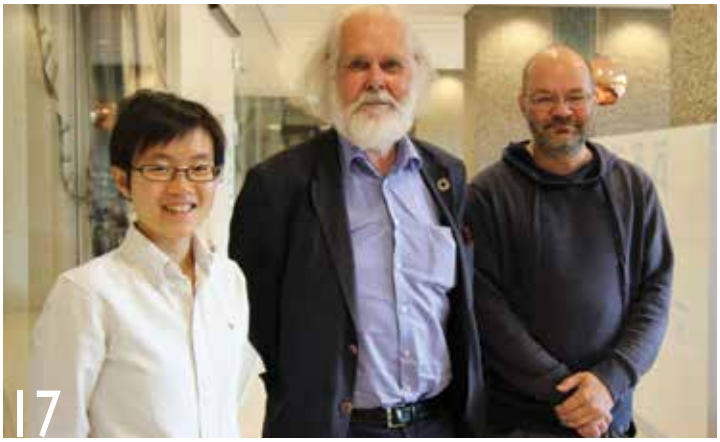

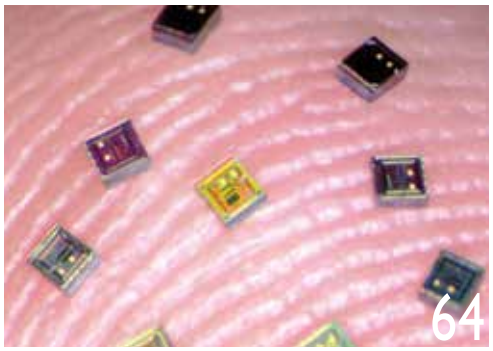


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Update from around the region

Cleveland Clinic Abu Dhabi first facility outside US to be recognised as Antimicrobial Stewardship Center

Cleveland Clinic Abu Dhabi has become the first hospital outside the United States to be named an Antimicrobial Stewardship Center of Excellence by the Infectious Diseases Society of America (IDSA).

The designation serves as international recognition that Cleveland Clinic Abu Dhabi's antimicrobial stewardship program meets or exceeds the highest standards in optimizing antimicrobial use and combating antimicrobial resistance – declared one of the top ten global public health threats facing humanity by the World Health Organization. Cleveland Clinic Abu Dhabi is now among the 131 programs from the United States, and the only one outside the United States, that have received the designation since its launch in 2017.

"This designation is the culmination of years of work across our organization to put antimicrobial stewardship at the forefront of patient care. If you look at healthcare globally, we see that antimicrobial resistance has gone from something people talk about in more abstract terms to something they battle every day. We see our role as protecting the quality, safety and effectiveness of our care for future generations," said Rania El-Lababidi, Co-Director of Cleveland Clinic Abu Dhabi's antimicrobial stewardship program.

At the heart of Cleveland Clinic Abu Dhabi's antimicrobial stewardship program is a collaboration between the hospital's pharmacy and infectious disease physicians who provide a layer of oversight on patient care. A pharmacist specialized in infectious diseases works with an infectious disease consultant to review patient records who have been prescribed antimicrobial medications and identify opportunities to further optimize their care.

In addition to optimizing efforts to curb and control antibiotic use, Cleveland Clinic Abu Dhabi's antimicrobial stewardship program is committed to supporting wider efforts to combat the rise of drug-resistant diseases. It has taken on an advisory role with numerous other providers across the UAE and in Saudi Arabia to support the development of their antimicrobial stewardship programs. The hospital also works closely with Abu Dhabi and UAE antimicrobial resistance committees on local and national guidelines.

Cleveland Clinic Abu Dhabi operates an antimicrobial stewardship training program though its 'ASP Academy'. The two-week program provides healthcare professionals from across the UAE with the knowledge, tools and experience they need to establish similar programs in their local facilities. MEH

Al Jalila Children's Specialty Hospital initiates study of Spinal Muscular Atrophy in UAE

Al Jalila Children's Specialty Hospital, the UAE's first and only hospital dedicated to treating children and adolescents, has launched the region's first study into the epidemiology of Spinal Muscular Atrophy (SMA), an autosomal recessive inherited disease and a leading genetic cause of death for sufferers under the age of two years.

The study will focus on the epidemiology of the disease in the UAE, and will take the form of a screening program to be led by Al Jalila Children's Specialty Hospital's state-of-the-art Genomics Centre – the UAE's first clinical genomics hub in collaboration with the Ministry of Health, Dubai Health Authority, and private hospitals, who are facilitating the recruitment of 6,500 newborns across more than 10 public and private maternity hospitals in the UAE. SMA genetic screening for all those infants will be conducted at Al Jalila Children's Genomics Center.

"As part of Al Jalila Children's Specialty Hospital's steadfast support of the UAE's National Advanced Sciences Agenda 2031 in addressing health challenges, this will be a breakthrough research study for the UAE as, to date, no such large-scale population-based studies into SMA epidemiology has been performed. The research takes us one step closer to achieving our goal in becoming the region's leading pediatric hospital." said Dr. Abdulla Ibrahim Al Khayat, Chief Executive Officer of Al Jalila Children's Specialty Hospital.

"We are aiming to bridge the knowledge gap about SMA among our local communities. The findings of the study will enormously help decision-makers to anticipate challenges and develop

suitable measures. Specifically, our findings will provide the required data to guide the establishment of national screening programs for SMA early detection and prevention. This initiative coincides with our wise leadership's vision to create a world-class healthcare system and aligns with the formation of the Emirati Genome Programme, one of the first dedicated programs to study the Arab genome. It also coincides with our recent launch of the Center for Genomic Discovery during Arab Health 2021.

"Genomics is being integrated into healthcare and is becoming an essential tool to diagnose, manage, and treat patients. Al Jalila Children's Hospital Genomics Centre is strengthening the UAE's efforts towards combatting genetic diseases through building much-needed genomic diagnostic and screening capacities," Dr. Al Khayat added.

"The Genomics Centre is filling a significant regional gap for complex genomic diagnostics and genetic counselling by making those services more easily accessible and cost-effective," said Dr Ahmad Abou Tayoun, Director, Al Jalila Children's Genomics Centre. "There is an increasing demand globally for genomic testing, and the data captured through this study is expcted to result in personalised and more effective medications and treatment plans for children and adults alike.

"Through this initiative, the Genomics Center is moving ahead. Rather than waiting for affected children to become very sick and present for diagnosis, we are now exploring newborn genetic screening as a tool for early detection before they are symptomatic. Early detection means earlier intervention and better clinical outcomes. Through this study, we will also generate the necessary data to determine the exact prevalence and carrier rates of SMA. The results will enable us to shed more light on the burden of SMA, raise public awareness around the disease, and support cost-effective national screening programs." Dr Tayoun added.

Al Jalila Genomics Centre is accredited by the College of American Pathologists (CAP) and uses highly advanced molecular technologies and bioinformatics pipelines to interpret genomic data consistent with the American College of Medical Genetics and Genomics (ACMGG) guidelines.

Saudi HealthTech Platform Clinicy to scale product following major investment by Mad'a Investment Company

Clinicy, an innovative Saudi healthtech business has announced a successful seven-figure investment from Riyadh-headquartered private equity firm Mad'a Investment Company. The funding follows successful integration and implementation results with medical institutions. The proprietary healthcare management system manages bookings, appointments and patient engagement, increasing efficiency and quality of service. While the exact investment figure remains undisclosed, it is the largest Pre-Series A investment in the healthtech sector in the Kingdom of Saudi Arabia this year.

On the occasion of the investment round signing, Clinicy Co-founder and Managing Director, Talal Waleed Al-Hussein said: "This investment will allow us to scale the number of medical institutions and patients using Clinicy and further support our vital healthcare sector. We are proud that Mad'a Investment Company has confidence in Clinicy's successful model. Through this strategic partnership we will be able to capitalize on expertise and knowledge as we continue the development of quality innovative solutions and services. Our expansion will help to reach a larger segment of customers and focus on creating enhanced experiences and benefits for users."

Mad'a Investment Company CEO, Abdullah Abdulaziz Al-Othaim, commented: "In line with Vision 2030 goals to improve the quality and efficiency of the

Saudi HealthTech Platform Clinicy to scale product following major investment by Mad'a Investment Company

health sector, Clinicy has demonstrated a valuable proposition which has the power to transform and enhance healthcare services across the entire region. As we have all seen over the past year during the pandemic, healthcare is one of the most important sectors for society. We are pleased to invest in a homegrown Saudi start-up that provides excellence in digitizing healthcare management and is a first-of-its-kind in the Kingdom. This investment adds to our commitment in supporting businesses that create jobs through innovation."

This latest round continues Mad'a Investment Company's commitment in supporting the healthcare sector, with 121 health professionals already employed through the private equity firm's strategic investments.

After 24 months of research and development, Clinicy identified three core challenges: missed appointments (no-show), high administrative operating costs and lack of reach and communication with patients. The average local market 'no-show' rate of patients who fail to attend appointments is over 30 per cent, costing more than 2.2 billion Saudi Riyals (US$ 600 million) annually. This rate hasn't changed in two decades.

Clinicy addresses each of these challenges with its proprietary patient engagement system, seamlessly managing daily operations including automating bookings and appointments between medical institutions and patients. Its integration with clinics across the Kingdom has been highly successful, including reducing 'no-show' rates by up to 40 per cent, 61 per cent of interactions with patients automated via the Clinicy communication tool and a 30 per cent reduction in daily tasks for call centre, receptionists and coordinators.

- For more information about Clinicy, visit *www.clinicy.com.sa*

Saudi's Eastern Health Cluster selects patient safety software from RLDatix to meet Vision 2030 objectives

RLDatix, a leading provider of intelligent patient safety solutions, has been selected by Saudi Arabia's Eastern Health Cluster (EHC) to power its patient safety and improvement initiatives across all 125 healthcare facilities in the cluster.

It is the first of 21 health clusters in the Kingdom of Saudi Arabia (KSA), to be using the cloud-based DatixCloudIQ (DCIQ) software to align with the government Vision 2030 objectives. DCIQ was selected for its proven ability to deliver an organisation-wide view of governance, risk and compliance (GRC), and for its ability to expand capabilities to include Enterprise Risk Manager that will enable the monitoring, prioritising and mitigation of risk throughout the organisation.

King Fahad Specialist Hospital Dammam (KFSH-D), part of the EHC, has been successfully using RLDatix software since 2014. The system will be updated and deployed across all facilities within the EHC, starting with KFSH-D. Initially, the DCIQ Capture Toolkit will enable the collation and triage of data for incidents, claims, feedback, and mortality reviews. The Datix Anywhere app will be used by staff to capture the details of key events via a mobile or tablet device, supporting user engagement and encouraging faster and more comprehensive reporting. The new solution will de-silo data and provide a unified system across all facilities within the cluster which includes 22 hospitals and 148 primary care health locations, providing visibility of all patient safety data, enabling learnings and improvements to be implemented on a wide scale across the cluster. The powerful DCIQ analysis and reporting tool will connect all facilities with highly adaptable reporting and real-time alerting, supporting staff engagement and decision-making at a corporate level.

Dr. Khalid Hamawi, Vice President of Clinical Excellence in EHC said "Transforming healthcare has found poor safety culture to be a significant contributing factor to adverse outcomes. Ineffective leadership can contribute to adverse events in various ways, such as insufficient support for patient safety event reporting and lack of feedback. Utilizing an effective electronic reporting system like RLDatix will support our healthcare facilities to capture and process adverse events, providing information-rich data from safety events and near misses to inform learning and systems improvement."

Safa Jawa, Director, Quality and Patient Safety Administration at KFSH-D commented; "RLDatix provides a proven, powerful and flexible solution for patient safety and risk management, that will enable EHC to meet the strategic objectives of the Kingdom's Vision 2030 and expand our services to meet the future needs of our citizens. Our journey with the RLDatix software and the collaborative and dynamic RLDatix team has been, and always will be, fruitful. The flexibility to configure significant components of the software to tailor it to KFSH-D needs, the notification feature and real-time dashboard enables us to capture adverse and other safety events, in addition to identifying trends and patterns. I am confident that DCIQand the RLDatix mobile app will drive incident reporting and improve staff engagement."

- RLDatix – *https://www.rldatix.com/en-mea* MEH

Mia AI solution for breast cancer detection comes to Qatar

Mia, a deep learning artificial intelligence (AI) solution that works with radiologists to improve breast cancer detection, avoid unnecessary biopsies and ultimately improve the patient experience for all women is being launched in Qatar.

UK-based Kheiron Medical Technologies has signed an agreement with Medtech Corporation, one of Qatar's leading suppliers of medical and laboratory equipment, to bring its Mia solution to the Qatar market. With patented AI technology developed on more than three million breast images, Mia (Mammography Intelligent Assessment) is designed to support breast radiologists in making the critical decision to recall women for further testing based on their mammography screening.

Mia is the first solution of its kind to receive the CE (European regulatory clearance) mark for use as an AI-enabled independent reader for the detection of breast cancer. Through rigorous clinical studies and testing, Mia has learnt to read mammograms to the same level of detail as a consulting radiologist.

In double-reading mammography workflows where scans are reviewed by two radiologists, Mia can be deployed independently alongside a single human reader. This delivers the quality improvements needed to ensure the sustainability of breast screening services and frees up clinicians to spend more time with patients. Mia can also be deployed as a concurrent reader or in double reader triage.

Speaking at a signing ceremony between Kheiron and Medtech Corporation, Alex Hamlow, Kheiron's Chief Commercial Officer, said: "Our mission at Kheiron is to support breast screening professionals in the fight against breast cancer with proven and effective AI-enabled tools. We're excited that Mia is the first AI independent reader solution available for use within the breast screening community in Qatar. Based on its performance in the UK and Europe, Mia represents a major breakthrough in helping radiologists to dramatically improve breast cancer detection and patient outcomes.

"According to the WHO's International Agency for Research on Cancer, breast cancer was the most prevalent of all cancers detected in Qatar in 2020, accounting for 37.5% of all new cancer cases detected in women. I'm excited that Mia can help both radiologists and the women they care for," Hamlow said. MEH

Climate crisis: Over 200 health journals urge world leaders to tackle "catastrophic harm"

More than 200 health journals have called on governments to take emergency action to tackle the "catastrophic harm to health" from climate change.

A joint editorial[1] says that while recent targets to reduce emissions and conserve biodiversity are welcome, they are not enough and need to be matched with credible short and longer term plans.

The editorial was published simultaneously on 6 September in 233 international titles including *The BMJ*, the *Lancet*, the *New England Journal of Medicine*, the *East African Medical Journal*, the *Chinese Science Bulletin*, the *National Medical Journal of India*, and the *Medical Journal of Australia*. A full list of authors and signatories can be found here: *https://bit.ly/3n1qzXB*.

"As health professionals, we must do all we can to aid the transition to a sustainable, fairer, resilient, and healthier world," the editorial says. "We, as editors of health journals, call for governments and other leaders to act, marking 2021 as the year that the world finally changes course."

The editorial is being published ahead of the UN General Assembly from 14-27 September, one of the last international meetings taking place before the COP26 climate conference in Glasgow in November. It has been coordinated by the UK Health Alliance on Climate Change, a coalition of leading UK health bodies.

Eric Rubin, editor in chief of the *New England Journal of Medicine*, said: "The environment and health are inextricably intertwined. The changing climate is endangering us in many ways, including its critical impacts on health and healthcare delivery. As medical and public health practitioners, we have an obligation not only to anticipate new healthcare needs but also to be active participants in limiting the causes of the climate crisis."

Fiona Godlee, editor in chief of *The BMJ* and one of the editorial's co-authors, said: "Health professionals have been on the front line of the Covid-19 crisis, and they are united in warning that going above 1.5°C and allowing the continued destruction of nature will bring the next, far deadlier crisis.

"Wealthier nations must act faster and do more to support those countries already suffering under higher temperatures. 2021 has to be the year the world changes course – our health depends on it."

Transforming economies

Health professionals and health journals have been warning for decades about the severe and growing effects from climate change, including extreme temperatures, destructive weather events, and the degradation of essential ecosystems.

The impact of climate change disproportionately affects the most vulnerable people in society including children and elderly people, ethnic minorities, poorer communities, and people with underlying health conditions.

The editorial urges world leaders to transform societies and economies by supporting the redesign of transport systems, cities, the production and distribution of food, and markets for financial investments and health systems. This will need substantial investment but will have enormous positive benefits, it argues, including reduced air pollution, increased physical activity, and improved housing and diet.

Wealthier countries that have disproportionately created the environmental crisis must do more to support low and middle income countries in building cleaner, healthier, and more resilient societies, say the authors.

Tedros Adhanom Ghebreyesus, director general of the World Health Organization, said, "The risks posed by climate change could dwarf those of any single disease. The IPCC [Intergovernmental Panel on Climate Change] report shows that every fraction of a degree hotter endangers our health and future. Similarly, every action taken to limit emissions and warming brings us closer to a healthier and safer future."

Read the editorial

1. Atwoli L, et al. *Call for emergency action to limit global temperature increases, restore biodiversity, and protect health.* BMJ2021374:n1734. *https://doi.org/10.1136/bmj.n1734*

75 percent of Covid vaccine doses administered in just 10 countries

Speaking to G20 Health Ministers Meeting on Sunday 5 September, Tedros Adhanom Ghebreyesus, the Director-General of the World Health Organization called on them to recognise the injustice in the current Covid-19 vaccine distribution. Although "more than 5 billion vaccines have now been administered worldwide," he said, "almost 75 percent of those doses have been administered in just 10 countries."

"Africa has the lowest vaccination coverage at 2%. This is unacceptable."

WHO's global targets are to support every country to vaccinate at least 10 per cent of its population by the end of September, at least 40 per cent by the end of the year, and 70 per cent by the middle of next year.

"We can still reach these targets, but only with the commitment and support of G20 countries," Tedros stated.

As the largest producers, consumers and donors of Covid-19 vaccines, he upheld that they hold the key to achieving vaccine equity and ending the pandemic.

"We can never allow a pandemic on this scale to happen again. And we can never allow an injustice like this to happen again," he said.

Global responses to the pandemic must be grounded in certain core principles, according to Tedros.

He outlined that they must have the engagement and ownership of all countries; be multisectoral, involving partners from across the One Health spectrum; be linked to and aligned with WHO's mandate; and ensure coherence with the International Health Regulations and other international instruments.

"And they must be accountable and transparent," he stressed.

Against this backdrop, the WHO chief spoke of four critical areas for action, beginning with better global governance.

Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization

> An international instrument on pandemic preparedness and response will strengthen the foundation for global cooperation, setting the rules of the game, and enhancing solidarity among nations.

"An international instrument on pandemic preparedness and response will strengthen the foundation for global cooperation, setting the rules of the game, and enhancing solidarity among nations," he said.

Second, more and better financing for national and global preparedness and response was required.

Third, "Financing facilities must be built using existing financial institutions, rather than creating new ones that further fragment the global health architecture," Tedros said, adding that WHO has already taken steps toward better systems and tools across the One Health spectrum.

Finally, he noted the need for a "strengthened, empowered and sustainably financed WHO" to fully realize the Organization's broad mandate.

"Redressing this imbalance is critical if WHO is to be the independent and authoritative institution the world needs it to be," the Director-General said.

In closing, the WHO chief urged the G20 health ministers to swap near-term delivery schedules with COVAX, by fulfilling dose-sharing pledges and sharing technology, know-how and intellectual property to support regional vaccine manufacturing.

He also requested that they support the development and adoption of a legally binding international agreement on pandemic preparedness and response and strengthen WHO by backing initiatives that "strengthen, not weaken, its mandate". MEH

World failing to address dementia challenge

Only a quarter of countries worldwide have a national policy, strategy or plan for supporting people with dementia and their families, according to the WHO's 'Global status report on the public health response to dementia', released 2 September. Half of these countries are in WHO's European Region, with the remainder split between the other Regions. Yet even in Europe, many plans are expiring or have already expired, indicating a need for renewed commitment from governments.

At the same time, the number of people living with dementia is growing according to the report: WHO estimates that more than 55 million people (8.1 % of women and 5.4% of men over 65 years) are living with dementia. This number is estimated to rise to 78 million by 2030 and to 139 million by 2050.

Dementia is caused by a variety of diseases and injuries that affect the brain, such as Alzheimer's disease or stroke. It affects memory and other cognitive functions, as well as the ability to perform everyday tasks. The disability associated with dementia is a key driver of costs related to the condition. In 2019, the global cost of dementia was estimated to be US$1.3 trillion. The cost is projected to increase to US$1.7 trillion by 2030, or US$2.8 trillion if corrected for increases in care costs.

"Dementia robs millions of people of their memories, independence and dignity, but it also robs the rest of us of the people we know and love," said Dr Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization. "The world is failing people with dementia, and that hurts all of us. Four years ago, governments agreed a clear set of targets to improve dementia care. But targets alone are not enough. We need concerted action to ensure that all people with dementia are able to live with the support and dignity they deserve."

The report highlights the urgent need to strengthen support at national level, both in terms of care for people with dementia, and in support for the people who provide that care, in both formal and informal settings.

Care required for people with dementia includes primary health care, specialist care, community-based services, rehabilitation, long-term care, and palliative care. While most countries (89%) reporting to WHO's Global Dementia Observatory say they provide some community-based services for dementia, provision is higher in high-income countries than in low- and middle-income countries. Medication for dementia, hygiene products, assistive technologies and household adjustments are also more accessible in high-income countries, with a greater level of reimbursement, than in lower-income countries.

The cost of dementia

The type and level of services provided by the health and social care sectors also determines the level of informal care, which is primarily provided by family members. Informal care accounts for about half the global cost of dementia, while social care costs make up over a third. In low- and middle-income countries, most dementia care costs are attributable to informal care (65%). In richer countries informal and social care costs each amount to approximately 40%.

In 2019, carers spent on average five hours a day providing support for daily living to the person they were caring for with dementia; 70% of that care was provided by women. Given the financial, social and psychological stress faced by carers, access to information, training and services, as well as social and financial support, is particularly important. Currently, 75% of countries report that they offer some level of support for carers, although again, these are primarily high-income countries.

Dementia research

A series of unsuccessful clinical trials for treatments for dementia, combined with the high costs of research and development, led to declining interest in new efforts. There has, however, been a recent increase in dementia research funding, mainly in high-income countries such as Canada, the United Kingdom and the United States of America. The latter increased its annual investment in Alzheimer's disease research from US$631 million in 2015 to an estimated US$2.8 billion in 2020.

"To have a better chance of success, dementia research efforts need to have a clear direction and be better coordinated," said Dr Tarun Dua, Head of the Brain Health Unit at WHO. "This is why WHO is developing the Dementia Research Blueprint, a global coordination mechanism to provide structure to research efforts and stimulate new initiatives." An important focus of future research efforts should be the inclusion of people with dementia and their carers and families. Currently two-thirds of countries reporting to the Global Dementia Observatory involve people with dementia "rarely" or not at all.

More positively, countries in all regions have made good progress in implementing public awareness campaigns to improve public understanding of dementia, with strong leadership by civil society. Two-thirds of countries reporting to the Observatory have run awareness-raising campaigns. And two-thirds have taken action to improve the accessibility of physical and social environments for people with dementia and to provide training and education to population groups outside the health and social care sector, such as volunteers, police, fire services and first responders.

on the WEB Global status report on the public health response to dementia
https://bit.ly/3jMoqwV

the laboratory

Medical research news from around the world

Breast milk enhances heart performance in premature babies – study

New research from RCSI University of Medicine and Health Sciences demonstrates the beneficial effect of breast milk consumption on cardiovascular health and early cardiovascular development in premature infants.

Published in *JAMA Network Open*[1], the study of 80 preterm infants is the first of its kind to show that preterm infants with higher exposure their mother's own milk had enhanced cardiac function at age one year, with values approaching those of healthy full-term infants.

The research was led by Professor Afif EL-Khuffash, Clinical Professor of Paediatrics at RCSI and Consultant Neonatologist at the Rotunda Hospital, Dublin, in collaboration with researchers at University of Oxford; Mount Sinai Hospital, Toronto; Northwestern University Feinberg School of Medicine; Washington University School of Medicine; and, Harvard Medical School.

Children and adults who are born preterm are at increased risk of cardiovascular disorders, including ischemic heart disease, heart failure, systemic and pulmonary hypertension, and are more likely to die as a result of cardiovascular disease. The hearts of young people born early are known to have unique traits such as reduced biventricular volume, shorter length, lower systolic and diastolic function and a disproportionate increase in muscle mass. This results in impaired heart function, which is significantly lower than that of healthy infants who are born at term. This dysfunction is detectable at hospital discharge and persists throughout their adolescence.

This study shows that exclusive breast milk consumption in the first months after birth is associated with a normalisation of some of these traits. Premature infants exposed to a high proportion of their mother's own milk during the first few week after delivery had greater left and right heart function and structure with lower lung pressures and enhanced right heart response to stress at one year of age compared to preterm infants who had a higher intake of formula, with all measures approaching those seen in term-born healthy children.

Professor Afif EL-Khuffash, Clinical Professor of Paediatrics at RCSI and Consultant Neonatologist at the Rotunda Hospital, Dublin

These findings were apparent before discharge from the hospital and persisted up to a year of age (the duration of follow up).

Prof. EL-Khuffash said: "This study provides the first evidence of an association between early postnatal nutrition in preterm-born infants and heart function over the first year of age, and adds to the already known benefits of breast milk for infants born prematurely."

"Preterm infants have abnormal heart function. However, those who are fed their mother's own milk demonstrate recovery of their heart function to levels comparable to healthy term born infants. Preterm infants fed formula do not demonstrate this recovery."

Reference:

1. A. E. Khuffash, et al. Cardiac Performance in the First Year of Age Among Preterm Infants Fed Maternal Breast Milk. *JAMA Network Open*. 2021. *https://doi.org/10.1001/jamanetworkopen.2021.21206*

The effect of metabolic syndrome on atherosclerosis can be reduced by increasing cardiorespiratory fitness beginning in childhood

The deleterious effects of metabolic and cardiovascular risk factors on arterial health can be reduced by increasing cardiorespiratory fitness already in childhood, a new study suggests. The study[1] also found that the traditional way of investigating whether excess body fat relates to poor arterial health may be insufficient in understanding the biology of disease, because better arterial health was associated with higher fat mass in children.

Researchers from the University of Eastern Finland, the University of Exeter, and the University of Bristol carried out the study using data from one of the world's most extensive ongoing prospective birth cohort studies – The Avon Longitudinal Study of Parents and Children (ALSPAC).

Metabolic disease and atherosclerotic cardiovascular disease are among the world's main causes of death. The paucity of evidence on the mediating role of cardiorespiratory fitness on the associations of cardiometabolic risks with atherosclerotic cardiovascular disease risks in the young population warranted this novel study, which was conducted among more than 5500 British children and adolescents, aged 9 to 11 years. Cardiometabolic risk comprised of elevated blood pressure, abnormal blood lipids and high body fat. The study found that increased cardiorespiratory fitness was associated with a reduction in the adverse effect of cardiometabolic risk factors on arterial elasticity and stiffness by 4 – 12% after controlling for other risk factors. Theoretically, this implies that for every 100 children who could develop atherosclerosis from metabolic syndrome, about 4 – 12 children may avoid atherosclerosis due to high cardiorespiratory fitness.

"This result may have clinical and pub-

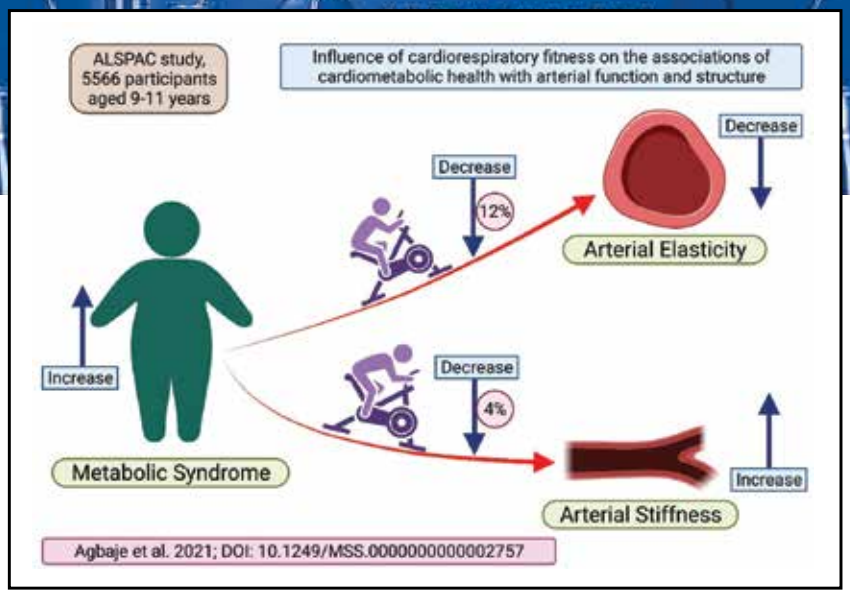


Image: Andrew Agbaje.

Increased risk of metabolic syndrome in childhood could increase arterial stiffness and reduce arterial elasticity, which are precursors of atherosclerosis. However, increased cardiorespiratory fitness in childhood could delay this progression by 4-12%.

lic health significance since the studied population was apparently healthy but it needs to be replicated in a population with a high prevalence of obesity and metabolic diseases, and in prospective studies. If the findings from such studies are consistent, it would suggest that enhanced cardiorespiratory fitness from childhood could prevent an altered cardiovascular effect of metabolic syndrome in later life," said Andrew Agbaje, a physician and clinical epidemiologist at the University of Eastern Finland.

"These data add to a growing body of evidence highlighting the importance of providing children with opportunities to develop their physical fitness. This can be achieved by meeting physical activity guidelines for health, which encourages children to reach 60 minutes of physical activity at a moderate to vigorous intensity on a daily basis. Children should be provided with opportunities to accumulate activity across the day," said Alan Barker, an Associate Professor of Pediatric Exercise and Health at the University of Exeter.

Arterial health and fat mass

Another key finding from this study is that the usual approach for studying the adverse effect of fat mass on arterial health in a single direction might have led to insufficient knowledge on the biology of arterial physiology and disease since the reverse association has been largely overlooked. The researchers found that increased arterial stiffness in children was associated with reduced general or central adiposity and better endothelial function was associated with higher adiposity. These results remained consistent after accounting for factors such as age, sex, puberty, systolic blood pressure, socio-economic status, total fat mass, cardiorespiratory fitness, low-density lipoprotein, and the diameter of the brachial artery.

This finding can be described as an 'arterial paradox' in which healthy arteries in children and adolescents seem to promote higher fat mass, albeit healthy fat since less than five percent of the study participants were obese. "Hence, it is important to prospectively investigate whether this 'arterial paradox' continues into early adulthood, especially in the same population," said Dr Agbaje.

Reference:

1. A. O. Agbaje, et al. Cardiorespiratory Fitness, Fat Mass, and Cardiometabolic Health with Endothelial Function, Arterial Elasticity, and Stiffness. Medicine & Science in Sports & Exercise. 2021. *https://doi.org/10.1249/MSS.0000000000002757*

Multinational study, including ICLDC, shows metabolism over lifetime much more stable than previously thought

A recent study published in the journal Science has shed new light on how the body's metabolism changes over time, suggesting it peaks much earlier and declines much later than previously thought.

The landmark research, led by Herman Pontzer, associate professor of evolutionary anthropology at Duke University, examined metabolic data for more than 6,000 people ranging in age from just one week old to age 95. The largest study of its kind, it relied on data collected by an international team of scientists including research data generated at Imperial College London Diabetes Centre (ICLDC), Abu Dhabi.

Results revealed that total energy expenditure is more stable for much longer than previously thought. Rather than the conventional wisdom that the body's metabolism peaks in the teens and begins to slow around middle age, people's total energy expenditure per kilo of bodyweight appears to peak in infancy before stabilising in their early 20s and does not change significantly until after the age of 60 when it begins to drop by about 0.7% per year. Major life events such as pregnancy and puberty were not found to have any significant effect on total energy expenditure.

Dr Nader Lessan, a consultant endocrinologist and clinical lead in research at ICLDC who contributed to the research project, said: "Combining research data from multiple centres across 29 countries is a truly novel approach and some of the findings that have already come out of this new data set are totally unexpected and quite a surprise. That total energy expenditure is stable through most of life and peaks much earlier than we thought was not a finding I expected to see. The exciting next step is to dig into why that might be and see how it informs the way we look at and treat metabolic disorders such as diabetes and obesity, including our approach here in the UAE."

The group identified four different stages of metabolism during a person's life. After an initial surge in infancy, that sees infants burn calories 50% faster for their body size than an adult, data showed that metabolism slows by about 3% each year until a person reaches their 20s when it levels off into a new normal. Despite the commonly accepted idea that the metabolism slows in middle age, the middle decades of life were found to be the most stable of all.

Unlike previous large-scale studies that examine base metabolic rates or the amount of energy the body uses to maintain vital functions, the study looked at

Eyleen de Poel, copyright: UMC Utrecht.

Swelling response of patient derived mini-guts. Collapsed organoids (left) show active swelling response that is mediated by the CFTR ion channel after one hour incubation with forskolin (right). Green staining shows complete cells (Calcein green) and DNA is shown in Blue.

people's total metabolic rate, the amount of energy they use throughout their day, walking around, working and even thinking. To do this, the research team used data from "doubly labelled water" studies, long considered the gold standard for measuring daily energy expenditure in real-life conditions. These studies have participants drink water that has had its hydrogen and oxygen atoms replaced with naturally occurring "heavy" forms and measuring how quickly they are flushed out of the body.

The study's results and the building of a large, international data set have opened a range of new avenues for research into the metabolism and associated health conditions.

"At Imperial College London Diabetes Centre, our research is focused on the most pressing health needs of the population in the region, specifically diabetes and obesity. Having this new resource available means we will be able to supplement the research data we have already collected to build a more accurate and detailed picture and look into how it varies regionally – something that can only benefit our patients," said Dr Lessan.

Reference:

H. Pontzer et al. Daily energy expenditure through the human life course. *Science 2021*. https://doi.org/10.1126/science.abe5017

Researchers correct cystic fibrosis using new CRISPR/Cas9 variant technique

Recently published research provides new hope for a potential cure for the devastating cystic fibrosis disease. In the study, a research collaboration demonstrated how they corrected mutations that cause cystic fibrosis in cultured human stem cells using a CRISPR/Cas9 variant technique called prime editing to replace the 'faulty' piece of DNA with a healthy piece. They also demonstrated that prime editing is safer than the conventional CRISPR/Cas9 technique.

The researchers from the group of Hans Clevers (Hubrecht Institute) in collaboration with UMC Utrecht and the Oncode Institute published their findings in *Life Science Alliance* on August 9. They commented: "We have for the first time demonstrated that this technique really works and can be safely applied in human stem cells to correct cystic fibrosis."

Cystic fibrosis (CF) is one of the most prevalent genetic diseases worldwide and has grave consequences for the patient. The mucus in the lungs, throat and intestines is sticky and thick, which causes blockages in organs. Although treatments are available to dilute the mucus and prevent inflammations, CF is not yet curable. This study offers new hope for these patients.

Correcting cystic fibrosis mutations

The researchers succeeded in correcting the mutations that cause CF in human intestinal organoids. These organoids, also called mini-organs, are tiny 3D structures that mimic the intestinal function of patients with CF. They were previously developed by the same research group from stem cells of patients with CF and stored in a biobank in Utrecht. For the study, a technique named prime editing was used to replace the piece of mutated DNA that causes CF with a healthy piece of DNA in these organoids.

Prime editing safer than CRISPR/Cas9

Prime editing is a newer version of the better-known gene editing technique CRISPR/Cas9. CRISPR/Cas9 cuts the DNA before correcting it. Although this corrects the mutated piece of DNA, it also causes damage in other regions in the genome.

"In our study, prime editing proves to be a safer technique than the conventional CRISPR/Cas9. It can build in a new piece of DNA without causing damage elsewhere in the DNA. That makes the technique promising for application in patients," says first author on the publication Maarten Geurts of the Hubrecht Institute, Royal Netherlands Academy of Arts and Sciences and University Medical Center Utrecht, the Netherlands.

The mutations that cause CF are localized in the CFTR channel, which is present in the cells of various organs including the lungs. Due to the mutations, the channel does not function properly, leaving the layer of mucus that covers the cells with too little water: the mucus becomes sticky. The addition of a substance called forskolin causes healthy organoids to swell, but this does not happen in organoids with mutations in the CFTR channel.

"We applied prime editing to the mutations, after which the treated organoids demonstrated the same response as the healthy organoids: they became swollen. That provided us with proof that our technique worked and replaced the mutated DNA," Geurts explains.

Clinical application

Now that the researchers showed that the mutations that cause CF can be safely corrected, applications in the clinic come one step closer. "New variants of CRISPR/Cas9, such as prime editing, can safely correct mutations without causing damage in other regions of the DNA. This will hopefully enable us to cure or even prevent genetic diseases in the future," Geurts. But before that, some challenges still lie ahead for the researchers. The technique for example still needs to be adapted for safe use in humans. "But this is a great step towards successfully applying prime editing in the clinic," Geurts says.

Reference

"Evaluating CRISPR-based Prime Editing for cancer modeling and CFTR repair in organoids". Maarten Geurts, et al. *Life Science Alliance*. https://doi.org/10.26508/lsa.202000940 MEH

Viral load is not a true indicator of SARS-CoV-2 transmission risk

The transmission of SARS-CoV-2 virus is dependent on many factors. Although some in vitro studies indicate that the amount of virus isolated from infected individuals affects the successful rate of virus transmission, whether the viral load carried at the individual level can determine transmissibility was unknown. A study of college students who underwent regular testing and contact tracing after positive tests, found significant overlap in cycle thresholds (Ct) between spreaders and nonspreaders. This makes Ct values questionable in determining transmission rates. Even those with low viral loads can pass on the virus, researchers report in *The Journal of Molecular Diagnostics*[1].

"We wanted to find whether there was a scientifically sound way to quickly triage students with potential high-risk exposure to COVID-19 positive students for quarantine," explained co-lead authors Patrice Delafontaine, MD, Department of Medicine, and Xiao-Ming Yin, MD, PhD, Departments of Pathology and Laboratory Medicine, Tulane University School of Medicine, New Orleans, LA, USA. "Some studies have found that the Ct value of the RT-PCR assay is a surrogate for infectivity, and cut-off Ct values have been proposed as a way to guide isolation practices. Through testing and contact tracing, we found that Ct value could not predict transmissibility. We should not overlook positive patients with low viral load, and all positive patients should be quarantined."

Tulane University maintained on-campus educational activities in the fall semester of 2020. A high-throughput SARS-CoV-2 surveillance testing program was established to support contact tracing, isolation, and quarantine efforts needed to restrict viral transmission throughout the campus. All students were tested twice a week. At the time of testing, students were asked about symptoms they may be experiencing. Contact tracers spoke to all positive case subjects to identify close contacts.

The study looked at 7,440 patients who were screened between September 1, 2020 and October 31, 2020. Six hundred and two positive cases were identified. From this group, 195 index cases were identified with one or more reported close contacts, who were then tested during their mandated 14-day quarantine period for evidence of transmission from the associated index cases. Of these index cases, 48.2% had at least one contact who became SARS-CoV-2 positive, whereas 51.8% of the index cases were nonspreaders with no contacts who subsequently tested positive. Mean Ct values of the spreaders and the nonspreaders were nearly identical.

The investigators then took a reverse approach, in which index cases were traced for 481 students undergoing quarantine due to known exposure to the disease. Eighteen percent of the students became positive during their quarantine. Index cases for the 481 quarantined students were considered spreaders if they were linked to one or more quarantine students with a positive test result, or nonspreaders if they were associated only with students with negative test results. The mean Ct values of the spreader and the nonspreader groups were similar.

Next the investigators identified and evaluated 375 positive COVID-19 cases to assess the relationship between symptom presentation and Ct values. Reported symptoms included lethargy, fever, headache, cough, runny nose, and gastrointestinal symptoms. The mean and median Ct values were significantly lower in symptomatic cases than in asymptomatic cases, indicating a higher viral load. These findings suggest that infections with a higher viral load may be more likely to lead to symptom development, or that symptomatic individuals tend to have higher viral loads or maintain their viral loads for a longer period of time. Ct levels may be useful at a population level, in association with symptomatic presentation, to indicate the likelihood of transmission. These values may thus have epidemiologic or surveillance importance.

"Taken together, these index cases suggest that Ct values alone do not predict transmission risk, and reporting of Ct values at the individual level, such as by setting a cutoff value of 32, would provide little diagnostic value for case management," noted Dr. Delafontaine and Dr. Yin. "A sensitive and robust SARS-CoV-2 diagnostic testing method is needed to effectively control viral transmission by maximizing the ability to identify and quarantine even those with a low level of virus."

Reference:

1. Di Tian, et al. Ct Values Do Not Predict Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Transmissibility in College Students. *The Journal of Molecular Diagnostics*. https://doi.org/10.1016/j.jmoldx.2021.05.012

RECOVERY-RS trial finds CPAP reduces need for invasive ventilation in hospitalised Covid-19 patients

The Respiratory Strategies in Covid-19; CPAP, High-flow, and Standard Care (RECOVERY-RS) trial[1] has demonstrated that treating hospitalised Covid-19 patients who have acute respiratory failure with continuous positive airway pressure (CPAP) reduces the need for invasive mechanical ventilation.

Preliminary data from the trial also suggests that the routine use of *high flow nasal oxygenation* (HFNO), which can consume large amounts of oxygen, should be reconsidered as it did not improve outcomes for Covid-19 patients compared with conventional oxygen therapy.

RECOVERY-RS, led by the University

of Warwick and Queen's University Belfast, is the world's largest non-invasive respiratory support trial for Covid-19 – with over 1200 participants taking part across 48 UK hospitals. The multi-centre, adaptive, randomised controlled trial compared the use of CPAP (oxygen and positive pressure delivered via a tightly fitting mask), with HFNO (high pressure oxygen delivered up the nose), against standard care (standard oxygen therapy).

All three interventions are commonly used to treat Covid-19 patients before they are moved onto invasive ventilation in a critical care bed, but it was not known which, if any, resulted in better outcomes.

Commenting on the study, Professor Danny McAuley, Chief Investigator and Professor and Consultant in Intensive Care Medicine at the Royal Victoria Hospital and Queen's University Belfast said: "Over the Covid pandemic, we've seen a large number of patients requiring high levels of oxygen and admission to ICU for invasive ventilation, causing a huge strain on staff and beds.

"The results of this trial are really encouraging as they have shown that by using CPAP, invasive ventilation may not be needed for many patients with Covid-19 requiring high oxygen levels. Avoiding invasive ventilation is not only better for the patients, but it also has important resource implications as it frees up ICU capacity. This research should help healthcare professionals in the UK and beyond manage patients with Covid-19, to improve patient outcomes while helping to lessen the burden on resources."

Results

Over 13 months, between April 2020 and May 2021, a total of 1,272 hospitalised Covid-19 patients with acute respiratory failure, aged over the age of 18, were recruited to the study and randomly allocated to receive one of three respiratory support interventions as part of their hospital care.

380 (29.9%) participants received CPAP; 417 (32.8%) participants received HFNO; and 475 (37.3%) received conventional oxygen therapy.

The primary outcomes assessed through the trial were whether the patient went on to require tracheal intubation (invasive mechanical ventilation) or died within 30-days of beginning treatment through the trial.

In the comparison of CPAP and conventional oxygen therapy, the likelihood of patients going on to require invasive mechanical ventilation or die within 30-days of treatment was significantly lower in those who were treated with CPAP, than those who received standard care. In the CPAP group, 137 of 377 participants (36.3%) either needed mechanical ventilation or died within 30 days, compared with 158 of 356 participants (44.4%) in the conventional oxygen therapy group.

There was no difference in primary outcomes between patients in the HFNO and conventional oxygen therapy groups. In the HFNO group, 184 of 414 participants (44.4%) went on to require mechanical ventilation or die, compared with 166 of 368 participants (45.1%) in the conventional oxygen therapy group.

Based on these results, one person would avoid needing invasive ventilation within intensive care units for every twelve people treated with CPAP instead of standard oxygen therapy.

Commenting on the study, Professor Gavin Perkins, Chief Investigator and Professor in Critical Care Medicine at Warwick Medical School at the University of Warwick, said: "The RECOVERY-RS trial showed that CPAP was effective at reducing the need for invasive ventilation, thus reducing pressures on critical care beds. The routine use of high flow nasal oxygenation, which can consume large amounts of oxygen, should be reconsidered as it did not improve outcomes. By giving patients the most effective treatment to begin with, we can help prevent resource shortages in our NHS and make sure the right type of ventilation is available to patients when it is required.

"This is the first large trial of different types of ventilation in Covid-19. While it is encouraging that these results can help reduce the number of people who require invasive ventilation, it is important to stress that, where it is needed, invasive ventilation can be lifesaving."

• [1]The preliminary results of this evaluation of the data are available as a pre-print on medRxiv. doi: *https://doi.org/10.1101/2021.08.02.21261379*

Researchers start new investigation into Long COVID core outcome set

The World Health Organization (WHO) recently called countries to prioritise recognition, rehabilitation and research for the consequences of COVID-19, and the collection of standardised data on Long Covid and proposed the term "Post COVID-19 condition" should be used for people living with Long COVID.

A significant portion of people diagnosed with COVID-19 subsequently experience lasting symptoms including fatigue, breathlessness and neurological complications months after the acute infection. However, the evidence for this condition is limited and based on small patient cohorts with short-term follow-up.

There is an urgent need for the development of a core outcome set (COS) to optimise and standardise clinical data collection and reporting across studies (especially clinical trials) and clinical practice for this condition. With this in mind, clinical research communities and people living with Post COVID-19 condition have come together to respond to this emerging global healthcare crisis.

An international group of experts in COS development and Post COVID-19 Condition research and clinical practice have developed a programme of research together with WHO, ISARIC (International Severe Acute Respiratory and emerging Infection Consortium), and patient partners to develop a Post COVID-19 Condition COS.

This project, Post-COVID Condition Core

Outcomes, <*www.pc-cos.org*> will start by surveying people living with Post-COVID-19 condition, assess what outcomes matter and build a plan in two phases. The first phase will focus on what outcomes should be measured and the second phase will focus on how to measure these outcomes.

Researchers aim to complete the first phase (what outcomes to measure) in the summer of 2021 and the second phase (how to measure these outcomes) in 2022.

This project follows the COMET (Core Outcome Measures in Effectiveness Trials) Initiative's standards and has been registered on COMET's COS registry < *https://cometinitiative.org/Studies/Details/1847* >.

This plan is being globally publicised in its early stages so that research and patient communities are aware, thereby potentially avoiding any unnecessary duplication of work, and to let researchers planning studies, especially clinical trials, and clinicians know the anticipated time frame of these recommendations.

Covid-19 will become a childhood disease according to epidemiologists

A new modelling result [1] suggests that Covid-19 will turn into a childhood disease mostly affecting younger children. Risks will shift from older adults to younger children within the next few years, researchers predicts as they share the results from their mathematical models. Because children generally gets less ill from this disease, the overall burden from Covid-19 will decline.

"In a few years Covid-19 may behave like other common-cold coronaviruses. It is likely that it will affect mostly young children who have not yet been vaccinated or exposed to the virus", explained Ottar Bjørnstad, an expert in epidemiology and professor at Penn State University.

He stressed that the only thing scientists can do at this time of the epidemic is to try to make predictions, and plausible scenarios of what will happen.

"We don't know anything much about SARS CoV-2. Scientists can't be sure at this stage, but for this study we have used key data, and we have also taken into account what we know from other coronaviruses," Bjørnstad said.

For example ongoing work suggests that the Asiatic or Russian flu, which killed one million people in the pandemic in 1889-1890, may have been caused by the emergence of a coronavirus.

"Today this is a mild cold virus affecting mostly children," noted Bjørnstad.

He worked closely with Ruiyun Li, postdoctoral fellow at the University of Oslo, on this study. They have developed a realistic age-structured mathematical model that integrates demography, social mixing, and immunity. The model predicts possible scenarios of future age incidence and burden of mortality.

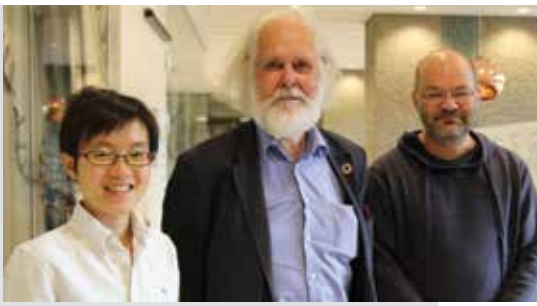
"We have also taken into account varying demographics and we have examined disease burden over immediate, medium and long terms," explained Li.

The researchers looked at 11 different countries that differ widely in their demographics. Their model predicts different outcomes for different countries. Nils Chr. Stenseth, professor of ecology and evolution, University of Oslo, explained this: "Different countries have different age pyramids, and also different age-specific contact rates. South Africa, for example, will have a lower number of deaths due to its younger population structure compared to older populations such as Italy."

However regardless of demographics, the scientists predict a consistent shift of the risk to the young for all the countries.

Building on this study the team consisting of Stenseth, Bjørnstad and Li have also developed a mathematical framework for comparing alternative vaccine roll-out strategies for the years to come. Their results show that switching vaccination among groups will be important in the future.

"Health authorities should be aware that over time switching the priority from high-risk older age groups to more social groups that are responsible for more circulation of the virus will be beneficial," said Stenseth.



Authors on the paper (from left): Ruiyun Li, postdoctoral fellow at the University of Oslo, Nils Chr. Stenseth, professor of ecology and evolution, University of Oslo, and Ottar Bjørnstad, an expert in epidemiology and professor at Penn State University.

The research team considered different vaccine allocation strategies and have shown that it is important to identify the ones in the population that are more sociable. The model shows that the mixed vaccination approach, as compared to focusing on the high-risk groups only, can lead to a substantial reduction in mortality as well as infections.

"Our goal is trying to lower the death rate and also the infection," said Li.

The researchers stress that the governments will need a flexible tool to guide future vaccination campaigns. Coronavirus immunity may not be very long-lived, and repeat vaccination may be important.

"What is interesting about our results is that the best strategies depend on the age pyramid of the country and the demographic profiles of course, but also country specific mixing social patterns," Bjørnstad pointed out.

Reference:

[1.] Ruiyun Li, et al. A general model for the demographic signatures of the transition from pandemic emergence to endemicity. *Science Advances*, 2021. *https://doi.org/10.1126/sciadv.abf9040*

Siemens Healthineers Dual Source CT scanners offers enhanced diagnostic possibilities

Precision, speed, and patient comfort are the needs of the hour in CT imaging. Siemens Healthineers supports this requirement with its state-of-the-art Dual Source Technology offering significant gains with spectral data, enhanced diagnostic quality and extended clinical application range for doctors and radiologists. During routine imaging, Dual Source Dual Energy (DSDE) technology delivers enhanced image quality, greater accuracy and diagnostic confidence along with the ability to tailor dose and protocols for challenging clinical decisions. Overall productivity is increased enabled by AI-based clinical automation and reduced patient preparation times.

Dual Source Dual Energy

DSDE technology is an advancement of Siemens Healthineers' Dual Energy Computed Tomography (CT) offering features that were previously difficult or impossible. As compared to the physical limitations of single source scanners, Dual Source CT enhances imaging capabilities, irrespective of how demanding the clinical application is. AI-driven auto power selection (KV and mAs) and high power from the dual source scanners promises accurate diagnostic results regardless of a patient's age, size, weight or other physical conditions, directly translating into informed decisions and better treatment outcomes. The system's scan speeds can support high patient loads, while addressing critical and emergency patient care.

DSDE systems use two X-ray sources, which can be set to work independently offering five key imaging modes. With the Fast Temporal Resolution mode, intrinsic native temporal resolutions under 75 milliseconds can be achieved without any software correction. The Turbo Flash ultra-fast scanning mode enables high-pitch spiral scans and rapid acquisition speed helps keep patient motion in check, leading to exceptional image quality. With the Dual Energy mode, the X-ray tubes are set at different energies to provide maximum spectral separation allowing large anatomical volumes to be covered at high speeds and low doses. The Dual Power mode allows the combined output of the two tubes, keeping radiation dose and contrast media levels down for both obese and normal patients. The Adaptive 4D Spiral mode is ideal for dynamic and functional imaging, providing significantly high coverage at exactly the right moment in time with low dose.

Intelligent automation

Siemens Healthineers has two Dual Source CT scanners – the SOMATOM Force *https://www.siemens-healthineers.com/en-ae/computed-tomography/dual-source-ct/somatom-force* and the SOMATOM Drive *https://www.siemens-healthineers.com/en-ae/computed-tomography/dual-source-ct/somatom-drive* – both of which use FAST (Fully Assisting Scanner Technologies) AI Integrated Workflow, a combination of solutions such as FAST 3D camera, touch panels and other advanced applications. An array of diagnostic possibilities like virtual unenhanced maps for oncology cases, mono-energetic images for metal artifact reduction or perfused blood volume maps of lungs for pulmonary embolism assessment are available automatically. Some of the other key applications of these scanners include paediatric, neurological, functional cases, trauma and critical care, cardiovascular imaging including dynamic myocardial perfusion, orthopaedics, thoraco-abdomen, head and neck, and bariatrics.

Future-ready

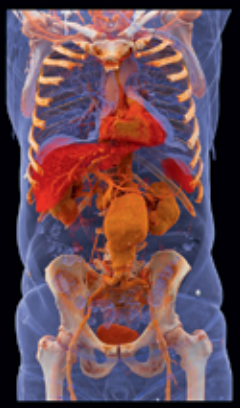
The Siemens Healthineers Dual Source CT scanner family is a future-ready solution for the healthcare sector.

Find out more about the technology here *https://www.siemens-healthineers.com/en-ae/computed-tomography/technologies-and-innovations/dual-source-ct*

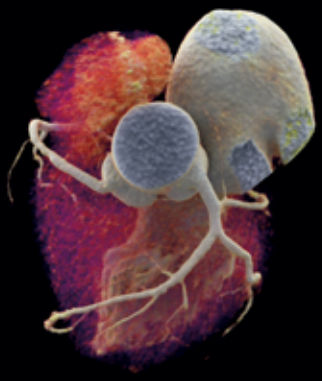
Dr. Usama Mohammad Hassan Al Bastaki, Director of Diagnostic Imaging Department, Dubai Health Authority.

> As a resident back in 2004, my tutor told me that CT scans would soon be replaced by the more innovative MRI technology. DSDE technology has proven that CT has the potential to evolve and prove its existence. It's exceptional image quality enables easy diagnosis through dual-energy spectral and cardiovascular imaging delivering excellent medical outcomes while ensuring patient comfort at the same time.
>
> *– Dr. Usama Mohammad Hassan Al Bastaki*

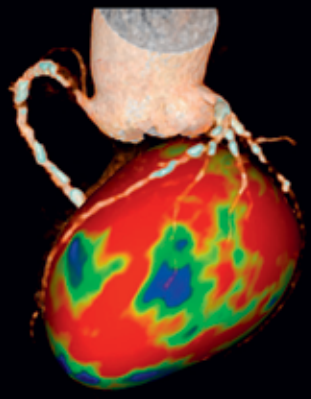
Get two steps ahead with Dual Source CT



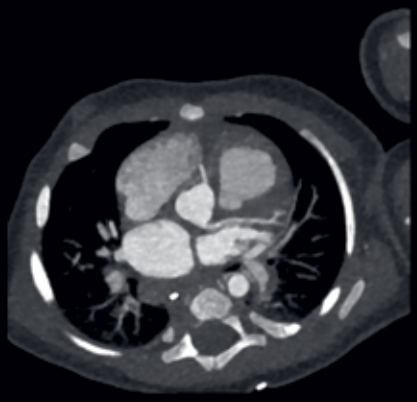
Precise and dose-neutral Dual Energy imaging significantly increases precision[1, 2]



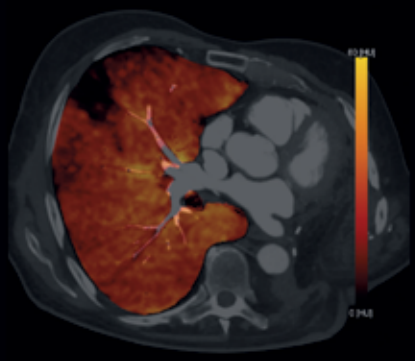
Sub-millisievert Turbo Flash cardiac imaging at 75-130 bpm – RCA irregularities without significant stenosis[2, 3]



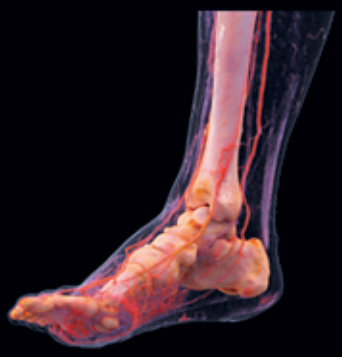
Dynamic myocardial stress perfusion – combining diagnostic and functional imaging at low dose (43.08 mGy; 70 kV) allows the most efficient possible use of radiation dose[4]



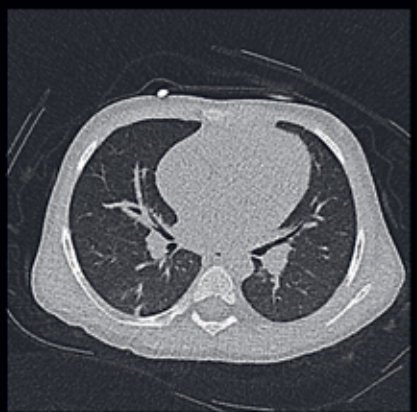
Visualization of coronaries in a 2-month-old free-breathing baby (1.16 mGy, 70 kV) at HR of 130 bpm[5]

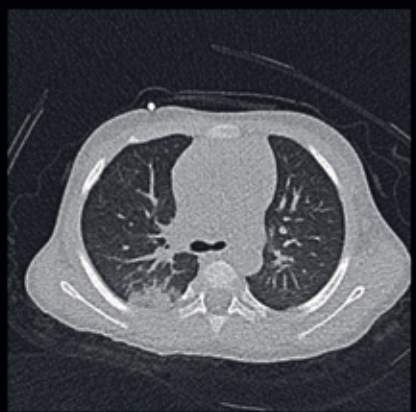


Precise Dual Energy tissue differentiation – lung perfusion[6]

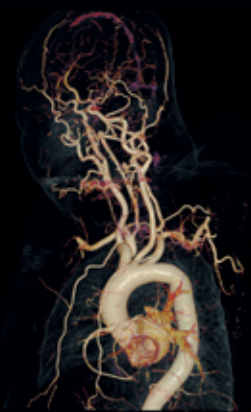


4D imaging at half the dose (Eff. dose: 1.39 mSv)[2, 7]





Free-breathing and ultra-low-dose imaging (Eff. dose: 0.08 mSv)[1]



Turbo Flash Mode covers 50 cm within 0.6 s even showing coronary arteries in the finest detail (HR: 38-214 bpm; CM: 40 mL)[2,3]

1 Courtesy of University of Tuebingen, Tuebingen, Germany.
2 Requires the license syngo.via Cinematic VRT. Cinematic VRT is recommended for communication, education, and publication purposes and is not intended for diagnostic reading.
3 Courtesy of Baotou City No. 8 Hospital, Baotou, P.R. China.
4 Courtesy of Peking University Medical College, Beijing, P.R. China.
5 Courtesy of University of Karolinska, Solna, Sweden.
6 Courtesy of University Hospital Calmette, Lille, France.
7 Courtesy of University Medical Center Mannheim, Mannheim, Germany.

SIEMENS Healthineers

The impact of new data protection laws on healthcare organisations

Data impact assessment recommended to avoid risk of breaching new regulations

Simon Isgar, Partner and Head of Insurance at BSA Ahmad Bin Hezeem & Associates, looks at the UAE's new robust regulations regarding healthcare data storage, protection and sharing, and recommends that healthcare organisations that process data/informaton carry out a healthcare data impact assessment to address potential risks for breaching the new regulations.

Healthcare data, and information, and its development in terms of how this data/information is processed and protected, is a fast-evolving growth area, challenging both industry and consumers alike in the United Arab Emirates.

With the imposition of considerable US and EU safeguards to regulate the storage and processing of healthcare data within those respective jurisdictions, the Middle East was mindful to review and enhance its own protection mechanisms. In addition, with the risk of global and local cyberattacks on many industry sectors, it is now imperative that industry understands its obligations to properly process, retain and keep healthcare data/information secure.

Legal protections

Generally, healthcare data/information falls within a class of special or sensitive data that needs more legal protections. However, many organisations may not appreciate that they are dealing with highly sensitive data and may not have put in the necessary protective frameworks, as is required by the legal requirements in the United Arab Emirates.

For sake of background, historically, the legal frameworks for the processing and protection of healthcare data/information have been fragmented in terms of industry sectors and operational jurisdictions, i.e., depending upon the data/information being either "onshore" or in one of the respective UAE free zones. Healthcare information and data is regulated in the United Arab Emirates through various legal and regulatory frameworks, including Federal provisions under the Ministry of Health & Prevention (the "Ministry") and locally, through the respective health authorities, including the Department of Health Abu Dhabi (Department of Health), Dubai Health Authority (DHA) and Sharjah Health Authority (collectively referred to as the "Health Authorities").

Busch provides central vacuum systems for hospitals

The VCR centre for spinal injuries in Viborg, Denmark has a central vacuum supply powered by dry-running Mink claw vacuum pumps.

This supply comprises a rack of three Mink MV 0040 B claw vacuum pumps, an upstream 500 litre vacuum reservoir, bacteria filters and a controller. The system supplies vacuum to 40 connections in patient rooms, treatment areas and operating theatres throughout the hospital. Busch offered VCR Viborg a vacuum system equipped with three of the smallest Mink claw vacuum pumps, each with a pumping speed of 40 m³/h.

Two of the three Mink MV vacuum pumps maintain a vacuum level of about 250 mbar in the vacuum reservoir. If devices requiring vacuum are connected anywhere in the hospital network, air flows into the vacuum reservoir. The subsequent rise in pressure causes one of the two vacuum pumps to start automatically, returning the vacuum level to the desired value.

Vaccum pumps with integrated frequency converter

All three Mink MV vacuum pumps have an integrated frequency converter, and are controlled to deliver the minimum output required to maintain 250 mbar in the reservoir. This means the vacuum pumps operate extremely efficiently.

The second vacuum pump is activated only when the output of the first is insufficient. The controller starts the vacuum pumps alternately, so the number of operating hours for each unit is approximately equal.

The third Mink MV 0040 B serves as a standby and reserve unit, and is controlled redundantly by a pressure sensor in the reservoir. If this sensor detects a sudden rise in reservoir pressure – only possible if the system has a leak, or the other vacuum pumps have stopped – the standby unit is activated. The hospital vacuum supply is thus guaranteed, even if two vacuum pumps fail. The standby unit can also be used when maintenance work is carried out on the other two vacuum pumps. In this way the system is designed in accordance with the European standard EN ISO 7396-1 'Medical gas pipeline systems - Part 1: Pipeline systems for compressed medical gases and vacuum'.

- For more information, visit: *www.buschvacuum.com*
- Phone: (+971) 6 5529174 MEH

Healthcare information and data is also regulated in other legal structures, such as Dubai Healthcare City, through its established regulatory body, Dubai Healthcare City Authority. In addition, some of the other UAE free zones add a further layer of protection to safeguard against the unauthorised disclosure of health data and information, including the Dubai International Financial Centre (DIFC), through DIFC Law No. 5 of 2020, (DIFC Data Protection Law), which is closely aligned with the EU's General Data Protection Regulation (GDPR). Specifically, the DIFC Law does not permit the processing of healthcare data/information unless, inter alia, the processing is "required for the purposes of preventive or occupational medicine, the assessment of the working capacity of an employee, medical diagnosis, the provision of health or social care or the treatment or the management of health or social care systems and services, provided that the personal data is processed by or under the responsibility of a health professional subject to an obligation of professional secrecy or by another person also subject to an obligation of secrecy".

UAE's overriding Federal ITC law

Federal Law No. 2 of 2019 – Using IT and Telecommunications in the Healthcare Sector – was promulgated by the UAE Federal Government on 6 February 2019 ("ITC law"). ITC law, for all intents and purposes is the first Federal data/privacy law of its kind in the United Arab Emirates, albeit limited to healthcare data. ITC law, (like the US statute, Health Insurance Portability and Accountability Act of 1996 (HIPAA), Title II, which deals with privacy rules for the protection of healthcare data) is a timely welcome relief with implementing overriding Federal statutory provision to a very fragmented regulatory regime for healthcare data/information.

The ITC law prescribes 31 Articles, and its application is wide both in terms of geographical spread and industry sectors. ITC law covers the entire United Arab Emirates, including the Free Zones and will impact on many sectors including the Health Authorities in the different Emirates as well as all sectors dealing with healthcare data/information. ITC law applies to pharma companies, healthcare providers/facilities, medical insurance providers, insurance intermediaries dealing and placing medical insurance, third party medical claims administrators, technology companies in the healthcare space, and others dealing with healthcare data/information through technology platforms i.e., analytics of healthcare data/information.

The primary purposes of the ITC Law are to keep UAE health information confidential, to permit the circulation thereof only in authorised cases, and to ensure the validity and credibility of the health data and information. "Health Information" is defined broadly to include "health information that were processed and were given a visual, audible or readable indication, and that may be attributed to the health sector, whether related to the health or insurance facilities or entities or to the health services beneficiaries".

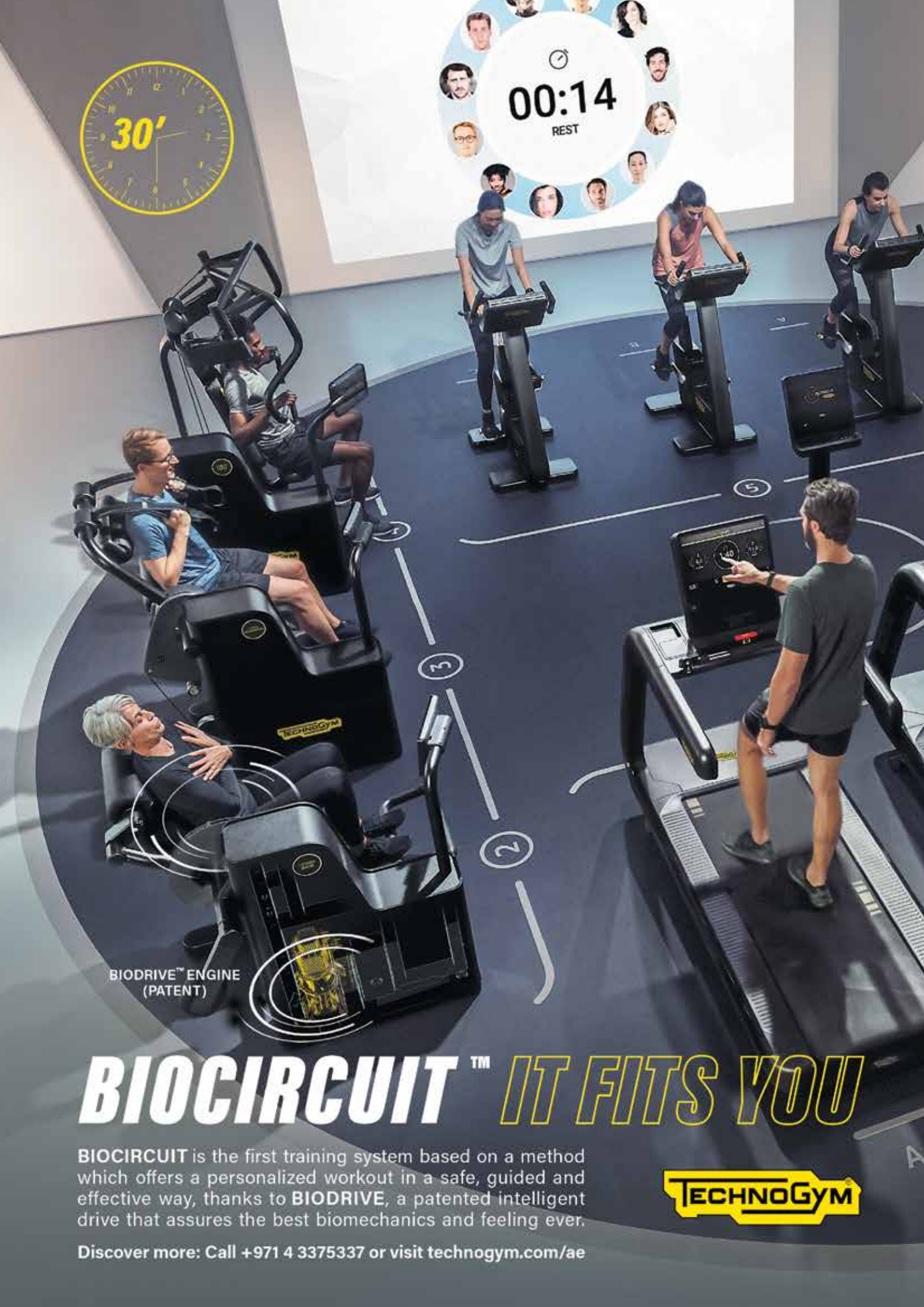
The Central System

Interestingly, and for the first time, Article (5) creates a Central System for data population between the Ministry, Health Authorities and all those involved with healthcare data/information, i.e., healthcare data/information processors. This is a welcome move by the UAE Government as we anticipate that where health data and information is captured and processed properly, this will benefit the UAE healthcare markets in terms of providing quality and accurate data to avoid potential fraud and better underwriting of medical insurance risk for the market, i.e., through the identification of pre-existing or co-morbid medical complaints/conditions. The entities authorised to use the Central System are required to elect authorised users and designate their powers regarding the access and circulation of health information/data and otherwise take all necessary procedures to protect and ensure the safety and confidentiality of the healthcare data/information.

The primary purposes of the ITC Law are to keep UAE health information confidential, to permit the circulation thereof only in authorised cases, and to ensure the validity and credibility of the health data and information.

Data storage and sharing regulations

Articles (12) and (13) provide obligations around storage of healthcare data/information within and outside the UAE, respectively. In terms of Article (13), health data/information may not be stored, processed, generated, or transferred outside the UAE, related to the health and healthcare services provided within the UAE, other than through a special resolution issued in favour of the healthcare data/information processors in coordination with the Ministry. Article (13) generated much debate and controversy as many organisations process healthcare data/information outside the UAE. However, Ministerial Decision No. (51) of 2021 (the "Decision"), which has recently been passed, provided certain exceptions/exemption to Article (13), which is a welcome relief to many industry sectors dealing with healthcare data/information ▶



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in the UAE. These are included in Article (2) of the Decision. They are:

- Data of patients treated outside the UAE;
- Data used in the framework of scientific research;
- Data required by an international organization cooperating with the UAE government;
- Data related to samples sent to laboratories outside the UAE;
- Data required by insurance companies and claim administration institutions;
- Data collected by devices and simple medical tools;
- Data used within the scope of the provision of health services online; and
- Data related to the prevention, treatment, or diagnosis of patients.

The Decision also provides that the data must be anonymous, encrypted, only shared with relevant authorised bodies, and transmitted securely in terms of scientific research. There are also exceptions for healthcare data/information collected through fitness and medical devices, such as wearables. In addition, the Decision, provides exceptions for the operation of telemedicine. However, these exceptions are conditional that written consent of the patient is given, a viewing of medical records by the medical practitioner carrying out the remote consultation is limited to a timeframe, and medical reports must be sent to the patient's relevant medical practitioner.

Any transfer of healthcare data/information, under any of the exceptions mentioned above, are subject to the restrictions around written patient consent, approval of the relevant health authority, data encryption using best practice standards, anonymisation measures, and disclosure limitations when sharing data with third parties. When healthcare data/information is transferred outside the UAE a mirror image of that data must remain within the UAE.

Benefits of transparency

With ICT law in place, this law will be the starting point for industry and consumers, as it is a Federal law applicable to all UAE sectors dealing with healthcare data/information. With the implementation of the ICT law, the UAE now has a strong and robust statutory framework to protect healthcare data/information, which will serve to protect the public from unauthorised access to private/confidential medical data/records and a system of co-operation between the applicable authorities, which will serve to promote transparency for the benefit of the medical profession and the insurance industry.

Other legal and statutory requirements may be applied in certain free zones, such as The DHCC Health Data Protection Regulation No. 7 of 2013 (Dubai Healthcare City) and DIFC Law No. 5 of 2020 (DIFC Data Protection Law).

Recommendations for organisations

The UAE now has a strong and robust statutory framework to protect healthcare data/information. Despite this, many organisations may not understand the potential risks with breaching the ICT law requirements and other data protection laws protecting healthcare data/information. We would recommend that organisations processing healthcare data/information carry out a healthcare data information impact assessment as soon as possible and map out their data fields, to address risk and apply appropriate measures. This should also include looking at cyber risk and exposure. This will not only assist the organisation with reducing regulatory risk, but will play a key part of the organisation's data mapping, which may provide a commercial and competitive advantage in the long run. MEH

About the author

Simon Isgar is Partner and Head of Insurance at BSA Ahmad Bin Hezeem & Associates, Dubai. He was previously Head of Kennedys' Corporate and Regulatory Insurance MENA practice. He is a qualified barrister who was called to the Bar in 1998, practising commercial and company law matters in the English courts.

A specialist in international health regulation and health insurance law as well as general corporate law, Simon advises insurance companies and intermediaries on placement of risks and products in foreign markets including underwriting agents and brokers.

He has extensive experienced in corporate insurance transactional work including setting up international insurers and agents in foreign markets through local incorporation, reinsurance arrangements and partnering with local licensed primary insurers in all lines of insurance, specifically life and health.

With nearly 20 years' experience representing international insurers and international intermediaries in the insurance markets globally, Simon is a member of the DIFC Insurance Association and sits on the Regulatory and Life & Health committees.

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New study finds frequent shedding of infectious pathogens outside hospital rooms

New data[1] suggest that methicillin-resistant *Staphylococcus aureus* (MRSA) is frequently shed during outpatient healthcare visits, creating the potential for transmission to other patients and healthcare staff. The findings from a six-month, hospital-based observational study appear in the *American Journal of Infection Control* (AJIC), and provide some of the first empirical data regarding the frequency of and risk factors for MRSA contamination outside hospital rooms.

"The proportion of patient care delivered in outpatient settings has risen dramatically in recent years and hospitalized patients often leave their rooms for various procedures, but there is limited data on the shedding of highly transmissible pathogens such as MRSA in these settings," said Curtis Donskey, M.D., hospital epidemiologist, Louis Stokes Cleveland VA Medical Center, and the paper's lead author. "Given the growing problems associated with healthcare-associated infections and multidrug-resistant organisms, it is critical to understand whether sites outside of patient rooms are an underappreciated source of transmission."

MRSA and multidrug-resistant gram-negative bacilli (MDR-GNB) can be transmitted from person to person in healthcare facilities and are common causes of infections in inpatient and outpatient settings. Multidrug-resistant gram-negative bacilli are problematic because there are very few antimicrobial drugs to treat them, which can be very dangerous for patients. While many studies have evaluated the pathogen contamination and transmission that occur in patient rooms, the study published in AJIC is among just a few that have evaluated shedding of MRSA and MDR-GNB outside of the hospital room setting.

The six-month observational study conducted at Louis Stokes Cleveland VA Medical Center involved a total of 50 hospitalized or recently discharged

Journal of Infection Control launches new podcast series for healthcare professionals

The Association for Professionals in Infection Control and Epidemiology (APIC) in August this year released the first episode of a new monthly podcast to help infection control and epidemiology professionals stay abreast of scientific literature published in the *American Journal of Infection Control (AJIC)*, APIC's peer review journal.

"AJIC: Science into Practice" <*https://ajicscienceintopractice.org*> will feature new research and articles significant to the practice of infection prevention and control.

The first episode, titled "MRSA in Outpatient Settings and Integrating Antibiotic Stewardship and Infection Prevention and Control Programs," explores recent findings surrounding infectious diseases and antibiotic stewardship in outpatient settings. The podcast's hosts, Nicki Shorr, RN, BSN, CIC, and Jessica Swain, MBA, MLT, CIC, both practicing infection preventionists (IPs), engage the authors in a discussion of how their findings can be applied in clinical settings to improve patient outcomes.

New episodes of "AJIC: Science into Practice" will air on the first Thursday of every month.

The podcast is available to stream and download on Apple Podcasts, Stitcher, Google Podcasts, and Spotify.

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patients infected with MRSA (n=39) or MDR-GNB (n=11). Researchers cleaned and disinfected all surfaces and equipment prior to outpatient visits and inpatient appointments outside of patient hospital rooms, and then sampled a standardized group of these surfaces immediately following the appointments to determine whether they were contaminated with MRSA or MDR-GNB.

Findings suggest that significant MRSA shedding occurred during patient visits and appointments, with 15 of the 39 MRSA carriers (38.5%) shedding MRSA to the environment during one or more procedures. This compared to zero instances of shedding among MDR-GNB infected patients (0%, p=.02).

Overall, environmental shedding of MRSA occurred during 45% of the 53 total appointments outside hospital rooms and in outpatient settings. Among the 24 MRSA-infected inpatients specifically, 38 total appointments outside of hospital rooms resulted in 17 instances (44.7%) of environmental MRSA contamination.

Risk factors

After analysing risk factors that could be associated with the environmental shedding of MRSA, researchers found that the presence of a wound that was culture-positive for MRSA was the only factor significantly associated with shedding. Eleven of 15 (73.3%) MRSA-infected patients with culture-positive wounds shed bacteria during appointments versus only 4 of 24 (16.7%) with no culture-positive wounds (p=.008).

"These findings provide objective evidence that shedding outside of hospital rooms could be an important source of MRSA transmission," said Ann Marie Pettis, BSN, RN, CIC, FAPIC, and APIC 2021 president. "Effective cleaning and disinfection protocols should be reinforced in outpatient clinics and sites of inpatient appointments to reduce the transmission risk in these settings." MEH

References

[1] H. Almidi, et al. Shedding of methicillin-resistant *Staphylococcus aureus* and multidrug-resistant gram-negative bacilli during outpatient appointments and procedures outside hospital rooms. *American Journal of Infection Control*, Vol. 49, Issue 8, 2021. doi: https://doi.org/10.1016/j.ajic.2021.03.002

Sink drains next to toilets in patient rooms may harbour dangerous bacteria

Sinks situated next to patient toilets in hospital rooms may be reservoirs for *Klebsiella pneumoniae* carbapenemase (KPC), increasing the risk of dangerous germ transmission, according to research[1] published in the *American Journal of Infection Control (AJIC)*, the journal of the Association for Professionals in Infection Control and Epidemiology.

The study found a high prevalence of KPC positivity in sink drains located next to toilets. Of the samples tested, 87.0% of patient sinks next to toilets tested positive for KPC – in stark comparison to the 21.7% of sink drains located closer to the entry door of the room.

Klebsiella can cause a number of healthcare-associated infections, such as pneumonia, bloodstream infections, wound infections, or surgical site infections. Increasingly, *Klebsiella* bacteria have developed antimicrobial resistance, most recently to carbapenem antibiotics.

In four of five rooms in which the entry-door sink tested positive, the sink near the toilet was also positive, suggesting a potential source for cross-contamination within the same room.

Researchers in Milwaukee, Wisconsin performed the study in the medical intensive care unit (MICU) of a 600-bed Wisconsin hospital. The MICU did not have any documented interactions with KPC-producing organisms within the past year.

"This study, if validated, could have major implications for infection control," said study lead author, Blake Buchan, PhD. "If sinks next to toilets are indeed a reservoir for KPC, additional interventions – such as modified hand hygiene practices and sink disinfection protocols – may be needed to stem the risk of transmission among healthcare providers and patients alike."

This is the first study to directly examine the relevance of sink proximity to toilets in patient rooms. The researchers point out that while it is not clear how contamination occurs, it is plausible that biofilms growing in pipes shared between toilets and sinks or that flushing generates contaminated drops that reach the sink drains.

"The results of this study demonstrate the importance of remaining vigilant to potential areas of cross- contamination," said 2019 APIC President Karen Hoffmann, RN, MS, CIC, FSHEA, FAPIC. "Maintaining a strong understanding of environmental risks is critical to protecting patient safety, and this is yet another example of how germs can lurk in often the most unexpected of places." MEH

References

[1] B. W. Buchan, et al. The relevance of sink proximity to toilets on the detection of *Klebsiella pneumoniae* carbapenemase inside sink drains. *American Journal of Infection Control*, Vol. 47, Issue 1. doi: https://doi.org/10.1016/j.ajic.2018.06.021

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Healthcare associated infection: a growing global challenge

Infections acquired in the healthcare sector is an established challenge all over the world. Constant improvement of the disinfection processes is essential to save patients from unnecessary suffering while also saving money and human resources.

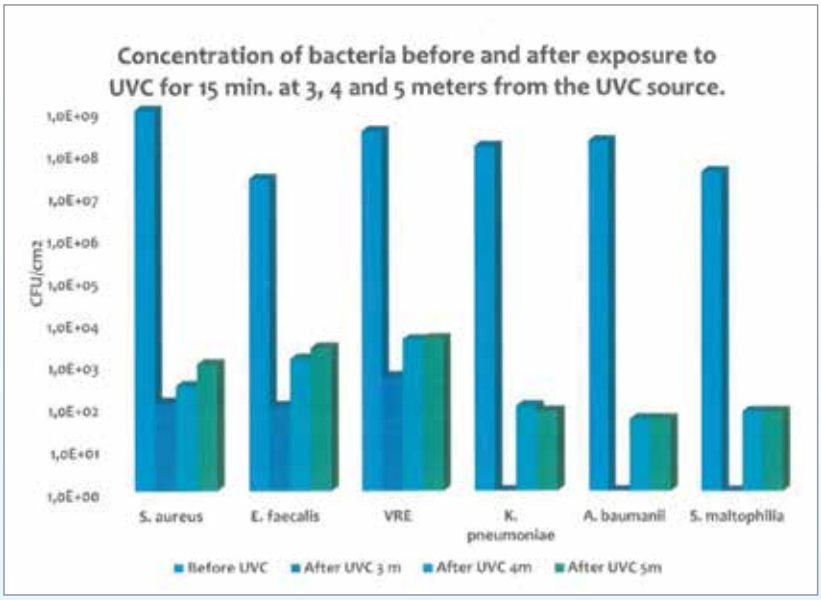

Figure from the test-report Dolphin Care Chemical-free UVC Room Disinfector, December 2018. By Leif Percival Andersen, MD, Specialist in Microbiology and Head of The Laboratory of Hygiene, Rigshospitalet, Copenhagen.

Seven percent of all hospitalized patients in developed countries will acquire a hospital infection[1]. This number varies between locations but the overall aim when securing an efficient disinfection process is the same: to reduce the rate of infection while remaining focused on the preservation of resources and limiting the impact on the environment.

UVC-light efficient and environmentally friendly

Ultraviolet germicidal irradiation (UVGI) is a disinfection method that uses short-wavelength ultraviolet light (UVC) to eliminate or deactivate microorganisms by destroying nucleic acids and disrupting their DNA/RNA. It is a disinfection method which has been used since the middle of the last century in medical sanitation and sterile work facilities.

This method is chemical-free and has no adverse impact on the surrounding environment – an aspect of increasing importance to our goal of fostering a more eco-friendly world.

Prevent spread of bacteria from the washbasins

The water-trap is one of the most contaminated areas in the healthcare environment. Many studies have reported that hospital outbreaks of various infections are the result of cross-contamination between patients and water fittings. When using UVC-light to decontaminate the water-trap it is possible to reduce the number of CFUs significantly.

The Danish company Dolphin Care has developed the UVC Water Trap Disinfector. It is a unique water-trap equipped with a UVC lamp which provides consistent germicidal irradiation, thereby reducing the spread of multi-resistant water bacteria from the washbasins to immunocompromised patients.

The Danish UVC Water Trap Disinfector has been tested in laboratory and clinical environments by Rigshospitalet, Copenhagen University Hospital, which has documented a reduction of germ count 3-6 $\log_{10}$.

The conclusion of the tests is that "UVC in drains may be beneficial in departments with immunocompromised patients to prevent spread of carbapenase-producing organisms.[2]"

The UVC Water Trap Disinfector from Dolphin Care is equipped with fittings that meet local requirements and standards.

Fast turnover of patient wards

Using UVC as a disinfection method in patient wards not only eliminates the impact of disinfection on the environment but also facilitates a faster turnover, as the process itself is less time-consuming and there is no need to aerate the space after the disinfection process.

The UVC Room Disinfector developed by Dolphin Care is a standalone unit which can cover an area up to 100m^2 and has a UVC irradiation dosage sufficient to reduce bacteria and spores from floor to ceiling in rooms with a height up to 220 cm.

The UVC lamp in the bottom of the unit secures total floor-irradiation, and because the unit stands still while in use, no contaminating germs will be stirred up in the process.

The product includes two UVC-satellites which can be used for disinfection of patient-toilets, entrances, and other small areas.

The UVC Disinfector has been tested by Rigshospitalet, Copenhagen University Hospital[3] and their conclusion is the Gram-negative bacteria is reduced 5 $\log^{10}$ after 15 minutes irradiation, and Gram-positive bacteria is reduced 4 $\log^{10}$ after 15 minutes, meaning effective disinfection can be obtained when MRSA or VRE are present even in rooms above 50m^2.

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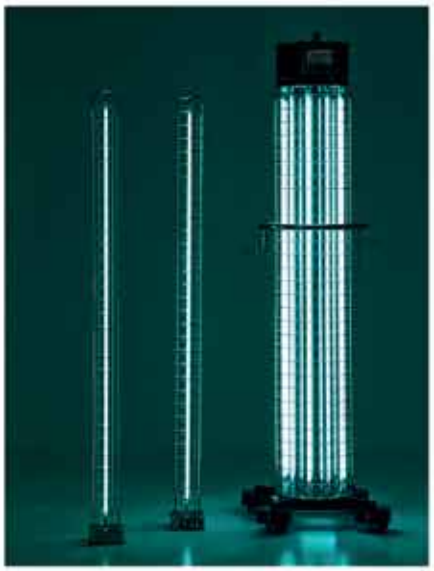
1. According to WHO
2. Test report – Dolphin Care UVC Water Trap Disinfector, December 2018. By MD Leif Percival Andersen, Specialist in Microbiology and Head of The Laboratorie of Hygiene Rigshospitalet, Copenhagen, Denmark
3. Test-report Dolpin Care Chemical-free UVC Room Disinfector, December 2018. By MD Leif Percival Andersen, Specialist in Microbiology and Head of The Laboratorie of Hygiene Rigshospitalet, Copenhagen, Denmark

High-end UVC disinfection solutions



Dolphin Care UVC Room Disinfector

Strong, consistent and effective UVC-dosage

The chemical-free UVC-disinfection process is a reliable solution where UVC-irradiation provides a consistent UVC-dose, enough to eliminate the RNA/DNA of virus, bacteria, fungi, and spores.

The Dolphin Care UVC Room Disinfector has been tested by Rigshospitalet, Copenhagen University Hospital and has a *documented efficacy against*

- MRSA
- Staphylococcus aureus
- ESBL producing gram negative bacteria
- Multi-drug resistant strains of pseudomonas aeruginosa
- VRE

The main unit provides coverage of 100 m² in rooms with a height up to 2.2 meters, including total floor irradiation. The two accompanying UVC satellites each cover 16 m², making them effective for disinfection of toilets, wards-entrances, and similar smaller rooms.

Dolphin Care UVC Air Sterilizer

Significant reduction of CFUs, allergen and bad odor

In the Dolphin Care UVC Air Sterilizer we combine UVC light, a titanium dioxide-coated filter, an activated carbon filter, and a HEPA14 filter, thereby significantly reducing the presence of microorganisms and odor in indoor environments.

The clinical tests of the UVC Air Sterilizer performed by Rigshospitalet, Copenhagen University Hospital, showed a *reduction of bacteria* and molds in patient rooms by *50-80 percent* which, according to Rigshospitalet, will most likely reduce the number of nosocomial infections from airborne microorganisms.

Dolphin Care UVC Water Trap Disinfector

Effective reduction of bacteria from waste water in wash-bassins

Washbasin drains are some of the most contaminated places in hospital environments and are likely to be the source of many nosocomial infections.

The Dolphin Care UVC Water Trap Disinfector combines UVC-light technology with chrome-polished pipes. Clinical tests performed by Rigshospitalet, Copenhagen University Hospital showed significant *reduction of the CFU – 3-6 log10 –* in the wastewater, which may prevent spread of carbapenem-producing organisms.

More information

Contact us for more information or demonstration of our high-end UVC disinfection solutions.

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DOLPHIN CARE

Keep that stethoscope clean!

A report published in the *American Journal of Infection Control*[1] notes that healthcare providers rarely perform stethoscope hygiene between patient encounters, despite its importance for infection prevention. Infection control guidelines from the U.S. Centers for Disease Control and Prevention state that re-usable medical equipment, such as stethoscopes, must undergo disinfection between patients.

"Stethoscopes are used repeatedly throughout the day and become contaminated after each patient exposure, so they must be treated as potential vectors of transmission," said Linda Greene, RN, MPS, CIC, FAPIC, 2017 president of APIC. "Failing to disinfect stethoscopes could constitute a serious patient safety issue simil

The report describes a quality improvement pilot project in which the authors observed stethoscope hygiene (alcohol swabs, alcohol gel, or disinfectant wipes) at the start of a four-week rotation for medical students, resident physicians, and attending physicians at a tertiary care academic teaching hospital. The baseline observation of stethoscope hygiene among staff found zero occurrences. The project also looked at hand hygiene, which can include alcohol gel or soap and water.

The team then sought to educate clinicians about the importance of stethoscope hygiene, and emphasized the expectation for clinicians to conduct stethoscope hygiene between each patient encounter. They also hinted that they might monitor during the follow-up phase. Despite this, the result was the same: zero occurrences of stethoscope sanitation.

The authors commented: "While the project had several limitations, it does highlight how rarely stethoscope hygiene is performed. Standard education may not be the answer to this problem. Behavioral and cultural modification to improve hand hygiene still remains a challenge, despite being studied in large randomized trials. Stethoscope hygiene implementation will need more consistent efforts to change culture and habits. We believe that stethoscope hygiene should be included in all hospital hand hygiene initiatives along with increased accountability."

Hand hygiene has traditionally received much more attention than stethoscope hygiene, but microbiology data show that stethoscope contamination after a single exam is comparable to that of the physician's dominant hand. Potential pathogens cultured from stethoscopes include *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Clostridium difficile*, and vancomycin-resistant enterococci.

Swiss study on stethoscopes carrying resistant bacteria

A Swiss study [2] found that stethoscopes were capable of transmitting potentially resistant bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA).

The team anticipated a poor result, based on the low rates of stethoscope hygiene that has been reported in studies elsewhere. "We anticipated low stethoscope hygiene rates, but were surprised that no one performed stethoscope hygiene, despite the fact that it is on the checklist for second-year medical students' final evaluation demonstrating competency in performing a complete history and physical at our institution." MEH

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Australian respirators protecting frontline staff from airborne contaminants

CleanSpace Technology, an Australian company that designs and manufactures next-generation respirators, has found itself at the forefront of the COVID-19 pandemic.

The proprietary technology, at the heart of all CleanSpace Respirators, was designed by ex-ResMed biomedical engineers. ResMed is a world leader in CPAP devices. The engineers had a vision to make respirators that delivered high level protection in an easy to use and comfortable system. The company has been successfully protecting workers in a wide range of sectors for the past ten years.

Until CleanSpace, the technology for masks had not changed for 30 years. Traditional devices were typically uncomfortable, hot and provided low protection.

"Our technology was seen as a game-changer, and still is. One of the main reasons people go unprotected is because of low compliance. If masks are uncomfortable or not quick and easy to put on then it simply doesn't get used," said CleanSpace Technology CEO, Alex Birrell. "CleanSpace is unique, it's a powered air purifying respirator (PAPR) without the heavy and cumbersome belt and hoses associated with PAPRs. Its simplicity with fresh air on the face, makes it far preferable to the N95 disposable."

The clear silicon mask is comfortable and soft and allows for easy communication. CleanSpace Respirators are operated using a simple one-button smart system. These features combined mean healthcare workers are more likely to wear them for a full shift.

Compared to disposable masks, CleanSpace Respirators offer more protection and are more economical as the cost of replacing disposables stacks up. Disposable masks are well-known for causing fogging and discomfort, leading to low compliance.

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Smart technology for respiratory protection

CleanSpace HALO is a PAPR system that houses smart technology in a revolutionary, compact design. CleanSpace delivers the highest protection in healthcare while being comfortable, quick to fit and easily integrated into any settings. The proprietary technology is AirSensit™ that is breath responsive to deliver filtered air on demand.

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- Lightweight 400g/0.9lb
- No belts or hoses
- Simple and fast to don
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- IP Rated 66 water tolerant
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CleanSpace HALO has won coveted awards, including the Red Dot Design Award and top honours in the Smart/Innovative product category, and the Occupational Health & Safety Platinum Respiratory Protection Award.

CLEANSPACE® STERI-PLUS

The respiratory innovation has the option to use with CleanSpace STERI-PLUS exhalation valve filter as the source control to filter wearer's exhaled air in sterile settings. Suitable for use in patient care settings and laboratory/pharmaceutical clean rooms. Developed specifically for sterile environments where filtering of the wearer's exhaled air is required.

CLEANSPACE® SMART APP

The latest launch is the CleanSpace SMART APP. Instant wireless connection to the CleanSpace HALO to check unit battery level, mask fit and more anytime at the beginning and during work shift. The CleanSpace Smart App can be downloaded free of charge from the Apple Store and Google Play Store. Healthcare staff can wear their Personal Protective Equipment (PPE) in confidence.

Customer Support: CleanSpace Technology, an Australian company based in Sydney, assists in product training, fit testing and instructions on maintenance and care with attentive customer support.

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Hospital privacy curtains can be source of MRSA

Without timely intervention, privacy curtains in hospitals can become breeding grounds for resistant bacteria, posing a threat to patient safety, according to research[1] published in the *American Journal of Infection Control (AJIC)*, the journal of the Association for Professionals in Infection Control and Epidemiology (APIC).

The longitudinal, prospective, pilot study tracked the contamination rate of ten freshly laundered privacy curtains in the Regional Burns/Plastics Unit of the Health Services Center in Winnipeg, Canada. While the curtains had minimal contamination when they were first hung, the curtains that were hung in patient rooms became increasingly contaminated over time – and by day 14, 87.5 percent of the curtains tested positive for methicillin-resistant *Staphylococcus aureus* (MRSA), a pathogen associated with significant morbidity and mortality. In contrast, control curtains that were not placed in patient rooms stayed clean the entire 21 days.

None of the rooms where the curtains were placed were occupied by patients with MRSA. Four curtains were placed in a four-bed room; four were placed in two double rooms; and two controls were placed in areas without direct patient or caregiver contact. Researchers took samples from areas where people hold curtains, suggesting that the increasing contamination resulted from direct contact.

"We know that privacy curtains pose a high risk for cross-contamination because they are frequently touched but infrequently changed," said Kevin Shek, BSc, the study's lead author. "The high rate of contamination that we saw by the fourteenth day may represent an opportune time to intervene, either by cleaning or replacing the curtains."

By day 21, almost all curtains exceeded 2.5 CFU/cm, the requirement for food processing equipment cleanliness in some locations, such as the United Kingdom.

"Keeping the patient's environment clean is a critical component in preventing healthcare-associated infections," said 2018 APIC President Janet Haas, PhD, RN, CIC, FSHEA, FAPIC. "Because privacy curtains could be a mode of disease transmission, maintaining a schedule of regular cleaning offers another potential way to protect patients from harm while they are in our care."

The study authors acknowledge the small sample size of this pilot study and recommend additional research to understand the clinical consequences of contaminated curtains. MEH

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FiltaMask medium concentration mask from Intersurgical

FiltaMask™ combines an oxygen delivery system with a filter media covering the exhalation ports. FiltaMask is intended for use on adult patients with respiratory infections who may be a source of aerosolised infectious pathogens and who also require supplementary oxygen.

Patients with respiratory infections have specific needs and yet pose a specific risk. Conventional oxygen masks can generate a plume of particles from their exhalation ports, which can travel a distance of 0.4 metres[1] [2] resulting in a potential risk.

FiltaMask is designed to reduce the risk to paramedics, hospital staff and visitors[3].

Features and benefits include:

- Incurved face seal providing improved level of fit and comfort
- On-chin positioning providing a better fit to a wider range of face shapes
- Low elastic position eliminating trauma to the patient's ears
- Integral filter media reducing the risk of escaping aerosols

An information sheet for the FiltaMask and the oxygen therapy training video can be found on the product pages of our website, and the product is part of the Infection Control range of options which may be used to help reduce the risk of cross contamination between patients and health care workers in the clinical environment. Visit our website to view the full range: *www.intersurgical.com/info/InfectionControl* MEH

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Making robots to enhance healthcare

Innovative Danish company Blue Ocean Robotics believes in "Robots for Humans". The company develops service robots to help improve efficiency of workflow, enhance quality of care and reduce healthcare costs. It is the first of its kind in the world – a robot venture factory.

Each of the company's three robots currently available on the market – UVD Robot®, GoBe Robot®, and PTR Robot® – is set up in its own subsidiary, a venture capital company focused on commercialization, global distribution and growth.

Three robots

The three robots help healthcare institutions to improve efficiency of workflow and protect patients and caregivers.

The UVD Robot is a fully autonomous disinfection robot that reduces the risk of Healthcare Associated Infections. It kills more than 99.99% pathogens including SARS-CoV-2 within minutes.

The UVD Robot uses concentrated germicidal UV-C light to destroy bacteria, viruses, and other harmful microbes, including SARS-CoV-2, on surfaces and in the air. It autonomously disinfects patient waiting rooms, wards, operating theatres and clinics.

With its pioneering technology, this iF Design Award-winning robot can navigate safely by itself while ensuring all relevant and contaminated surfaces are exposed with the right amount of UV-C light. The Danish invention is the only autonomous UV-C system in the world which disinfects the environment without putting caregivers at risk.

The GoBe Robot is a remote-controlled telepresence robot enabling doctors, specialists and other healthcare professionals to visit patients from remote locations. The robot has been greatly appreciated, especially during the pandemic, by helping people stay connected, without engaging in physical interactions, thereby minimising the risk of spreading infections.

The PTR Robot is a patient transfer and rehabilitation solution that can flexibly move around at hospitals, rehabilitation centres, and nursing homes. It helps individuals with impaired functions to be transferred and rehabilitated and relieves the strain on staff, releasing them from labour-intensive tasks, thus helping to optimize human resources. In addition, the PTR Robot lowers the risk of infection, because only one caregiver needs to be present to perform a patient transfer.

With the PTR Robot, patient transfer and rehabilitation become easier, more efficient and of higher quality for both patients and caregivers. By moving from passive patient lifts to active and sensing patient lifts, the patient rehabilitation is able to start much sooner.

Making our world more sustainable

"At Blue Ocean Robotics we embrace our vision to create Robots for Humans. Our approach is to leverage robotic technology to meet customer needs based on a profound understanding of our customers. With a presence in more than 70 countries, we strive to connect and partner with people and organisations everywhere to offer our service robots to benefit more healthcare organizations all over the world," says Claus Risager, CEO, Blue Ocean Robotics.

Claus Risager, CEO, Blue Ocean Robotics

> People use our robots to make their way of work more meaningful, rewarding and healthier. We improve quality-of-life and productivity. We make robots for humans.
> – Claus Risager, CEO, Blue Ocean Robotics

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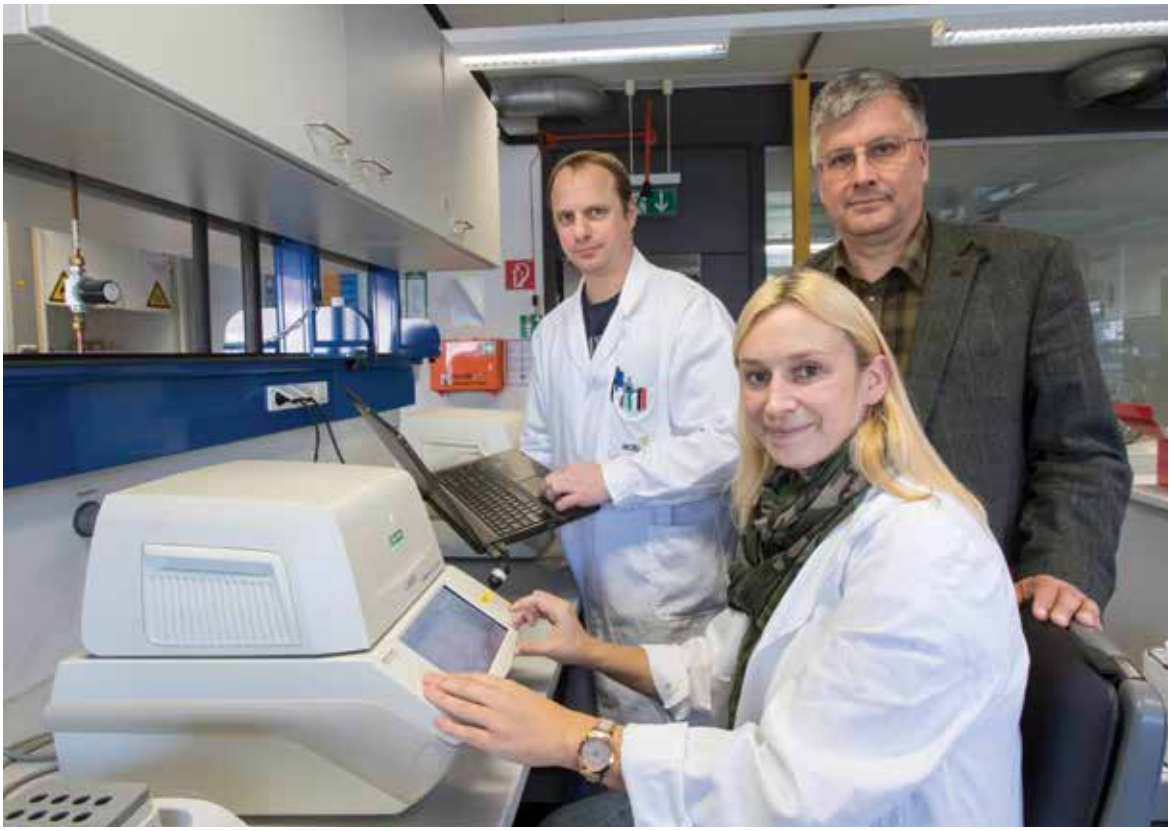

A team led by Christoph W. Sensen (right), head of the Institute of Computational Biotechnology at TU Graz, has succeeded in using biomarkers to diagnose sepsis 2 to 3 days before the first clinical symptoms appear.

New test marks major milestone for early detection of sepsis

Researchers at TU Graz's Institute of Computational Biotechnology with scientists from the Austrian Centre of Industrial Biotechnology (acib), the Medical University of Graz and CNA Diagnostics GmbH (Grambach, Styria) have identified biomarkers that can be used to diagnose sepsis with high accuracy two to three days before the first clinical symptoms occur.

The test could significantly increase the chance of survival of sepsis patients and lower the negative side effects for sepsis survivors.

The research is published in two papers: "Evaluation of host-based molecular markers for the early detection of human sepsis"[1] and "Circulating cell-free DNA is predominantly composed of retrotransposable elements and non-telomeric satellite DNA"[2] in the *Journal of Biotechnology*.

Classification algorithms

"Our team has identified 24 biomarkers with which bacterial- or fungal-induced sepsis can be detected at an earlier stage when compared to the currently used tests, using newly developed classification algorithms," explained Christoph W. Sensen, head of the Institute of Computational Biotechnology at TU Graz.

For their work, the bioinformaticians used sequencing data derived from anonymised plasma samples provided by the research groups led by Robert Krause, co-director of BioTechMed-Graz, and Peter Neumeister at the Medical University of Graz. The samples came from persons diagnosed with sepsis caused by bacteria or fungi, respectively, (in whose blood these pathogens were detected), influenza or lymphoma, as well as from healthy individuals. The sequencing data formed the basis for the development of the algorithms that were used to identify the markers, thus creating an unprecedented set of markers.

"This data set can be used to distinguish people in the early stages of sepsis and those with early clinical signs from healthy people and from people with other diseases," said Sensen. "Within the patient group for which the markers were developed, the diagnostic accuracy was almost 90% in the period from two days before the first clini-

cal signs until two days after diagnosis with the currently used diagnostic methods. In blind studies with patient groups that were not included in the marker development, the accuracy was still up to 81%."

With the help of this method, sepsis can therefore be diagnosed much earlier than with any other diagnostic method.

In the course of their studies, the researchers also developed a new form of quantitative real-time PCR (Polymerase Chain Reaction) test. These kind of tests are often used to amplify the DNA or RNA of an infectious agent in a blood, plasma or serum sample, allowing the direct detection of bacteria or fungi in sepsis patients. In view of the large number of possible pathogen species which might cause sepsis, this is only possible to a very limited extent for sepsis patients and is therefore very imprecise.

The newly developed test of the Graz group, on the other hand, focuses on the body's own signals, which are representative for the onset of sepsis for all bacterial and fungal cases. These can therefore be measured with much higher accuracy and also 2-3 days earlier than the direct detection of pathogens would allow.

Data from China shows that even Covid-19 patients with severe end-stage disease often had sepsis as a secondary disease. Sensen and his team are all the more interested in cooperating with biobanks such as BBMRI-ERIC and hospitals that are able to provide the team in Graz with plasma samples from Covid-19 patients. Because, according to Sensen: "On the basis of the sepsis early-detection research programme, we should be able to develop diagnostic tools for the faster identification of high-risk patients and a strategy for early intervention at the first signs of sepsis, which can be used in future pandemics to reduce the consequences of the infection for those affected." MEH

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Early-warning system for sepsis shown to improve survival rates, cut hospital stays

Emergency room patients who were flagged by an artificial-intelligence algorithm for possibly having sepsis received antibiotics sooner and had better outcomes, according to a peer-reviewed study conducted by physician-researchers at Case Western Reserve University and MetroHealth in the United States.

Their findings were published in *The Journal of Critical Care Medicine*[1].

"We showed that when providers had access to the early warning system, patients had better sepsis-related outcomes," said Yasir Tarabichi, an assistant professor of medicine at the Case Western Reserve School of Medicine and the study's principal investigator. "These patients got their antibiotics faster and had, on average, more days 'alive and out of hospital' than the group that had usual care. Taken together, the increase in survival rates and reduction in hospital stay improved with the implementation of the early warning system."

Over five months in 2019, the study's authors tracked nearly 600 patients who came into the emergency department. MetroHealth implemented an electronic health record-embedded early warning system for sepsis.

Patients 18 and older presenting to the emergency department were randomized to standard care for sepsis versus the pathway augmented by the early warning system.

Alerting physicians and pharmacists

The early warning system alerted both the physicians and pharmacists. This resulted in the patient who was flagged receiving antibiotics significantly faster than those patients whose alert was hidden, according to the study.

Collectively, those who received early antibiotics were measured to have more days alive and out of the hospital more than those in the standard care group.

Yasir Tarabichi, assistant professor of medicine at the Case Western Reserve School of Medicine.

"This study adds to the recent national discourse about sepsis early warning systems," Tarabichi said. "Recent studies assessed how that score worked in isolation, which is not reflective of how it would actually be used in the real world. We envisioned the early warning system's role as supportive to our healthcare team's response to sepsis. Most importantly, we assessed the utility of the tool with the highest quality approach – a randomized controlled study. In fact, our work stands out as the first published randomized controlled evaluation of a model-based early warning system in the emergency room setting." MEH

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New research recommends ceftazidime and amikacin for neonatal sepsis in LMICs

New research published in *The Lancet Infectious Diseases*, looks, for the first time, at the efficacy of various antibiotic treatments for neonatal sepsis in Low- and Middle- Income Countries (LMICs). The paper proposes alternative antibiotics for septic neonates which could drastically decrease new-born mortality.

The study[1], combining microbiology, genomic, epidemiological, pharmacodynamic and economic data, was done by an international network led by the microbiologists at the Division of Infection and Immunity, Cardiff, in collaboration with researchers at the University of Oxford.

This research, funded by the Bill and Melinda Gates Foundation, studied over 36,000 infants over seven countries, making it the largest study of its kind. Data was procured by Burden of Antibiotic Resistance in Neonates from Developing Societies (BARNARDS) [2], a project run by Professor Tim Walsh, which collected data across seven countries between April 2015 and March 2018. Prof. Walsh joined the University of Oxford in 2021 to help establish the Ineos Oxford Institute of Antimicrobial Research. BARNARDS collected data from Nigeria, Pakistan, Bangladesh, Rwanda, South Africa, Ethiopia, and India, allowing researchers to have a vast amount of data to analyse.

2.5 million infant deaths annually from sepsis

Neonatal sepsis causes an estimated 2.5 million infant deaths annually, with LMICs in sub-Saharan Africa and Asia having the highest mortality rates. These countries often have reduced access to resources such as laboratory facilities to assess what sepsis-causing pathogens are present, and to discover more about associated antimicrobial resistance.

The World Health Organisation recommends the use of ampicillin and gentamicin for the empirical treatment of neonatal sepsis. Whilst these may be effective in Higher Income Countries (HICs), there has long been speculation that they were less effective in LMICs due to different levels of antibiotic resistance and variation in common pathogens.

Ceftazidime and amikacin

Researchers discovered that some sites are already using different antibiotics to those endorsed by the WHO, due to high resistance against these antibiotics. Those prescribed the recommended combination of ampicillin and gentamicin had a survival rate of 75% over 60 days. Conversely, where those prescribed ceftazidime and amikacin had a survival rate of over 90% over the same time. Previous research found that globally an estimated 214,000 neonatal sepsis deaths are attributable to resistant pathogens each year, so changing the recommendations to ceftazidime and amikacin could drastically reduce this number.

These findings will lead to additional follow-up studies; not least, intervention studies related to treatment and ensure that sepsis is treated with appropriate antibiotics and Infection Prevention and Control practices.

The study also investigated the frequency of resistance to various antibiotics, which shows how frequently resistance may arise in susceptible bacteria against different antibiotics. Whilst varied antibiotics have been suggested for neonatal sepsis, this is the first study that has incorporated frequency of resistance data, allowing insight into how quickly a certain antibiotic could become redundant following extensive use, if selected as an alternative, allowing for more accurate recommendations on which antibiotics to be used.

Lead author Kathryn Thomson said: "Extremely high resistance (>97%) was found against ampicillin in Gram-negative sepsis causing isolates analysed from BARNARDS sites. Furthermore, only 28.5% of Gram-negative isolates were susceptible to at least one of the combined antibiotic therapy of ampicillin and gentamicin. While this may be a suitable empirical treatment for neonatal sepsis in high income countries, this data showcases that it is not an effective option for LMICs, who have different common pathogens and vastly increased resistance against these antibiotics. Many LMIC sites depend on recommended therapies, due to a lack of microbiology facilities to detect common species or resistance profiles. Therefore, further work is urgently needed to improve the sparsity of data in LMICs regarding prevalence and AMR in neonatal sepsis."

Follow-up studies will be undertaken by the newly formed Ineos Oxford Institute [3] at the University of Oxford, which will focus on new drug development for both human health and replacement of clinically relevant antibiotic use in agriculture, in addition to studying antibiotic resistance and ways of promoting more responsible and effective uses of antibiotics.

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Picture this – how medical printing adds marketing value to sterile healthcare organisations

Personalised medical imaging could increase patient satisfaction in the healthcare industry, says Javier Lopez, General Manager, Vertical Solutions, OKI Europe Ltd.

Simple measures, such as a friendly, personal service make all the difference for patients and customers in doctor visits, and if those measures were reflected in the medical results and documentation supplied to patients, medical organisations could benefit from increased confidence and patient satisfaction.

Businesses and healthcare organisations offering radiology services, such as cardiologists, gynaecologists, medical centres and others with X-ray facilities, must rely on medical imaging manufacturers to produce informative, easy to digest images. These essentially enable medical staff to recognise medical complications, assert the best course of action, and help patients understand complex issues.

Building patient trust

For medical imaging manufacturers, there is a clear opportunity to help those radiology-based organisations build trust with their patients while reducing time spent describing those complex issues. Presenting patients with sharp, high quality colour images will undoubtedly increase the ease of describing issues and treatments. For patients, this creates a friendlier more personalised and satisfying experience that will provide a valued level of comfort during an otherwise daunting experience.

However, the benefits of DICOM are only recognised by medical imaging manufacturers and medical staff.

Traditionally, DICOM image files are not easy to share with patients. While other image file formats such as JPEG, PNG or TIFF files are recognised and easily read by personal computers, DICOM files are not recognised by the standard home PC or laptop running Windows or MacOS operating systems. While medical organisations could share the images via email, the patient would require additional software in the form of a DICOM viewer to access the file and would need additional information in a separate text file to explain the image's findings.

Personalising the patient experience

This is where medical imaging manufacturers can provide a simple yet effective solution in the form of personalised booklets, providing a referenceable take-home source of information for patients, including post-diagnosis radiology report, and detailed, high quality images. To maximise their marketing value, the booklets should include relevant information alongside the images, explaining the findings of the scan or X-ray, or detailing proposed surgery in booklets that present visual renderings of potential cosmetic procedures.

Through variable data printing, the booklets can be further personalised with the patient's name, surname and date of birth clearly displayed on the front cover.

A patient requiring cosmetic surgery could be presented with an A3 colour booklet during the consultation stage, prior to deciding on whether to go ahead with the surgery. Having the personalised booklet with details including before and after images, will enable the patient to make an informed decision.

For patients requiring dental care, the personalised booklet will help keep them updated with the course of treatment, and new updated booklets during treatment will increase patient satisfaction by highlighting the patient's progress on the road to recovery.

Personalised booklets will also be of great value to expecting parents, presenting high quality ultrasound scans of the foetus that will provide a lasting keepsake which can be shared with friends and family members.

For medical organisations, there is opportunity to increase marketing value through increased satisfaction in a highly personalised experience. In turn, this creates a clear opportunity for medical imaging manufacturers that can provide high quality personalised booklets in a flexible range of formats and sizes that include sharp, colourful images that will inform and placate medical patients in an age of high expectations.

- Find out about OKI's unique DICOM embedded printers: *http://www.oki.com/me/printing/products/colour/dicom/index.html*
- OKI's medical health solutions: *http://www.oki.com/me/printing/services-and-solutions/industry-solution/healthcare/index.html*


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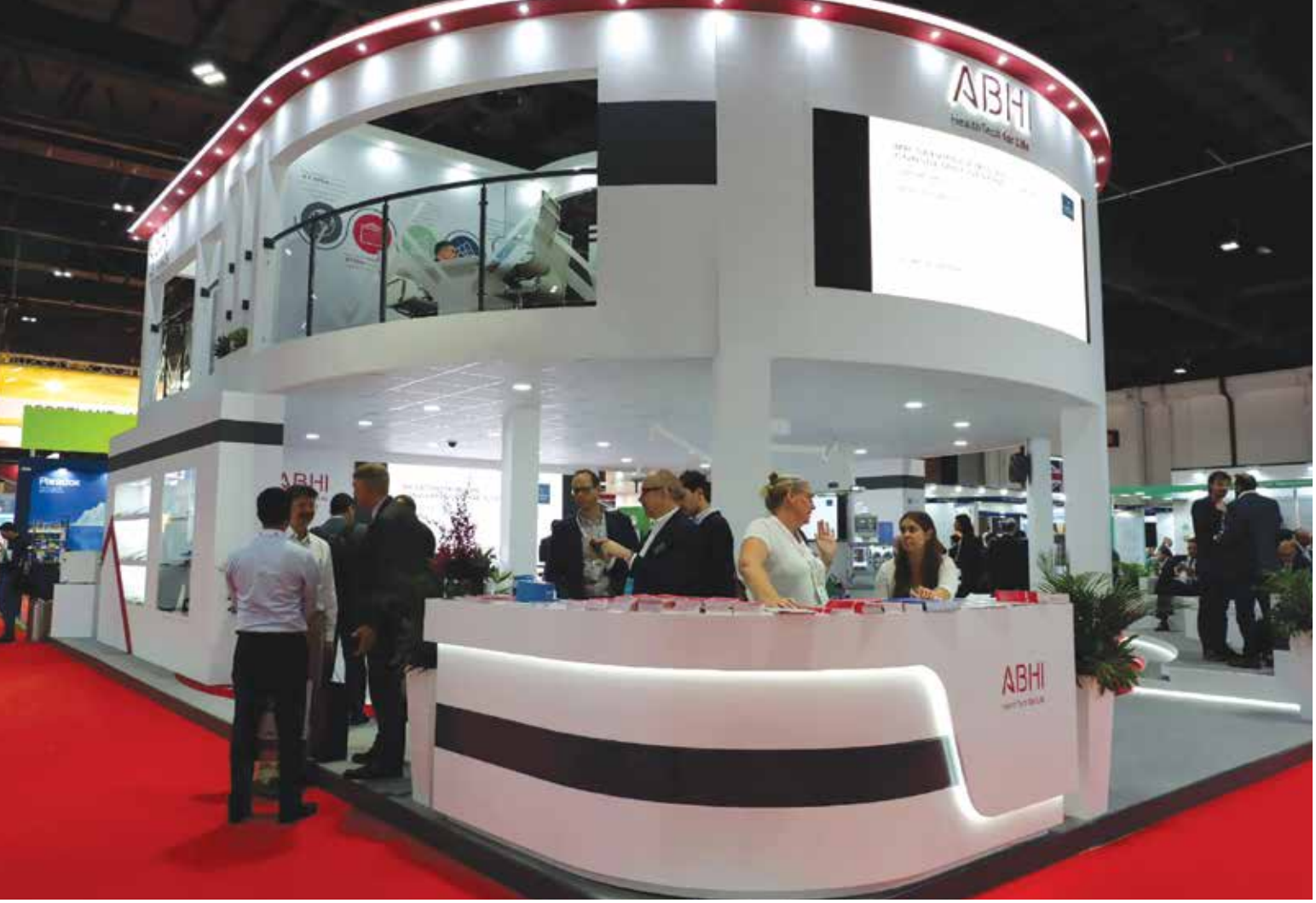

Newly launched UK Healthcare Pavilion offers the Middle East a gateway into the UK

By **Paul Benton**
Managing Director, International, at the Association of British HealthTech Industries

Over the last 16 months, travel has been heavily restricted due to the COVID-19 pandemic. However, the UK has come up with an innovative way of still connecting with global audiences.

The recently launched 'UK Healthcare Pavilion' <*http://ukhealthcarepavilion.com*> showcases the very best of UK healthcare and life sciences and has been developed to help Middle Eastern audiences learn more about the UK.

The platform provides news, insights, and interviews from a variety of key opinion leaders and policy makers, offering their views on topical subjects in the sector and showcasing the strengths the UK has to offer.

It includes a searchable directory of British companies providing overseas buyers with a simple and intuitive way to identify and engage with UK industry and healthcare organisations. Also listed are the UK's most prestigious private healthcare providers, highlighting why millions of people each year choose the UK as the place to access world class healthcare treatment.

The UK brand is well respected in the region, presenting an opportunity for UK innovators to support the major drivers in the Middle East, such as ageing populations, increased life expectancy, and sedentary lifestyles that lead to an increase in obesity, cancer and diabetes.

The virtual site will also support the UK's physical attendance at Arab Health 2022.

Arab Health now features 39 country pavilions, including the United Kingdom. Each year the show attracts over 106,500 visitors, generating US$824 million in business. For over 11 years the UK Pavilion has been organised by the Association of British HealthTech Industries (ABHI) – the leading industry association for the health technology sector in the UK.

The UK Pavilion is a vibrant hub of activity and the 2022 show is shaping up to be no different. The ABHI UK Pavilion will be located in Hall 2 and alongside the businesses exhibiting there is a busy programme of activity planned to showcase the very best of UK healthcare expertise. This will include live surgical demonstrations and product showcases; activities which always draw sizeable crowds to the pavilion.

Simulated operating theatre

Taking centre stage within the ABHI UK ▶

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For more information or to refer a patient to Great Ormond Street Hospital for Children, please contact our Gulf Office.

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Professor Shafi Ahmed performs virtual reality and augmented reality surgery

A demo at the ABHI pavilion at Arab Heatlh

pavilion will once again be the state-of-the art simulated operating theatre. It celebrates collaborations between healthcare providers, clinicians and healthcare technology companies, allowing visitors to watch Britain's best surgeons in action.

At the 2019 show, cutting-edge doctor Professor Shafi Ahmed performed virtual reality and augmented reality surgery on the UK Pavilion. Dubbed the "world's most watched surgeon" due to the live streaming of one of his surgeries, Professor Ahmed is just one example of the forward-thinking clinical experts the UK boasts, and ABHI are delighted to be hosting an equally impressive line-up this time around.

From the essential everyday products such as sticking plasters and surgical instruments, through to hip and knee implants, pacemakers and MRI machines, we are seeing products increasingly incorporate new fields of science, utilising data, artificial intelligence, robotics and nanomaterials. The industry is integral to the delivery of modern healthcare, supporting better patient outcomes and improved efficiencies within healthcare systems around the globe.

The sector has matured; devices, diagnostics and digital technologies have become increasingly sophisticated and treatment for the likes of cancer and stroke are now quicker and more targeted, supporting improved survival rates and life expectancy.

Digital health

The UK is leading the way, and this will be demonstrated by the number of Digital Health companies keen to exhibit at Arab Health.

As people live longer, we are experiencing a rise in chronic conditions, meaning we must predict, identify, diagnose and treat patients as early as possible to prevent, manage or halt disease progression.

There will always be a role for the hospital, but with the right use of technology we can start to look at delivering care in alternative environments, such as the home or workplace. Through monitoring and predictive algorithms, we are positioned to manage our own health, with added focus on prevention and protection, thus alleviating pressures on health systems.

It's not all apps, robots and telemedicine though. There are currently over 11,000 Digital Health employees working in the UK; applying their trade to infrastructure projects, such as hospital and GP information systems. Programmes that will equip services, such as the UK's NHS, to deliver on what is arguably its prize asset: its data. As the world's largest single health-payer system, the NHS has a rich data pool. Large datasets, utilised effectively, mean three things for care: it can be more predictable, more personalised and more precise.

When we consider the proximity of the world-class research institutions to the NHS, the country has a unique advantage over its global competitors and is highly regarded overseas.

International markets continue to view the UK as a 'stamp of quality', and vice versa, UK businesses are eager to demonstrate their credentials on the world-stage, to bring their technologies to new countries and support improved patient outcomes internationally.

As the economies of the region continue to diversify, with banking, tourism, commerce and real estate all growing, the demand for proven HealthTech has increased to support the burgeoning population and rise of expatriate workers. Unsurprisingly then, UK companies are well placed to support these trends and Arab Health continues to be the region's flagship show to demonstrate the latest capabilities.

Connect with the UK

The UK Healthcare Pavilion is now live, and we want visitors across the globe to really understand that the UK is open for business and ready to collaborate. To find out more, visit: *ukhealthcarepavilion.com*

We look forward to seeing you in person at Arab Health 2022. MEH

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The Royal Marsden Private Care opens new diagnostic and treatment centre in central London

The Royal Marsden has expanded its Private Care presence in London this year by officially opening a brand-new, research-led, diagnostic, outpatient and treatment facility in Cavendish Square.

Thanks to its reputation for specialist cancer treatment, patients from all over the world choose The Royal Marsden for their private care, including many who travel from the Middle East.

Located in the heart of London's world-renowned and most respected healthcare district, The Royal Marsden Private Care at Cavendish Square is a convenient location for patients visiting from the UK and further afield.

Housed within an Edwardian listed building and situated between Oxford Street and Harley Street, the new facility offers world leading standards of cancer care to patients in a calm, modern and reassuring environment.

Cavendish Square is a dedicated and comprehensive cancer diagnostic and treatment centre offering patients fast and direct access to The Royal Marsden's world-leading diagnostic and research active consultants who specialise in a full range of cancer services.

Professor Chris Nutting, Consultant Clinical Oncologist and Clinical Director of The Royal Marsden Private Care at Cavendish Square said: "The Royal Marsden sees and treats 60,000 NHS and private patients every year and Cavendish Square is an exciting new development that will allow our multidisciplinary teams to offer world class standards of cancer care to even more patients, diagnosing cancers faster with a targeted and personalised approach."

State-of-the-art diagnostic imaging

Home to a state-of-the-art diagnostic imaging suite offering MRI, CT, X-ray, ultrasound and mammography, experts are able to identify and diagnose cancers earlier across all the main tumour types with other clinical specialties offered including genetics, plastic surgery and reconstruction and pain management.

A one stop diagnostic service is offered at the centre where patients can expect to have an appointment booked following their initial enquiry, direct access to diagnostic services, same day scans and test results. The centre is also home to a minor procedure suite and a medical day unit with bespoke treatment bays, which will provide the highest level of patient-focused care for UK and overseas patients who are receiving some of the most advanced cancer treatments.

International Arabic Advocate service

An International Arabic Advocate service is available at the new centre which ensures that the needs of overseas patients are met, both from a cultural perspective and in terms of treatment and care. They work closely with a multinational team of eight interpreters who can offer one-to-one translations.

Strict infection control measures are also in place at Cavendish Square, with clear signs, temperature checks at the front door, regular COVID-19 testing for patients receiving treatment in the Medical Day Unit, mask wearing and limits on numbers in the centre to allow for social distancing. MEH

The Royal Marsden

The Royal Marsden is ranked as one of the leading cancer centres in the world and The Royal Marsden Private Care offers an award-winning service – having won the LaingBuisson Best Hospital Award in 2020 for the third time. It's one of the few private hospitals to have been rated Outstanding by the Care Quality Commission.

Private patients are offered additional benefits including hotel–style service, single en-suite rooms and direct access to their treating consultant.

on the WEB The Royal Marsden Private Care at Cavendish Square
https://www.royalmarsden.nhs.uk/cavendish-square

Watch on YouTube
Welcome to The Royal Marsden Private Care at Cavendish Square
https://youtu.be/pvXV-NyOoJ4

Mayo Clinic Healthcare in London provides tailored healthcare programs

Mayo Clinic Healthcare in London, is an outpatient clinic that provides personalized health care ranging from preventive screenings and tailored wellness plans to second opinions for complex diagnoses, as well as several medical specialties including cardiology, gastroenterology and pulmonary medicine.

The clinic, located at 15 Portland Place in the Harley Street Medical Area of London, also serves as a gateway to Mayo Clinic's 4,000 physicians in the United States and a hub for virtual visits for patients who otherwise might need to travel to Mayo in the U.S. for care. Mayo Clinic Healthcare's wellness plans include genetic testing and programs tailored to corporations and executives.

Consultants at Mayo Clinic Healthcare are the top in their fields. They will take the time to listen to your patients, collaborate with you and build a relationship resulting in expert care tailored to their needs.

"Mayo Clinic is the place to go for definitive answers. We excel at helping people live their healthiest lives and in caring for patients with serious, complex or unsolved medical needs," says G. Anton Decker, MBBCh, president of Mayo Clinic's international activities. "Anyone who goes to Mayo Clinic Healthcare has access to all of Mayo and its deep expertise. We aim to serve as a trusted resource and partner to patients and health care organizations across the U.K. and world."

The teams at Mayo Clinic Healthcare

The cardiology team at Mayo Clinic Healthcare includes:

Elijah Behr, M.D., whose areas of focus include heart rhythm disorders, genetic heart disease, cardiomyopathy and sudden cardiac arrest.

Sanjay Prasad, M.D., whose special areas of expertise include heart failure, cardiomyopathy, coronary artery disease and high blood pressure.

Gosia Wamil, M.D., Ph.D., whose focus areas include heart failure, hypertension, heart valve abnormalities and inherited cardiomyopathies.

Gastroenterologists include:

James East, M.D., whose areas of interest include endoscopy, stomach cancer, gastroesophageal reflux disease, irritable bowel syndrome, anemia and swallowing disorders.

Bobby Prasad, M.D., whose focus areas include irritable bowel syndrome, gastric cancer screening, gastroesophageal reflux disease, obesity, pancreatic and biliary disease, and small intestinal bacterial overgrowth.

In pulmonology, the areas of focus of John Costello, M.D., include asthma, chronic obstructive pulmonary disease, COVID-19-related lung issues, shortness of breath, and early detection of lung cancer.

The clinic's physicians also include Kevin Fleming, M.D., an expert in personalized health care, wellness and chronic, age-related and stress-related conditions, and Sandeep Kapur, M.B.B.S., who has special interests in chronic disease management, complex care coordination and medical technology.

Mirroring the patient experience at Mayo Clinic, ranked No. 1 hospital in the U.S. for the sixth consecutive year by *US News and World Report*, first-time patients to Mayo Clinic Healthcare in London can expect a pre-planned itinerary, with most of the needed tests performed and analyzed before they see their specialist.

The clinic offers a range of diagnostics including colonoscopies and other cancer screenings, ultrasounds, magnetic resonance imaging (MRI), X-rays and echocardiograms.

- To learn more or refer a patient, visit: *mayoclinichealthcare.co.uk*

or email: *info-ukmch@mayo.edu*

Breaking barriers in cancer care: Working in the forefront of precision radiotherapy to improve patient experience

Rutherford Health was the first to introduce high energy proton beam therapy to the UK and is the only centralised network in the world equipped to provide seamless patient transfer across its proton therapy centres. With every step we strive to enhance patience experience and have diagnosed or treated well over 6,000 cancer patients from across the UK and internationally.

Our state-of-the-art technology, learning opportunities and impressive clinics have attracted renowned oncologists to join us from across the UK. Through our relationship with the University of Pennsylvania, one of the world's leading providers of PBT, we have trained more than 60 oncologists in the delivery of the treatment. The Rutherford is open to collaboration opportunities internationally with clinics and clinicians, to offer its services from the UK for international patients.

Bespoke risk assessments

The Rutherford has developed bespoke risk assessments and procedures for international patients arriving during the pandemic. Our staff has worked hard to guarantee patients a safe environment while remaining open throughout the pandemic. Our concierge services have been appreciated as reassuring and comfortable while complying to government quarantine rules. Of course, the pandemic has not slowed the onslaught of the threat of cancer for people around the world and the commitment to providing high quality, innovative care must be steadfast.

Our commitment to offering the best possible patient experience has led us to form Rutherford Panel Reviews through which oncologists and clinical teams assess the optimum treatment plan for each patient. PBT has proved to be an excellent treatment for hard-to-treat tumours as it reduces damage to surrounding healthy tissue.

Proton beam therapy

As the leading provider of proton beam therapy in the UK and one of the largest in Europe, Rutherford Health has launched the 'Rutherford Proton Decision System' which facilitates best practice among oncologists by making dual planning easy, efficient and inexpensive. Oncologists are able to secure a rapid comparison of treatment benefit from protons versus other radiotherapy modalities at the click of a button. The fully automated modelling system can take diagnostic images and weigh up the dosing advantage to organs at risk within a few hours without the need for a planning CT.

Partnerships and training

At Rutherford we were extremely proud to recently announce a new partnership with OncoDNA, a genomic and theranostic company specialising in precision medicine. The partnership will provide Rutherford cancer patients with access to the latest biomarker testing developed by OncoDNA and support the accessibility and development of these tests within the UK. This will help oncologists and patients identify the most effective therapy for them, as well as monitor disease progression and therapeutic response.

As well as providing wider access to proton therapy for patients from across the world, we are also looking to the future and helping train the next generation of clinicians in the provision of PBT through our strong commitment to research, education and training.

We are partnering with a number of external professional bodies, R&D committees, universities, local clinics and NHS departments to develop our research portfolio and develop proton teaching modules, clinical training, learning and research opportunities. Our vision is to continuously enhance the rate of translation of research and innovation into healthcare in order to create a self-improving and high-quality health system, which is also sustainable.

Demand for proton beam therapy across the world is increasing continually. Rutherford is proud to have created a class-leading network of centres in the UK and look forward to many years more of offering effective treatment to those who need it most.

- For more information, visit: *www.therutherford.com/international*

The UK's first Proton Therapy network

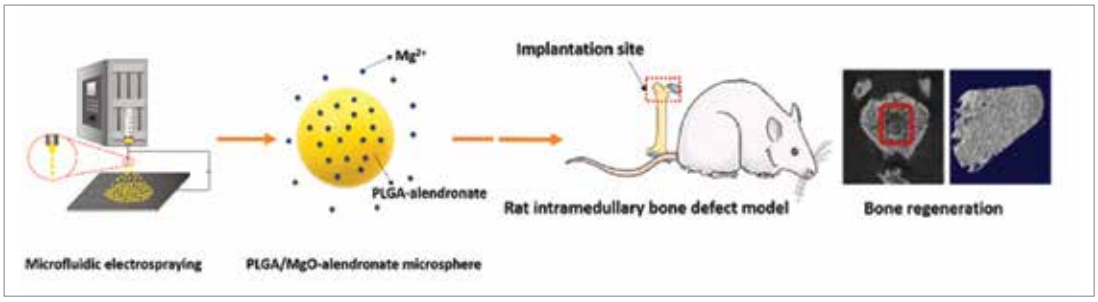
The Rutherford Cancer Centres are **welcoming international patients** - with collaboration opportunities for clinicians and international pathways.

- Leading oncologists and specialised clinical team
- Premium concierge service
- COVID-safe clinical environment
- Virtual consultations with interpreters

Rutherford Cancer Centres

Contact:
Krisha Verma, Global Business Development Manager
krisha.verma@therutherford.com
+44 (0)7377 535 214 | therutherford.com/international
Connect with us at

All our registered centres undergo a registration inspection by the healthcare regulators of each country to ensure that the quality and safety of services meet the required standards of care. In addition, ongoing inspections are undertaken, and where these have taken place, full reports are made available on our website.



This illustration shows how the magnesium-loaded microspheres generate favourable osteoimmune conditions and support bone regeneration.

Magnesium ions injected directly into compromised bone accelerate bone regeneration

Bone-regenerating treatments are in high demand due to the ageing population. Increasingly, the orthopaedic biomaterials used to support these treatments are designed to be "immunomodulatory", i.e., guide the body's inflammatory response. They do this by encouraging macrophages – a type of white blood cell that surrounds and kills microorganisms – to adopt new roles based on signals and stimuli in their microenvironment. This approach has proved effective for developing new bone and for encouraging existing bone to accept artificial implants.

Magnesium is a mineral that not only helps to maintain normal nerve and muscle function, importantly, it also supports a healthy immune system and helps bones to retain their strength. Typically, it is given to orthopaedic patients as an oral supplement.

In a recent study [1] published in the KeAi journal *Bioactive Materials*, a group of researchers from Hong Kong and mainland China, trialed a new immunomodulatory approach which replaces that magnesium supplement with an injection – directly into the compromised bone – of custom-made, polymer microspheres that control the release of magnesium ions.

According to one of the study's authors, Kelvin Yeung, Professor in Orthopaedics and Traumatology at the University of Hong Kong, the team tested the hypothesis by using two different animal models.

"In one, we injected the microspheres containing the magnesium (Mg) ions. In the other, we injected microspheres without the Mg loading. In the two weeks following the injections, faster bone regeneration rates were observed in the first group."

Professor Young believes that one of the benefits of magnesium is that it encourages the immune system and skeletal system to work in tandem to support in situ healing.

He explains: "The biomaterial development for bone repair usually involves the direct activation of osteoprogenitor cells – stem cells located in the bone that play a key role in bone repair and growth. However, the 'conversation' that takes place between the skeletal and immune systems during the bone healing process has often been overlooked."

Professor Yeung points to the fact that the healthy functioning of immune cells significantly impacts bone regeneration and remodelling. "In this study, we have drawn on the properties of biomaterials that can tailor the plasticity of macrophages. For instance, our custom-made, magnesium-loaded microspheres created a favourable, anti-inflammatory, osteoimmune environment."

> Bioactive metal ions working as minerals have huge potential in bone or other musculoskeletal tissue regeneration.

He adds: "Bioactive metal ions working as minerals have huge potential in bone or other musculoskeletal tissue regeneration. We hope our results can convince scientists to explore the potentials of these ions beyond bone healing." MEH

References

[1] doi: *https://doi.org/10.1016/j.bioactmat.2021.01.018*

Researchers use hot nano-chisel to create artificial bones in a Petri dish

A holy grail for orthopaedic research is a method for not only creating artificial bone tissue that precisely matches the real thing, but does so in such microscopic detail that it includes tiny structures potentially important for stem cell differentiation, which is key to bone regeneration.

Researchers at the NYU Tandon School of Engineering and New York Stem Cell Foundation Research Institute (NYSF) have taken a major step by creating the exact replica of a bone using a system that pairs biothermal imaging with a heated "nano-chisel".

In a study: "Cost and Time Effective Lithography of Reusable Millimeter Size Bone Tissue Replicas with Sub-15 nm Feature Size on a Biocompatible Polymer," which appears in the journal *Advanced Functional Materials*[1], the investigators detail a system allowing them to sculpt, in a biocompatible material, the exact structure of the bone tissue, with features smaller than the size of a single protein – a billion times smaller than a meter. This platform, called, bio-thermal scanning probe lithography (bio-tSPL), takes a "photograph" of the bone tissue, and then uses the photograph to produce a bona-fide replica of it.

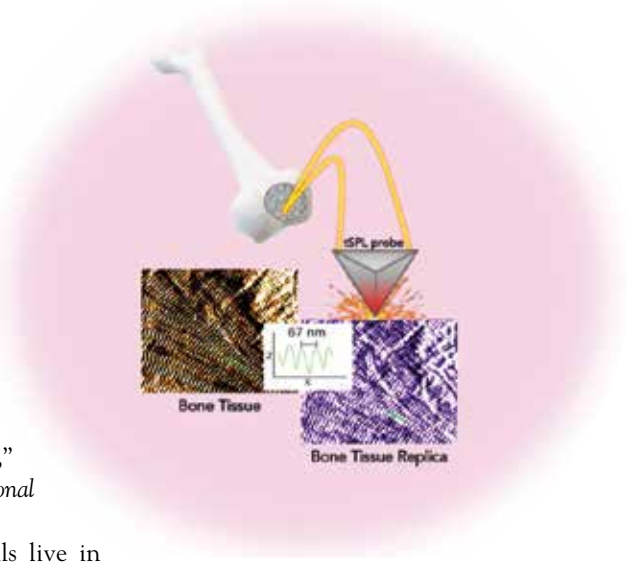
The team, led by Elisa Riedo, professor of chemical and biomolecular engineering at NYU Tandon, and Giuseppe Maria de Peppo, a Ralph Lauren Senior Principal Investigator at the NYSF, demonstrated that it is possible to scale up bio-tSPL to produce bone replicas on a size meaningful for biomedical studies and applications, at an affordable cost. These bone replicas support the growth of bone cells derived from a patient's own stem cells, creating the possibility of pioneering new stem cell applications with broad research and therapeutic potential. This technology could revolutionize drug discovery and result in the development of better orthopaedic implants and devices.

The research, "Cost and time effective lithography of reusable millimetre size bone tissue replicas with sub-15 nm feature size on a biocompatible polymer," appears in *Advanced Functional Materials*.

In the human body, cells live in specific environments that control their behaviour and support tissue regeneration via provision of morphological and chemical signals at the molecular scale. In particular, bone stem cells are embedded in a matrix of fibres — aggregates of collagen molecules, bone proteins, and minerals. The bone hierarchical structure consists of an assembly of micro- and nano- structures, whose complexity has hindered their replication by standard fabrication methods so far.

"tSPL is a powerful nanofabrication method that my lab pioneered a few years ago, and it is at present implemented by using a commercially available instrument, the NanoFrazor[2]," said Riedo. "However, until today, limitations in terms of throughput and biocompatibility of the materials have prevented its use in biological research. We are very excited to have broken these barriers and to have led tSPL into the realm of biomedical applications."

Its time- and cost-effectiveness, as well as the cell compatibility and reusability of the bone replicas, make bio-tSPL an affordable platform for the production of surfaces that perfectly reproduce any biological tissue with unprecedented precision.



This study replicates with sub-15 nm resolution the bone tissue structure in a biocompatible material, over large areas, by scaling up and adapting to cell studies thermal scanning probe lithography. By introducing cell-culture compatible reusable materials and novel writing strategies, we increase throughput and reduce cost by orders of magnitude, thus opening up unprecedented possibilities for pioneering new stem cell studies and biomedical applications.

"I am excited about the precision achieved using bio-tSPL. Bone-mimetic surfaces, such as the one reproduced in this study, create unique possibilities for understanding cell biology and modelling bone diseases, and for developing more advanced drug screening platforms," said de Peppo. "As a tissue engineer, I am especially excited that this new platform could also help us create more effective orthopaedic implants to treat skeletal and maxillofacial defects resulting from injury or disease." MEH

References

[1] doi: *https://doi.org/10.1002/adfm.202008662*
[2] The NanoFrazor: *https://heidelberg-instruments.com/product/nanofrazor-explore/*

Northwestern Medicine impacts lives

Northwestern Medicine is an integrated academic health system anchored by Northwestern Memorial Hospital, a top 10 hospital in the U.S. and the No. 1 hospital in Chicago and Illinois, as ranked by the *U.S. News & World Report* 2021 – 2022 Honor Roll of America's Best Hospitals. Northwestern Medicine provides patients with access to world-class medical care, delivered in state-of-the-art facilities offering leading-edge treatment options.

Northwestern Medicine has 11 hospitals, more than 200 outpatient clinical sites, more than 33,000 employees, and more than 4,000 practicing physicians on the medical staff.

Orthopaedic Surgery Center of Excellence

Northwestern Memorial Hospital has one of the top-ranked Orthopaedics programs in the U.S. according to *U.S. News & World Report*, 2021 – 2022. Northwestern Medicine Center for Comprehensive Orthopaedic and Spine Care (CCOSC) at Northwestern Memorial Hospital is a premier destination for musculoskeletal services. Featuring state-of-the-art imaging and operating room facilities, our diverse team of medical specialists includes orthopaedic surgeons, neurosurgeons, primary care sports medicine physicians, physiatrists and radiologists. This fosters an ideal collaborative environment to help ensure accurate diagnoses, better patient outcome and streamlined care.

The centre specializes in hip and knee replacement offering advanced care with systematic approach designed to ensure each patient's condition is treated in the most effective manner possible. Within a caring environment, the dedicated team treats the most complex adult hip and knee issues, striving to optimize patient satisfaction, improve outcomes, minimize complications and enable shorter hospital stays.

Feature Care Areas of Orthopaedics

- Joint Replacement Surgery
- Sports Medicine
- Trauma
- Orthopaedic oncology
- Foot and Ankle
- Hand, Wrist and Elbow
- Geriatric Fractures
- Osteoporosis

The centre also specializes in spine surgeries, including correction of spine deformities and complex revision surgeries offering a unique model for spine care where orthopaedic surgeons and neurosurgeons collaborate in the same clinic in order to meet each patient's individual needs.

The Spine Center at Northwestern Memorial Hospital uses the latest surgical techniques and technology, including regenerative- and nanotechnology-based bone graft substitutes, computer navigated surgery, minimally invasive spine surgery and stereotactic radiosurgery for the management of:

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- Spine fractures
- Spinal stenosis
- Spinal deformity
- Spine tumours and cancer of the spine
- Sports-related spine injuries
- Rheumatologic and autoimmune disorders of the spine

Northwestern Medicine International Health

Northwestern Medicine International Health helps to connect patients and caregivers to the most advanced medical care at Northwestern Memorial Hospital and its affiliates, while driving innovation and growth in hospitals and clinics worldwide.

With a dual focus on the patient and supporting the global development of healthcare, Northwestern Medicine International Health works to create outstanding patient care worldwide.

Serving patients and caregivers from over 100 countries, those coming to Northwestern Medicine for treatment are welcomed with personal support and assistance throughout their healthcare journey.

Orthopaedic physician pioneer

Terrance D. Peabody, MD
Chair, Department of Orthopaedic Surgery, Northwestern University Feinberg School of Medicine

Edwin Warner Ryerson Professor of Orthopaedic Surgery, Feinberg School of Medicine

Dr. Peabody is an orthopaedic oncologist. His research and clinical expertise focus on the treatment of benign and malignant bone and soft-tissue tumours, including limb salvage surgery and functional restoration for adult and paediatric patients. Dr. Peabody belongs to the American Academy of Orthopaedic Surgeons, the American Medical Association and the North American Musculoskeletal Tumor Society, where he has served as president.

Dr. Peabody earned his medical degree and completed his residency and internship at University of California-Irvine. He completed a fellowship at University of Chicago. Dr. Peabody is board-certified by the American Board of Orthopaedic Surgery.

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Northwestern Medicine is proud to be Chicago's premier academic medical system. Our integrated healthcare system includes five of America's "Best Hospitals," one of which is a top 10 hospital in the U.S. with 10 nationally ranked specialties and a nationally ranked medical school. Together we provide exceptional care to patients across Chicagoland—and the world.

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Pharmacogenomics: Engaging and uniting teams is key to advancing care

Drug therapy cannot be viewed as one-size-fits-all

More than 90% of individuals carry at least one potentially actionable pharmacogenetic variation[1], giving pharmacogenomics (PGx) growing importance in clinical decision support. Additionally, non-European populations carry a greater frequency of variants, many not yet captured by current PGx allele definitions, that are predicted to be harmful[2].

Without knowledge of pharmacogenetic factors, improper drug selection and administration can result in reduced therapeutic response or serious adverse drug reactions (ADRs), the latter of which is estimated to be the sixth leading cause of death worldwide.

Some examples of clinically significant genomic variants influencing mediation therapy include:

- Reduced cytochrome P450-mediated opioid metabolism, which could lead to excessive respiratory depression and death
- Effects of decreased TPMT metabolism on thiopurine treatment, which could predispose to serious blood toxicities
- Effects of reduced liver uptake of simvastatin, which could lead to significant muscle damage. However, preemptive pharmacogenomics testing is still emerging as best practice, translating genotypes into actionable phenotypes.

While PGx is a subject that intrigues many clinicians, transitioning it into a practical component of the diagnostic and treatment routine will require access to consistent, evidence-based PGx data and a team-based approach involving healthcare professionals from prescribers, pharmacists, and nurses, to lab technicians and those managing benefits.

Awareness: Engaging clinicians on how, when, and why to use PGx

Clinicians are aware of the impact of genetic factors on drug therapy, but don't always feel prepared to implement that information into their daily practice:

- A survey of 285 physicians from five of the Implementing GeNomics In practiCe (IGNITE) clinical trial network sites revealed that most physicians felt unprepared to use genetic information in their practice and believed steps needed to be taken to develop tools and training for physicians. Those with five years or fewer in practice were more likely to report that their training had prepared them to care for genetically high-risk patients compared with those with over five years' experience (41% vs 25%)[3].

Recognizing the need to help clinicians understand the importance of pharmacogenomics early on, Wolters Kluwer has curated clinically relevant PGx content since 2003 and is widely recognized as a leader in providing extensive and actionable clinical guidance on important PGx interactions.

This content covers the prevalence of genomic variants in patient populations, the utility and interpretation of laboratory testing, and subsequent clinical recommendations[4]. For clinicians working at the point of care, drug-gene summary monographs provide testing and patient management recommendations from authoritative clinically actionable guidelines[5].

When more comprehensive research data is required, clinicians need access to in-depth pharmacogenomics content.

To accommodate this need, Lexicomp® core drug monographs contain links to detailed, extensively referenced gene-based monographs which provide an overview of the population incidence of the most common or clinically important gene variations and the relevance to drug response. Online and mobile pharmacogenomics drug references also offer benefits outside of the direct care arena, providing valuable genetic research information for medical affairs departments and R&D and important safety context for healthcare benefits businesses, which have been slowly expanding coverage for gene testing over the past decade.

Alerting: Getting the right data into clinicians' hands

Interviews with general practitioners in the United Kingdom revealed that most saw value in PGx but felt there were many obstacles to primary care embracing it in everyday practice, including educating clinicians, cost effectiveness, and incorporating the information into electronic health records[6].

Currently, integrating genomic data and clinical decision support tools into electronic health records is one of the largest barriers to more widespread adoption of

preemptive pharmacogenomics testing. The Electronic Medical Records and Genomics (eMERGE) Network is leading the way in piloting and implementing PGx and integrating the results within EMR and clinical decision support systems in the U.S.

A survey of 10 of the sites within the network reported that delays in the process were not stemming from the pharmacogenomics testing itself, but more likely to be related to health information technology, among other logistical issues[7].

Pharmacogenomic data embedded within an EMR, clinical, or pharmacy system serves as a powerful tool for getting vital data before the clinicians' eyes at the right time in the decision-making process. A smartly designed system with evidence-based data can help prevent high-risk patients from being exposed to "dangerous" drugs due to their genetic predispositions. Such a system would provide appropriate dosage recommendations based on relevant genetic variance and would only alert on known risky combinations, optimizing the alerts that fire in the system.

Wolters Kluwer looks to help clinicians overcome some of those technological barriers by infusing Medi-Span® embedded drug data modules with evidence-based and actionable pharmacogenomic data that aligns with respected Lexicomp content and by providing clear guidance and best practices on how to optimize and apply relevant pharmacogenomics data.

Alignment: PGx works best when care teams work together

With resources available at the point of care and in the EMR, the final element to successful adoption of PGx is human. Many clinical and non-clinical personnel need to collaborate, communicate, and align resources to fully integrate PGx into an organization's regular practice.

As well as systems or infrastructure to support these needs:

- IT/EMR set-up and maintenance of appropriate PGx screening and alerts
- Process for documentation of relevant medication and family histories
- Billable-service provider
- Mechanism for reporting results

Wolters Kluwer's investment in pharmacogenomics content seeks to benefit all members of this multi-disciplinary care team by providing solutions that centralize and standardize delivery of this content to the right provider, at the right time, providing insight and context relevant to the right patient.

Conclusion

As more clinicians adopt, adapt, and learn about personalized medicine and pharmacogenomics, it will only increase medication safety in the future. Peter Bonis, MD, Chief Medical Officer for Wolters Kluwer Clinical Effectiveness, notes that "scientific advances continue to offer new options for medications that have the potential to improve and save lives. The affordability of these drugs has spawned vigorous public debate. Equally important – but less in the public dialogue – are efforts to ensure that drugs are used both wisely and safely. Pharmacogenomics represents one such approach toward precision prescribing."

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Keeping gold cold: Securing, preserving and maximizing the value of Covid-19 vaccines

By **Tarek Kassab**, MD, MSc Biomed Eng, and **James Waterson**, RN, M.Med.Ed.
Becton Dickinson, Medical Affairs

Vaccination has been lauded as one of the greatest achievements of modern civilization. Childhood infectious diseases that were commonplace less than a generation ago are now increasingly rare, and one of the greatest examples of the world uniting to advance health was the campaign to eradicate smallpox via mass-vaccination. Smallpox is practically forgotten now, despite the fact that the disease blighted humankind for centuries and carried a 30% fatality rate.

The Covid-19 pandemic, and the race to repeat the achievements of the smallpox campaign with initially limited supplies of vaccines, requires that we protect, track, utilize absolutely 'every drop' of vaccine available to us. The speed at which these vaccines have come to market also places a responsibility on us to produce actionable Real-World Evidence (RWE), as we deal with virus mutations and variants, and heterogenous population responses.

Vaccine security

Medical device technology is central to the successful rollout, maintenance, and monitoring of high-quality vaccination programs. As soon as a vaccination clinic or health centre receives a supply of vaccine the issue of security and storage arises. There are already news reports of an emerging black market for Covid-19 vaccines and of 'mafias' looking to obtain these scarce resources. The core vaccines available also require judicious temperature control and an effective tracking of thawing, refrigeration, removal from refrigeration, time spent at room temperature, and documented delivery to the patient.

Vaccine tracking

Technology can assist in ensuring safety and maximized usage of all supplies as medical-grade 'intelligent' refrigerated units integrated to Automated Dispensing Cabinets ensure accurate temperature control and create alerts for any deviation. They can also track a vaccine vial's location through simple scanning processes and connected inventory systems. Distinct secure compartments within an integrated-intelligent fridge add the required security and access-privileges via codes or biometric recognition to enable tracking of the vial and alerting to any discrepancies in count.

The Institute for Safe Medication Practices (ISMP) suggests that vaccine centres and pharmacies carefully consider the timeframe for vaccine stability at room temperature and patient scheduling to minimize waste. A date and timestamp for removal of vials from the refrigerator is extremely valuable for both keeping this safe workflow going and for auditing. Verification of the doses needed per day from the vaccination centre to central cold-chain suppliers on a frequent basis – particularly in the case of those requiring ultra-cold temperatures – is also advocated by ISMP to prevent waste.

Medical grade, intelligent and inventory integrated, refrigeration units can also assist in this, as well in the allotment of doses based on footfall trends through the centre. As the currently available vaccines all require a second-dose, this is particularly important for Group Purchasing Organizations that service many vaccine distribution centres and need to know regional or national stock levels.

Real World Evidence

Vaccine usage data, when integrated into Electronic Medical Records (EMR), also has the potential to be a real asset for rapid review of appropriate and prudent usage. The societal value of reducing medication wastage has never been so well represented as it has been by the current crisis. Equally this data, as it can tie vaccine type, lot, vaccination date, and location to patient demographics from the EMR, assists in the gathering of Real World Evidence by specialized, effective tracking technology that has already shown an impact on the tracking of Antibiotic Microbial Resistance. This technology and knowhow are now being applied to help track and share Covid-19 insights with hospitals and public health agencies across the United States.

Given how potentially fragile an adequate global supply chain of vaccines is, utilization and protection are required in order to ensure these vital resources are shared as effectively and equably as possible. High rates of vaccine waste could potentially lead to extending the pandemic unnecessarily and make our societies vulnerable to continuing waves of infection. MEH

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Abbott introduces Jot Dx insertable cardiac monitor for difficult-to-detect abnormal heart rhythms

Abbott has recently launched in the US their Jot Dx, the company's latest insertable cardiac monitor (ICM). The Jot Dx ICM gives clinicians and hospitals control of how they manage the flow of information through a unique feature to view either all abnormal heart rhythm data or to simplify which irregular heart rhythms are recorded with a 'key episodes' option. This technology allows for accurate remote detection of cardiac arrythmia in patients. Jot Dx ICM is supported by SyncUP, a personalized service that delivers one-on-one training and education to help patients get connected and stay connected to their ICM.

To better help physicians diagnose their patients' abnormal heart rhythms, Jot Dx ICM continuously monitors patient cardiac rhythms 24/7 and connects directly to myMerlin, a downloadable mobile app that transmits data in real-time to both the clinician and patient.

For the first time in an ICM, Jot provides clinicians increased control over patient monitoring, with an option to toggle between viewing only three key episodes or all episodes depending on individual patient needs to make an accurate diagnosis. This functionality reduces overall data burden. For example, for every 100 patients, it can save clinic staff up to 120 hours per month in reviewing electromyogram (EGM) transmissions, while also providing the flexibility needed to find hard-to-detect arrhythmias.

In addition to improving workflow for physicians, clinics and health systems monitoring patients with potential abnormal heart rhythms, Abbott is also improving how patients interact with their device. A key element in the setup of Jot Dx ICM and the myMerlin mobile app is the new SyncUP support service, which Abbott offers on select products as part of its connected care portfolio. With SyncUP, an Abbott support expert will enrol a patient with a newly implanted device in the system, orient them through getting to know their new heart monitoring device and confirm connection to the myMerlin app.

SyncUP is designed to educate people about the technology from the comfort of home, which has been shown to increase information retention and encourage compliance, and helps reduce in-clinic burden. Currently, the process to ensure a patient is connected is conducted in the healthcare facility directly following the device's implant, which prolongs the stay for the patient. SyncUP also support patients with Abbott's implantable defibrillator, Gallant ICD.

- For more information, visit: *https://www.cardiovascular.abbott/us/en/hcp/products/cardiac-rhythm-management/insertable-cardiac-monitors/jot-dx.html* MEH

Technogym introduces Biocircuit – a completely guided workout experience

Imagine a circuit where you just need to login once, then relax and workout always in a given time, with equipment that adapts to you. A completely guided experience, from station to station, where you never stop, never wait. This is Biocircuit.

The latest Technogym solution provides the answer to all potential flaws of traditional circuit training and expands on them with the latest and greatest digital solution. The fully automated circuit guides members throughout the whole workout, not only where to go and how long to work for, but on specific loads related to their calculated 1RM, repetition number & tempo and range of motion. It also pre-sets the equipment into position based on the individual's anthropometrics. The most exciting feature however is the Biodrive. Thanks to the latest innovation, combining research from the aeronautical industry, Technogym has developed the ultimate resistance training solution.

The Biodrive can replicate up to seven different resistance types, for example eccentric overload, and even a build in spotter! This Biodrive is able to generate adaptive resistance adjustments in response to movement (i.e., position, velocity and acceleration). This method is the foundation of how Biocircuit works. An efficient, specific experience for the member, and an easy to manage solution for the operator… a win-win!

Despite of all of the fantastic innovations, the real added value is that members can now access a personalised plan specific to their ability level and matching their goals and needs. Biocircuit has five types of workouts (plus has the potential to customise your own plans) to cater for a variety of needs, ability levels and demographics, all of this squeezed into a sub 30-minute workout (variations are available).

Whether your goal is to "Start Moving", "Stay Young", "Lose Weight", "Tone Your Body", or "Boost Performance", Biocircuit has you covered. Each programme works on a specific repetition range, tempo and even type of resistance (viscous, inertia free, eccentric overload) to match the demand of the programme to achieve a specific outcome (I S.A.I.D so). This means that you can have up to 12 people at any given time working under a time and repetition-based circuit, each with a different programme and with different training history at any time.

- For more information, visit: *www.technogym.com/ae* MEH

Carestream unveils new features to improve workflow, patient comfort with DRX-Evolution Plus

Carestream Health has enhanced its premium X-ray system, the DRX-Evolution Plus. New features – designed to benefit radiology professionals and patients – help augment workflow and increase patient comfort.

"Radiology professionals worldwide capture complex patient diagnostic imaging exams with our powerful DRX-Evolution Plus," said Jing Chu, Worldwide Product Marketing Manager at Carestream. "The latest iteration of this exceptional DR room brings new features to accommodate patients of varying sizes, while performing X-ray exams faster and with ease."

The DRX-Evolution Plus now features a smaller tube head profile with a larger display, helping radiographers conduct exams with greater visibility. An extended tube-column offers greater flexibility and can accommodate sites with high ceilings.

An upgraded tabletop has more range, making it easier and more comfortable for patients to undergo an exam. Functional LED lighting has been added in several locations – changing colors as a patient exam progresses – enabling radiographers to easily monitor the exam process from patient positioning through image capture.

Optional Smart Room features for the enhanced DRX-Evolution Plus include Smart Position, Smart Technique and Smart Collimation to further streamline processes, support radiographer productivity and enhance patient care. Imaging facilities also can add Smart Noise Cancellation, an image processing option of Carestream's ImageView Software that uses artificial intelligence (AI) technology to help reduce noise in an image.

Since its launch, the CARESTREAM DRX-Evolution Plus has set a benchmark for X-ray room imaging performance. This versatile DR system offers a modular design to fit spaces, workflows and budgets; and superb image quality to support accurate diagnoses. It also provides a choice of a fully motorized or manual operation and mitigates technology obsolescence by growing with a facility's needs.

Additional updated features include:

- A refreshed industrial design
- Handheld remote control for the tube head and wall stand, and
- An enhanced tabletop that supports up to 320 kg or 705 lbs. with extended range.

Designed for the high-volume imaging needs of large hospitals, clinics and urgent care centers, the DRX-Evolution Plus features Carestream's ImageView Software powered by Eclipse, the engine behind the company's cutting-edge imaging software platforms.

In addition, Carestream's DRX Plus and Lux 35 detectors feature the X-Factor design, which means they can be shared with other compatible DRX equipment.

- For more information, visit: *https://www.carestream.com/en/us/medical/products/radiography/dr-systems/carestream-drx-evolution-plus*

Orthofix introduces new fiberFUSE Strip for bone graft

Orthofix Medical, a global medical device company with a spine and orthopaedics focus, has launched their fiberFUSE Strip and seen the first patient implants with the product, an advanced demineralized fibre bone-graft solution containing cancellous bone.

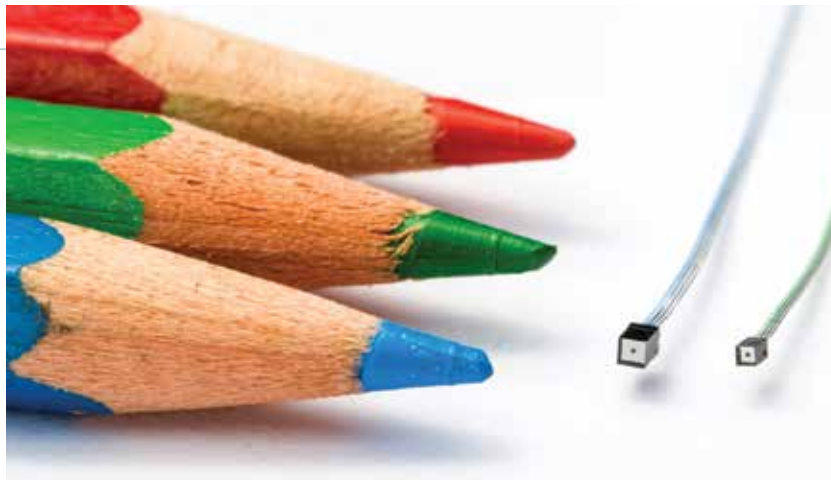
The fiberFUSE Strip is formulated as a convenient preformed bone-graft strip to enable optimized application for posterior cervical, posterior lumbar and degenerative spinal procedures.

Comprised of natural bone, the fiberFUSE Strip contains a unique mixture of mineralized cancellous and demineralized cortical bone, with no carrier added, to create a natural scaffold allowing for revascularization, cellular ingrowth and new bone formation.

"We are pleased to introduce this next-generation formulation in the fiberFUSE allograft line," said Kevin Kenny, President of Orthofix Global Spine. "The fiberFUSE Strip delivers a high-quality advanced bone-graft option in a convenient, easy-to-use strip preparation. This technology advancement was developed as part of our strategy to provide procedurally-focused solutions for spine surgeons and their patients."

MTF Biologics is the exclusive processor of the Orthofix fiberFUSE Strip. Their proprietary, validated aseptic processing methods retain the natural growth factors within the cortical fibres. The fibres interconnect, resulting in a pliable, cohesive graft. The cancellous matrix component provides a porous scaffold to allow ingrowth of host vasculature, osteoblasts and mesenchymal stem cells. The fiberFUSE Strip can be rapidly rehydrated with the surgeon's reconstitution solution of choice.

- For more information, visit: *www.orthofix.com/ifus/fiberfusestrip/*



ams OSRAM provides the world's smallest digital camera module for single-use endoscopy

ams OSRAM, a global leader in optical solutions, is expanding its NanEye portfolio with the NanEyeM camera module for single-use medical endoscopy. It offers a high resolution that meets current market standards at the smallest available size in the field of digital endoscopy camera modules. The small dimensions of 1.0 mm x 1.0 mm x 2.7 mm allow the module to be used in the smallest of areas.

In endoscopic procedures, such as bronchoscopy, the transition from reusable to disposable bronchoscopes has recently accelerated due the Covid-19 pandemic.

"Thanks to its space-saving size, the NanEyeM is made for use in areas of severe size restrictions, which includes single-use applications in bronchoscopy, urological endoscopy or endoscopic procedures in the kidney," says Dina Aguiar, Marketing Manager at ams OSRAM. "The combination with the requisite high image quality makes the camera module a unique and attractive solution for the fast growing disposable endoscope market."

- For more information, visit: **https://ams-osram.com/**

Neuropace launches nSight Platform to track epileptic seizure episodes

NeuroPace, a medical technology company dedicated to transforming the lives of people suffering from epilepsy, has launched its nSight Platform, an online portal that helps physicians provide more personalized, data-driven epilepsy care by enabling them to remotely review patient progress, discover actionable insights, and track their clinic's overall patient outcomes.

The RNS System is the only US FDA-approved epilepsy device that continuously monitors brain activity, delivers personalized treatment by responding in real time to a patient's unique seizure activity, and records intracranial EEG data that can help physicians optimize patient outcomes.

"The RNS System provides drug-resistant epilepsy patients with unparalleled seizure reduction, while giving physicians unprecedented visibility into their patients' ongoing brain activity," said Mike Favet, CEO of NeuroPace. "We believe that the brain data captured by the RNS System is a major technology differentiator – it gives physicians additional information, so that they can make more informed treatment decisions for their patients. With the launch of the nSight Platform, the RNS System data is more streamlined, more accessible, and more actionable than ever before."

As part of the nSight Platform offering, NeuroPace has partnered with Seizure Tracker <*https://seizuretracker.com*/> one of the most widely used electronic seizure diary apps, to help patients and clinicians more reliably track and manage seizures. The Seizure Tracker mobile app gives patients and caregivers the ability to record videos of seizures as they happen, and log seizure events and details afterwards. It also integrates with Amazon Alexa so patients can verbally record when a seizure begins and ends.

Through the companies' partnership, patients can elect to share Seizure Tracker information with their physicians through the nSight Platform. This enables physicians to better assess their patients' seizure burden, identify potential seizure triggers, and see trends in seizure activity based on medication or lifestyle changes.

The nSight Platform is especially helpful with the growing demand for telehealth visits. For epilepsy patients, Seizure Tracker can provide a convenient way to track daily seizure activity and share this information with their doctor. For physicians, the nSight Platform can provide a more comprehensive picture of their patient's epilepsy, all in one centralized place.

The RNS System

The RNS System, a paradigm-shifting treatment for drug-resistant focal epilepsy, is the only brain-responsive neuromodulation system approved by the FDA. The closed-loop technology delivers personalized, data-driven treatment targeted to the seizure source by continuously monitoring brain activity, recognizing a patient's unique seizure pattern, and responding in real-time with imperceptible stimulation to prevent seizures. By recording ongoing EEG data, the RNS System provides physicians with a unique "window to the brain," enabling them to remotely monitor their patients, gain insights based on brain activity, and use that information to optimize patient care.

Long-term clinical studies demonstrate that the RNS System provides significant reduction in seizure frequency and enduring improvements in quality of life and cognition, with no stimulation-related side effects.

- For more information, visit: *www.neuropace.com*

Novel virtual reality technology developed to reduce anxiety during MRI scan

Researchers from the School of Biomedical Engineering & Imaging Sciences have created a novel interactive VR system[1] to be used by patients when undertaking an MRI.

In a new paper published in *Scientific Reports*[2], the researchers say they hope this advancement will make it easier for those who find having a MRI scan challenging such as children, people with cognitive difficulties or those who suffer from claustrophobia or anxiety.

In normal circumstances, MRI scans fail in up to 50 percent of children under 5 years of age, which means that hospitals often rely on sedative medication or even anaesthesia to get children successfully scanned.

To provide patients with an immersive VR environment, the researchers developed a special VR headset that can be safely used inside MRI scanner.

The headset is designed to be light tight, so that the user cannot see their surrounding environment at all and is unaware of visual reminders of their position.

Once the system is properly positioned, the system's projector is immediately live, providing immersive content and the VR experience is then continuous from that point onwards until the patient is removed at the end of the examination.

The researchers say this and other measures are highly effective at removing the sense of being inside the MRI scanner, as their visual scene is completely replaced with the VR environment and through creating congruence with the other sensations that are perceived during MRI examinations such as scanner noise, table movement and table vibration..

Currently, there are no other such MR compatible systems which combine a VR presentation system with intuitive interaction in this way.

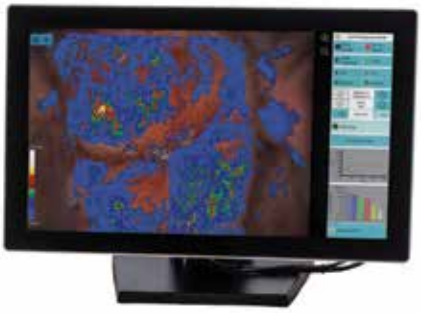
By simply looking at objects or areas in the VR environment, the user can navigate through the virtual world, to select content such as films and games, play games and to initiate or terminate a video link to their companion/carer.

The latter means that an anxious patient can interact at will with a companion or carer at any time during their examination via a webcam with microphone and a display monitor installed in the console area.

The researchers say the next steps for the system is to develop content and test it with patients.

[1] View on YouTube: *https://youtu.be/8K5-1ZT4Z5w*

[2] doi: *https://doi.org/10.1038/s41598-021-95634-y*



DYSIS introduces new compact, portable colposcope with computer-aided cervical mapping

DYSIS Medical has launched DYSIS View, a compact and portable colposcope, which includes the company's innovative computer-aided cervical mapping technology that helps healthcare professionals detect cervical lesions more clearly.

The DYSIS family of colposcopes include the novel DYSISmap, which is a colour-coded summary of the acetowhitening effect of the patient's cervix. Colours are allocated on the map depending on the acetowhitening changes measured by DYSIS during the examination. This data helps healthcare professionals improve biopsy selection. In the IMPROVE-COLPO study, when map-assisted biopsies were added to colposcopy exams, detection of patients with CIN2+ increased by 44%[1].

Darin Hammers, CEO of DYSIS Medical, said: "While DYSIS View is much more compact and portable than our previous colposcope designs, it's equal in sophistication and technology. It fills a gap in the market where we're able to provide our innovative mapping technology to a wide range of healthcare professionals."

In addition to the innovative cervical mapping technology, DYSIS View includes a camera for high resolution exam videos and images, instant replay of colposcopy exams, DYSIS SMARTtrack to compare a patient's DYSIS View colposcopy exams and a patient database for record storage.

- For more information, visit *dysismedical.com*

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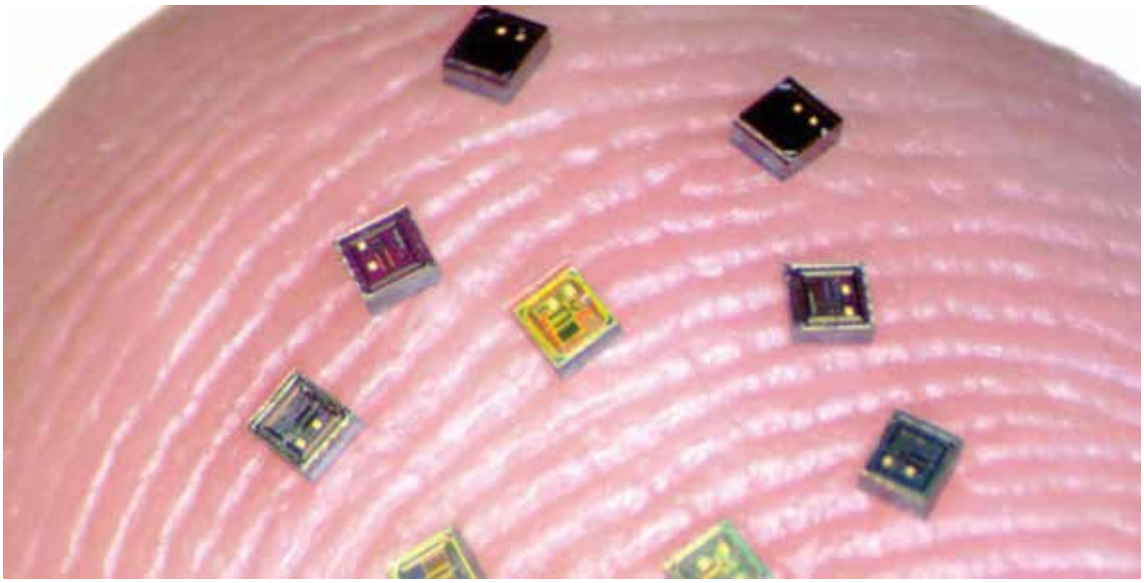

Jihun Lee

Tiny chips called neurograins are able to sense electrical activity in the brain and transmit that data wirelessly.

The next-generation brain-computer interface system

Brain-computer interfaces (BCIs) are emerging assistive devices that may one day help people with brain or spinal injuries to move or communicate. BCI systems depend on implantable sensors that record electrical signals in the brain and use those signals to drive external devices like computers or robotic prosthetics.

Most current BCI systems use one or two sensors to sample up to a few hundred neurons, but neuroscientists are interested in systems that are able to gather data from much larger groups of brain cells.

Now, a team of researchers has taken a key step toward a new concept for a future BCI system – one that employs a coordinated network of independent, wireless microscale neural sensors, each about the size of a grain of salt, to record and stimulate brain activity. The sensors, dubbed "neurograins," independently record the electrical pulses made by firing neurons and send the signals wirelessly to a central hub, which coordinates and processes the signals.

In a study published August 12 in *Nature Electronics*[1], the research team demonstrated the use of nearly 50 such autonomous neurograins to record neural activity in a rodent.

The results, the researchers say, are a step toward a system that could one day enable the recording of brain signals in unprecedented detail, leading to new insights into how the brain works and new therapies for people with brain or spinal injuries.

"One of the big challenges in the field of brain-computer interfaces is engineering ways of probing as many points in the brain as possible," said Arto Nurmikko, a professor in Brown's School of Engineering and the study's senior author. "Up to now, most BCIs have been monolithic devices – a bit like little beds of needles. Our team's idea was to break up that monolith into tiny sensors that could be distributed across the cerebral cortex. That's what we've been able to demonstrate here."

The goal of this new study was to demonstrate that the system could record neural signals from a living brain — in this case, the brain of a rodent. The team placed 48 neurograins on the animal's cerebral cortex, the outer layer of the brain, and successfully recorded characteristic neural signals associated with spontaneous brain activity.

The team also tested the devices' ability to stimulate the brain as well as record from it. Stimulation is done with tiny electrical pulses that can activate neural activity. The stimulation is driven by the same hub that coordinates neural recording and could one day restore brain function lost to illness or injury, researchers hope.

The size of the animal's brain limited the team to 48 neurograins for this study, but the data suggest that the current configuration of the system could support up to 770. Ultimately, the team envisions scaling up to many thousands of neurograins, which would provide a currently unattainable picture of brain activity.

There's much more work to be done to make that complete system a reality, but researchers said this study represents a key step in that direction. MEH

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