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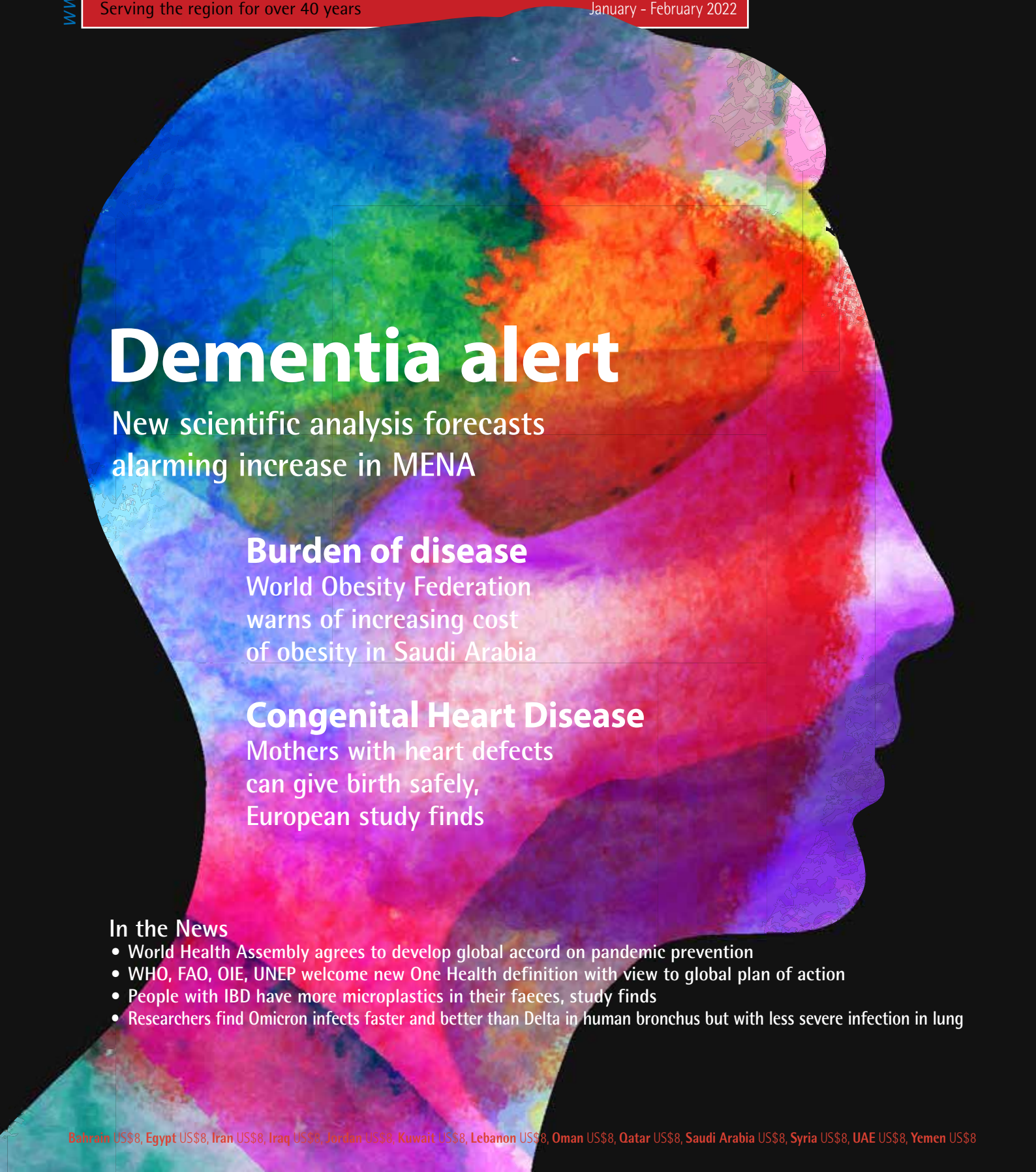
January - February 2022



Dementia alert

New scientific analysis forecasts alarming increase in MENA

Burden of disease

World Obesity Federation warns of increasing cost of obesity in Saudi Arabia

Congenital Heart Disease

Mothers with heart defects can give birth safely, European study finds

In the News

- World Health Assembly agrees to develop global accord on pandemic prevention
- WHO, FAO, OIE, UNEP welcome new One Health definition with view to global plan of action
- People with IBD have more microplastics in their faeces, study finds
- Researchers find Omicron infects faster and better than Delta in human bronchus but with less severe infection in lung

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Prognosis

Dementia on the horizon

The Middle East North Africa region is headed for an alarming escalation in the prevalence of dementia over the next 30 years if the forecasts derived from a new analysis by research scientists and published in *The Lancet Public Health* are borne out. The authors warn that if nothing is done to mitigate a range of modifiable risk factors, Qatar could see an astounding 1926% increase in dementia prevalence by 2050, the UAE, 1795%, and Bahrain, 1084%, with other countries in the region not far behind. The forecasts serve as a timely warning to public health officials of the need to urgently implement measures to reduce risk factors such as smoking, obesity, high blood sugar, and low education, which the researchers assert play a role in the development of dementia. You can read more about this in this issue of *Middle East Health*.

Also in this issue, we publish a statement delivered by the World Obesity Federation to Saudi Arabia which warns that the Kingdom will face an increasing cost burden over the next several decades due to the burgeoning prevalence of obesity. The Federation says that if current trends continue in the Kingdom, the economic cost of obesity could increase from the current 2.4% of GDP to more than 4% by 2060. The Federation notes that although several strategies and programmes have been developed to combat obesity in the Kingdom, many of them lack implementation.

It seems COVID-19 is refusing to relinquish its grip on us, despite our remarkable ability to develop vaccines at speed and the increasing number of vaccinated individuals. In fact, it is likely it may never relinquish it's grip, and 2022 will be the year where we begin to learn to live with it. This article in *Nature* <*https://go.nature.com/3tl2Gxp*> makes this very clear. As the new variant Omicron sweeps the world, a new study from the Faculty of Medicine at The University of Hong Kong goes some way to show why it is spreading so fast, but apparently with less severity. You can read about this study in our COVID-19 news update.

The region's largest healthcare exhibition, Arab Health, returns to Dubai in late January. We trust all participants will have a fruitful event as the industry attempts to return to pre-pandemic prosperity.

Remember to visit our newly enhanced website <*www.MiddleEastHealth.com*> for regular news from the region and research developments from around the world.

From the staff at *Middle East Health*, we wish all our readers good health and happiness in this new year.

Callan Emery
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middle east monitor

Update from around the region

Mohamed Ali Al Ansari, the chairman of Al Ansari Exchange, and Bill Gates, the co-chair of the Bill & Melinda Gates Foundation, pledge their support for humanitarian healthcare programmes.

Al Ansari Exchange and Bill & Melinda Gates Foundation sign $10m agreement to improve regional healthcare

Al Ansari Exchange, the UAE-based foreign exchange and worldwide money transfer company, and the Bill & Melinda Gates Foundation pledged US$10 million through the foundation's matching programme to support healthcare humanitarian programmes in the Middle East and Africa region.

This announcement comes during a meeting held in Dubai between Bill Gates, the co-chair of the Gates Foundation and Mohamed Ali Al Ansari, the chairman of Al Ansari Exchange to discuss the importance of supporting global efforts to improve healthcare and the important role philanthropists play in powering such programmes in different parts of the world.

The focus of this pledge will be to reduce inequities in health by developing new tools and strategies to reduce the burden of neglected tropical diseases (NTDs), which affect more than 1.7 billion of the world's population residing in low-income communities in the Middle East, Africa and Asia. Funding will be directed toward the Reaching the Last Mile Fund, a multi-donor initiative launched by His Highness Sheikh Mohamed bin Zayed, Crown Prince of Abu Dhabi, and managed by The END Fund. The pledge will also support ongoing global efforts to eradicate polio. By supporting high-impact programmes with strong track records for reaching some of the hardest-to-reach populations, this collaboration can help millions of people live healthier lives and have higher prospects of moving out of poverty.

Bill Gates said: "It's excellent to see this partnership come to fruition with Al Ansari Exchange. Together, we are committed to reducing inequities in healthcare. As we push toward the elimination of neglected tropical diseases and the eradication of polio, I'm pleased to renew our nearly decade-long collaboration with Al Ansari Exchange.

Mohamed A. Al Ansari said: "We always seek to establish strong long-term partnerships with foundations and institutes as we understand that consistency in strategy and direction is key to seeing a positive impact on communities in need. We are delighted to have the Bill & Melinda Gates Foundation as one of our global partners in this mission, and we will continue side by side in the efforts to combat poverty, disease and inequality around the world." MEH

Burjeel Medical City launches 'ultra-high-tech' Rehabilitation and Physical Therapy Centre

The Abu Dhabi-based multi-specialty hospital Burjeel Medical City has launched its new, state-of-the-art Department of Rehabilitation and Physical Therapy at its main campus in Mohamed bin Zayed City.

Dr. Mahesh Cirasanambati, Chief and Consultant Physical Medicine and Rehabilitation at VPS Healthcare, has been selected to head the new department, leading a multi-national team of experts who will extend a rich portfolio of services to communities across Abu Dhabi, UAE, and the region.

The new department is one of the largest of its kind in the country, and features an impressive range of medical technologies that include robotics, artificial intelligence, and the latest applications of computer-assisted rehabilitation. The treatments offered focus on restoring function and enhancing patients' quality of life.

In the paediatrics category, the department treats conditions like developmental delays, cerebral palsy, autism and ADHD. For adults, services include post-surgical rehabilitation and the treatment of musculoskeletal problems, such as injuries of the knees, back, shoulders, neck, ankle and hip. Moreover, patients with post-Covid complications will receive dedicated care at the department to recover pulmonary and physical functions impacted by

The team at Burjeel Medical City's new Department of Rehabilitation and Physical Therapy.

the virus. In neurological cases, the department attends to patients who have suffered strokes, spinal cord injuries, parkinsonism, peripheral neuropathy, and balance disorders.

Women's health is also a key area of focus at the department, which provides ante- and post-natal exercises as well as treatments for conditions such as stress urinary incontinence. Besides physiotherapy, the department offers other types of rehabilitation services, like speech and swallowing training by speech-language pathologists.

Dr. Mahesh Cirasanambati, Chief and Consultant Physical Medicine and Rehabilitation, VPS Healthcare said: "The department has been set up to provide high-quality care to patients and help them rebuild their lives. Toward this goal, we assembled a core team of world-class physiotherapists, occupational therapists and speech and language therapists who follow the highest standards and treatment protocols. We also offer rare and specialised services, including hydrotherapy, cardiopulmonary rehabilitation and hyperbaric oxygen treatment under one roof to help patients achieve maximum functional potential."

The new rehabilitation centre at BMC uses a variety of cutting-edge equipment for motor skills, cognition and task-specific training. The Gloreha Sinfonia robotic glove for hand rehabilitation, for example, aids in functional recovery, while the Walkbot is a robot-assisted gait-training system for adults and children with neurological or musculoskeletal impairments. Furthermore, the department has a Gait Analysis Lab to analyse walking patterns and its BTE PrimusRs aids in physical and occupational therapy. The department also provides neurological rehabilitation, musculoskeletal rehabilitation and pain-relieving interventions for home-bound patients. MEH

Dubai Technology Entrepreneur Campus partners with Fakeeh University Hospital to advance healthcare services

Dubai Technology Entrepreneur Campus (Dtec), Dubai Silicon Oasis' wholly owned tech hub and co-working space, and the largest of its kind in the MENA region, signed a partnership agreement with Fakeeh University Hospital.

The agreement was signed by Dr. Juma Al Matrooshi, Deputy CEO of Dubai Silicon Oasis (DSO), and Dr. Fatih Mehmet Gul, CEO of Fakeeh University Hospital (FUH), at the university hospital's building in DSO, in the presence of officials from both entities.

Under the agreement, DSO and FUH will work together to enhance smart health offerings, as well as medical and preventive services to more than 1,000 start-ups and entrepreneurs in Dtec. They will also collaborate to support the health of the start-ups' operations and the wellbeing of their employees

The agreement outlines that employee of Dtec-based companies will receive medical examination services and a health card, as well as exclusive healthcare benefits and priority in medical services at FUH. Furthermore, they will have access to remote medical consultations.

Fakeeh University Hospital will also organize several virtual awareness sessions, educational seminars and first aid training sessions, in addition to approved medical and surgical services, radiology and laboratory examinations, round the clock emergency services, and several diagnostic procedures such as endoscopy, CT scan and other programs.

Dtec entrepreneurs will benefit from exclusive opportunities to test innovative healthcare solutions in cooperation with FUH, in addition to benefiting from its laboratories and research centres, workshops and mentoring sessions which are organized for entrepreneurs and researchers. MEH

Medeor Hospital opens nephrology department and dialysis centre

Medeor Hospital, a 75-bed multi-specialty hospital, has opened a nephrology department and dialysis centre at the facility in Dubai. The centre's state-of-the-art infrastructure and modern diagnostics tools will cater to all the requirements of patients with kidney-related conditions.

Headed by Dr. Paulose Thomas, Specialist Nephrologist, the centre has a multi-disciplinary team of specialists and medical professionals.

The nephrology department can perform haemodialysis and plasmapheresis. It has three dialysis beds for hepatitis-negative patients and a negative-pressure isolation room for hepatitis C patients. The intensive-care unit at the hospital provides bedside haemodialysis including Continuous Renal Replacement Therapy for complex cases. The kidney biopsy program at the centre will help in the early diagnosis kidney malfunction, enabling early intervention.

Speaking on the significance of the nephrology department and dialysis centre, Dr. Thomas said: "Kidney-related ailments are soaring in the UAE with every passing year. The high prevalence of diabetes and hypertension are the root causes. The centre at Medeor Hospital aims to provide timely diagnosis and effective treatment for these patients. We have the best infrastructure and modern diagnostic tools. We aim to serve the people of the UAE well and play an active role in creating awareness among the public on ways to prevent the advancement of kidney-related diseases."

The nephrology department at Medeor Hospital will be actively working with government departments, community organizations, and other stakeholders in Dubai and northern emirates to create awareness on ways to prevent kidney ailments. MEH

Medcare opens Gastro & Obesity Centre

Medcare Hospitals and Medical Centres has opened the Medcare Dr Saeed Al Shaikh Gastro & Obesity Centre in Dubai, a first-of-its-kind facility offering innovative gastro and obesity treatments to patients within the centre.

The Medcare Gastro & Obesity Centre provides specialized care in Gastrointestinal & Colon Cancer and weight management, heartburn and acid reflux (GERD), Inflammatory Bowel Disease (IBS).

The centre comprises five out-patient consultation rooms, five post-operation recovery rooms, two pre-operation rooms, two operating theatres, an intensive care unit and an X-ray room. It also includes a dedicated Day Care Centre for the specialised diagnosis and treatment of acid reflux, digestive irritation, weight management, tumour detection and more. Day surgeries such as endoscopic and weight management procedures will be performed at the centre.

The new Medcare Gastro and Obesity Centre is headed by Dr Saeed Al Shaikh, a Gastroenterologist with a Doctorate of Medicine in Hepatology from the University of Dublin - Nui, Ireland. He is also a Fellow of the Royal College of Physicians, Ireland and has held posts as Head of Department of Medicine and Gastroenterologist at multiple hospitals in the UAE. He is also an active member of various professional associations and has previously been Vice President of the Emirates Gastroenterology Association. He is also a member of the American Gastroenterology Association and the UAE Gastroenterology Society. MEH

MBRU records significant increase in overseas student Intake

Dubai-based Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), has more than doubled its intake of international students in just five years.

MBRU offers undergraduate and postgraduate courses through its three colleges: the College of Medicine; College of Nursing and Midwifery and the Hamdan Bin Mohammed College of Dental Medicine.

In line with its mission to be a global hub for innovative and integrated healthcare education and research at the service of humanity, MBRU has been attracting top-achieving medical students from within the UAE and abroad since 2016.

More than 60% of the total student pool enrolled at MBRU since 2016 are international. And 60% of MBRU's latest intake for its 2021 programs is also international, spanning 47 nationalities.

"A key focus of our mission is global connectivity, and the data shows that we are on the right track through the enrollment of international students, in addition to successful partnerships with renowned healthcare operators and educational institutions. Dubai is a cosmopolitan city, home to some many nationalities, and our student community mirrors that. We are honored to be shaping the healthcare leaders of tomorrow who will have a vital role to play in advancing future health in the UAE and beyond," said said Ahmad Al Awadhi, Senior Director of Student Services and Registration, MBRU. MEH

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GE Healthcare, ADI open showroom in Dubai for advanced surgery

GE Healthcare, in partnership with Abu Dhabi International Medical Services Company (ADI), has opened a showroom in Dubai that focuses on advanced surgery systems and will serve as a hub for the region.

The showroom presents hybrid solutions that bring high-definition surgical imaging and flexibility for any environment, from orthopaedic and spine to vascular and cardiac surgical imaging solutions. The showroom is designed to emulate the experience of being inside an Operating Room including surgical table, ceiling suspended lights and a laparoscopy unit.

GE Healthcare has a strong footprint in the UAE and provides advanced technology for public and private sector hospitals. MEH

Saudi German Health introduces robotic surgery for joint replacement to Saudi Arabia

Saudi German Health has introduced a robotic joint (hip and knee) replacement surgery system at their hospital in Jeddah, Kingdom of Saudi Arabia.

This technology provides the surgeon with a patient-specific 3D model to pre-plan hip and knee replacement. During surgery, the surgeon guides the robotic arm based on a patient-specific plan. This helps the specialist to focus on removing the diseased bone, helping to preserve healthy bone.

Dr. Khalid A. Batterjee, Vice President of Saudi German Health and Head of Orthopedic Surgery, and his team will be offering this procedure to eligible patients at Saudi German Hospital in Jeddah.

"Hip joint replacement is intended for individuals with joint disease resulting from degenerative and rheumatoid arthritis, avascular necrosis, fracture of the neck of the femur or functional deformity of the hip. Knee replacement is recommended when severe pain due to osteoarthritis limits the patient's everyday activities. Our medical facilities are managed by highly skilled and trained medical professionals and equipped with the most advanced medical equipment, which demonstrates our commitment to quality patient care," Dr. Khalid Batterjee said.

Makarem Sobhi Batterjee, President and Executive Vice Chairman, Saudi German Health, said: "We are glad to become the first private hospital to offer robotic joint replacement surgery in the Kingdom of Saudi Arabia. We are fully committed to providing our patients with the best treatment possible, giving them a chance to live a normal and healthy life." MEH

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Mediclinic acquires Bourn Hall Fertility Centre in MENA

Mediclinic Middle East has acquired 100% of Bourn Hall Fertility Centre in the MENA region from TVM Capital Healthcare, following an initial acquisition of 30% of the shares in December 2018.

As pioneers of IVF with the first successful IVF procedure in 1978, Bourn Hall is synonymous with IVF and its founder, Professor Robert Edwards, was awarded the Nobel Prize for Medicine in 2010 for the invention of IVF.

Over the past few years, Mediclinic has widened its strategy from a focus on acute hospital care to include the wider continuum of care, with a vision of being the partner of choice that people trust for all their healthcare needs at all stages of their life. This, of course, includes IVF, which complements not only Mediclinic's highly-regarded maternity services, but its newly-launched precision and genetic medicine service.

David Hadley, CEO of Mediclinic Middle East, commented: "As an established and recognised brand, closely associated with high quality care and excellent results, Bourn Hall matches Mediclinic's own core purpose to enhance the quality of life, whilst upholding the highest standards of clinical governance and ethical behaviour. The opportunity to acquire such a company to enhance our offering across the continuum of care was extremely attractive and we look forward to working with Bourn Hall's staff and patients to further develop the service and grow the business across the UAE, beginning with the imminent opening of a new clinic in Abu Dhabi.

"For existing patients of Bourn Hall, absolutely nothing will change, and their treatment plan, costs and care team will remain the same. They can continue to expect the highest level of quality care with exceptional outcomes, and we very much look forward to working with them to realise their dreams." MEH

Clemenceau Medical Center in Dubai deploys Cognetivity Neurosciences' ICA for dementia diagnosis

Cognetivity Neurosciences has reached its first commercial agreement for the Integrated Cognitive Assessment (ICA) to be deployed in clinical care in the Middle East.

Following Cognetivity's launch in the region, the ICA is now set to be deployed at the state-of-the-art Clemenceau Medical Center (CMC) in Dubai. Cognetivity's ICA uses Artificial Intelligence to help detect the earliest signs of impairment by testing the performance of large areas of the brain to support diagnosis of dementia. It has achieved regulatory approval for clinical use in the UK and Europe with future clinical approval anticipated in North America and elsewhere in the world.

CMC in Dubai is situated within Dubai Healthcare City and enjoys a reputation as one of the region's leading hospitals across a range of medical specialities. It forms part of the prestigious Clemenceau Medicine International network, which is closely affiliated with Johns Hopkins Medicine International.

The CMC network is committed to making use of cutting-edge developments in medical technology, including artificial intelligence (AI), to provide its patients with the best possible care. Its flagship hospital, CMC in Beirut, was recently named in Newsweek's 2021 list of the top 100 smart hospitals in the world, ranking highest across the Middle East.

As part of the center's commitment to innovation and patient-first medical excellence, the ICA will be used to enhance the timely detection of mild cognitive impairment (MCI) and dementia. The ICA is perfectly placed to drive improvements in clinical cognitive assessment and monitoring thanks to its high sensitivity to early-stage deterioration and avoidance of learning effects upon repeat testing. Crucially, the test is language-independent and free from educational or cultural bias, facilitating its rapid deployment in new environments as a globally-applicable tool.

The implementation will be overseen by neurologist and clinical neurophysiologist Dr Raja Sawaya. One of the most highly respected clinicians, educators and researchers in his field throughout the Middle East, Dr Sawaya is also a Professor of Neurology and Clinical Neurophysiology at the American University of Beirut Medical Center. He is a fellow and active member of the American Academy of Neurology and the American Academy of Electrodiagnostic Medicine.

Commenting on the announcement, Dr Sawaya said: "Dementia is a serious and growing healthcare problem all over the world, including the Middle East. The ICA offers hope as a cutting-edge technology that can drive great improvements in the quality and efficiency of cognitive assessment, particularly at the all-important earlier stages of disease. I'm really excited to see the difference it makes for our patients, and can already see further areas for its application on the back of this rollout." MEH

Valiant Clinic and Hospital introduces robotic spine surgery

Dubai-based Valiant Clinic and Hospital, a leading multi-specialty boutique hospital, has partnered with Brainlab to bring Cirq Robotic Spine Surgery technology to the Middle East.

The Cirq robot with 3D imaging, Artificial Intelligence technology and surgical navigation can reduce the length of time for surgery, and improve stability and flexibility during surgeries.

Dr. Zbiggy Brodzinsky, Consultant Orthopedic Spine Surgeon at Valiant Clinic & Hospital said: "With its ability to provide real-time intraoperative navigation and rigid stereotaxy, robotic-assisted surgery has a higher accuracy rate while decreasing radiation exposure and possible complications. It also results in less time for the procedure and recovery. As shown in recent studies, robotic assistance simplifies complex procedures such as tumour resections and ablations, vertebroplasty, and deformity corrections.

"We are proud to bring this ground-breaking technology to the region, reflecting Valiant's commitment to provide innovative, world-class medical services and treatments to its patients." MEH

Regional guidelines for treating obesity nears completion

A plan to implement newly established recommendations for treating and managing obesity across the Gulf Cooperation Council (GCC) countries and Lebanon moved closer to fruition mid-November as representatives from the World Obesity Federation, Mubadala Health partners and other key players met with UAE health authorities to hammer out the finer details.

The "Regional Recommendations for the Treatment and Management of Adult Obesity in the Gulf and Lebanon" report is the culmination of work undertaken by the World Obesity Federation and experts from across the region that began in 2019. The principles were agreed at a meeting held in Muscat, Oman, in December 2019, after which the report was finalized and launched virtually in October 2020 during the second UAE Obesity Conference based in Abu Dhabi.

The recommendations were facilitated by the World Obesity Federation with input from Dr Omniyat Al Hajeri, Executive Director of Community Health in Abu Dhabi Public Health Centre, and the Gulf and Lebanon Recommendations Expert Group, which includes three physicians from Mubadala Health partners, namely Dr Sara Suliman from Imperial College London Diabetes Centre (ICLDC), Dr Mohammed Haddad from Healthpoint and Dr Wael Al Mahmeed from Cleveland Clinic Abu Dhabi, co-representing the UAE.

John Wilding, President of the World Obesity Federation said of the meeting: "I am delighted by the progress we have seen in the Gulf with regards to identifying and improving access to treatments and services following the release of the Regional Recommendations we published with regional experts last year. To do this during a pandemic is nothing short of remarkable and is all the more important because of the increased impact we have witnessed for those living with this disease."

On the occasion, Dr Al Hajeri, Executive Director of Community Health in Abu Dhabi Public Health Centre said: "Obesity is one of the toughest challenges that we have to face so far, it's a risk factor that predisposes people to chronic diseases. At Abu Dhabi Public Health Center, we work to reduce obesity and overweight, with clear plans and strategies. In 2020 the centre signed an MoU with the World Obesity Federation in to support research on obesity prevention, raise community awareness and cooperate in the development of educational programs, practical training and related conferences, hence the contribution in this conference came as an important step towards combating obesity." MEH

worldwide monitor

Update from around the globe

World Health Assembly agrees to develop historic global accord on pandemic prevention

In a consensus decision aimed at protecting the world from future infectious diseases crises, the World Health Assembly on 1 December 2021 agreed to kickstart a global process to draft and negotiate a convention under the Constitution of the World Health Organization to strengthen pandemic prevention, preparedness and response.

Dr Tedros Adhanom Ghebreyesus, WHO Director-General, said the decision by the World Health Assembly was historic in nature, vital in its mission, and represented a once-in-a-generation opportunity to strengthen the global health architecture to protect and promote the well-being of all people.

"The COVID-19 pandemic has shone a light on the many flaws in the global system to protect people from pandemics: the most vulnerable people going without vaccines; health workers without needed equipment to perform their life-saving work; and 'me-first' approaches that stymie the global solidarity needed to deal with a global threat," Dr Tedros said.

"But at the same time, we have seen inspiring demonstrations of scientific and political collaboration, from the rapid development of vaccines, to today's commitment by countries to negotiate a global accord that will help to keep future generations safer from the impacts of pandemics."

The Health Assembly met in a Special Session, the second-ever since WHO's founding in 1948, and adopted a sole decision titled: "The World Together." The decision by the Assembly establishes an intergovernmental negotiating body (INB) to draft and negotiate a WHO convention, agreement, or other international instrument on pandemic prevention, preparedness and response, with a view to adoption under Article 19 of the WHO Constitution, or other provisions of the Constitution as may be deemed appropriate by the INB.

Article 19 of the WHO Constitution provides the World Health Assembly with the authority to adopt conventions or agreements on any matter within WHO's competence. The sole instrument established under Article 19 to date is the WHO Framework Convention on Tobacco Control, which has made a significant and rapid contribution to protecting people from tobacco since its entry into force in 2005.

Under the decision, the INB will hold its first meeting by 1 March 2022 (to agree on ways of working and timelines) and its second by 1 August 2022 (to discuss progress on a working draft). It will also hold public hearings to inform its deliberations; deliver a progress report to the 76th World Health Assembly in 2023; and submit its outcome for consideration by the 77th World Health Assembly in 2024.

Through the decision, the World Health Assembly also requested the WHO Director-General to convene the INB meetings and support its work, including by facilitating the participation of other United Nations system bodies, non-state actors, and other relevant stakeholders in the process to the extent decided by the INB. MEH

The BMJ joins forces with Cochrane Sustainable Healthcare to launch *The Recovery*

The BMJ has joined forces with Cochrane Sustainable Healthcare to launch a new podcast series called 'The Recovery' co-hosted by The BMJ's Editor in Chief Dr Fiona Godlee and journalist and Bond University health researcher Dr Ray Moynihan.

The series will feature compelling and inspirational conversations with healthcare researchers, doctors, and activists from around the world who are actively working to wind back medical excess and forge more sustainable healthcare systems to improve our health, wellbeing, and climate.

Over six episodes, listeners will hear about new and sometimes radical initiatives that are changing the way doctors practice medicine, to ensure better access to high quality, evidence-based, and safe healthcare.

Highlights include:

- The Australian doctors fearlessly challenging professional norms to wind back ineffective and dangerous care

- A high-profile cancer specialist in India helping to reduce wasteful care in low and middle income countries
- A US-based doctor leading a non-violent revolution of care, built on compassion and solidarity
- A UK general practitioner championing physical activity, creating garden spaces, and improving access to fresh food, to empower patients, improve equity, and enhance the community's well-being and health

"All these voices are part of a growing global chorus campaigning for fundamental reform of how we practice medicine and showing that radical new alternatives are imminently feasible," write Godlee, Moynihan and Dr Minna Johansson, Director of Cochrane Sustainable Healthcare, in an opinion article to launch the series.

"All those unnecessary tests, treatments, and diagnoses bring direct harm to people through adverse effects of drugs and surgeries, psychosocial harms of labelling, and increasing the burden of treatments.

And since resources for healthcare are finite, waste is also harming patients indirectly because the overuse of some medical interventions means there are less resources to tackle underuse and underdiagnosis in other areas."

They acknowledge that the drivers of unsustainable healthcare are complex and diverse and say we must adapt to support more sustainable decision-making within healthcare.

"Most healthcare extends lives and reduces suffering, but too much medicine remains unnecessary and harmful," they warn. "Reducing medical excess is not primarily about saving money, it is about avoiding harm to people and the planet.

"We hope this podcast series will inspire listeners all over the world to imagine novel and radical approaches for a more sustainable healthcare, and to dare to move from imagination to action."

- 'The Recovery' podcast is available at: *www.bmj.com/podcasts* and *https://sustainablehealthcare.cochrane.org/recovery*

Over 1 kg of plastic waste is produced per patient anaesthetised, Spanish study finds

Over 1 kg of plastic waste is generated per anaesthesia procedure, an audit of surgical patients in a burns unit in Spain has revealed. Plastic wrappers are the most common item of waste. The study was revealed at Euroanaesthesia, the annual meeting of the European Society of Anaesthesiology and Intensive Care (ESAIC).

It is estimated that hospitals contribute up to 1% of solid waste in developed countries, with 21-30% of this coming from surgery. It has also been estimated that up to 60% of this waste could be recycled. Knowing more about how and when the waste is generated could raise awareness of the issue and aid with this recycling, as well as reduce the unnecessary use of plastics.

Anaesthesia residents Dr Fernando Suels and Dr Oscar Alfani and colleagues at anaesthesiology and intensive care department of Vall D'Hebron Hospital, Barcelona, Spain, collected and weighed the waste generated from anaesthesia procedures in the operating theatre of their hospital's burns unit in November 2020. Waste generated by other teams was excluded.

They then looked at how the patient's sex, health (ASA score), type and length of procedure and type of anaesthesia affected the amount of plastic waste.

The 10 women and 24 men whose burns operations were included in the study had an average age of 49.7.

An average of 1,057 g of plastic waste was generated, per patient, from anaesthesia alone. General anaesthesia produced almost three times as much plastic waste (1,407 g) per procedure as sedation / local anaesthesia (492 g).

Examples of the plastic items discarded as waste include syringes, infusion lines, aspiration tubes and their wrappers.

The type of surgery (severity of the burn) did not affect the amount of plastic waste but longer operations were associated with more waste. There was no difference in plastic waste between male and female patients.

The anaesthesia of the sickest patients, those with an ASA score of IV, produced more waste. But, as there were only two patients in this category, no firm conclusions can be drawn.

Plastic wrappers were the most common item, although they did not account for the bulk of the weight.

The researchers say that it is likely that similar amounts of plastic waste are produced in other hospitals in Spain and around the world and, although some is recycled, more recycling could be done.

Dr Suels explains: "More than 50 types of plastic items are commonly used in the operating theatre and because almost everything is sterile and single-use, almost every item comes in a plastic wrapper.

"While materials that have been in contact with biological fluids cannot be recycled, it's estimated that up to 60% of the plastic used by anesthesia in surgery is suitable for recycling.

"Although there is some recycling of

plastic wrappers and other items, more recycling could be done.

"Other strategies include working on the other two 'Rs' of waste management, Reduce and Reuse (where possible), which are even better for the environment than recycling, and running educational campaigns."

Johns Hopkins researchers win life sciences award for Astropath cancer mapping tool

Johns Hopkins astrophysicist, Alexander Szalay, Ph.D., and Kimmel Cancer Center pathologist Janis Taube, M.D., M.Sc., received a Life Sciences 2021 award for AstroPath at this year's Falling Walls Science Summit, an international event held in Berlin each year honouring research breakthroughs from around the world.

The Johns Hopkins submission titled "Breaking the Wall to Mapping Cancer Using Multispectral Microscopy" was selected from hundreds of entries for the AstroPath platform design. AstroPath is a new, comprehensive platform for imaging and mapping microscopic sections of tumours to identify and validate predictive biomarkers to guide precision immunotherapies for cancer.

"It's a convergence of scientific technology, big data and astronomy – aimed at curing cancer," said Szalay, Bloomberg Distinguished Professor of Physics and Astronomy and Computer Science, and director of the Institute for Data Intensive Engineering and Science at The Johns Hopkins University.

"Biomarkers are essential to understanding individual cancer signatures. Using this spatial mapping approach, we can better determine which patients will or will not respond to a cancer therapy. Our long-term goal is to match individual patients with personalized therapies," said Taube, professor of Dermatology and director of the Division of Dermatopathology at the Johns Hopkins University School of Medicine.

Janis Taube, M.D., M.Sc., Kimmel Cancer Center pathologist and Alexander Szalay, Johns Hopkins astrophysicist.

The foundation of the AstroPath platform is the database for the Sloan Digital Sky Survey, a 3D digital map of the universe architected by Szalay. "In astronomy we often ask, What is the probability that galaxies are near each other? We apply the same approach to cancer – looking at spatial relations in the tumour microenvironment. It is the same problem on a vastly different scale," he says.

Just as the Sloan Survey maps the cosmos on an astronomical scale, AstroPath maps tumor cells on a microscopic scale.

"Who would have thought techniques from astronomy would end up saving lives?" Szalay concluded.

AstroPath was developed with support from the Mark Foundation for Cancer Research; the Melanoma Research Alliance; the Johns Hopkins Bloomberg~Kimmel Institute for Cancer Immunotherapy; the Harry J. Lloyd Charitable Trust; the Emerson Collective; Moving for Melanoma of Delaware; the Barney Family Foundation; the Laverna Hahn Charitable Trust; Bristol Myers Squibb; Sidney Kimmel Comprehensive Cancer Centre; National Cancer Institute; and technology from Akoya Biosciences.

on the WEB Watch the Falling Walls Astropath video
https://falling-walls.com/discover/videos/immuno-oncology-how-astronomy-accelerates-pathology/

WHO, FAO, OIE, UNEP welcome new One Health definition with view to global plan of action

The Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO) have welcomed the newly formed operational definition of 'One Health' from their advisory panel, the One Health High Level Expert Panel (OHHLEP).

Through combined energies of the four organizations, a comprehensive Global Plan of Action for One Health is in development, supported and advised by OHHLEP. This Plan aims to mainstream and operationalize One Health at global, regional, and national levels; support countries in establishing and achieving national targets and priorities for interventions; mobilize investment; promote a whole of society approach and enable collaboration, learning and exchange across re-

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gions, countries, and sectors.

The One Health definition developed by the OHHLEP states:

> **One Health** is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.
>
> It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.
>
> The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.

The importance of establishing a One Health definition was first raised by OHHLEP, and later agreed by the four Partners, to develop a common language and understanding around One Health.

OHHLEP's members represent a broad range of disciplines in science and policy-related sectors relevant to One Health from around the world.

The new OHHLEP One Health definition aims to promote a clear understanding and translation across sectors and areas of expertise.

While health, food, water, energy, and environment are all wider topics with sector-specific and specialist concerns, the collaboration across sectors and disciplines will contribute to protecting health, addressing health challenges such as the emergence of infectious diseases and antimicrobial resistance and promoting health and integrity of our ecosystems. Moreover, One Health, linking humans, animals and the environment, can help to address the full spectrum of disease control – from disease prevention to detection, preparedness, response, and management – and to improve and promote health and sustainability.

The approach can be applied at community, subnational, national, regional, and global levels, and relies on shared and effective governance, communication, collaboration and coordination. With the One Health approach in place, it will be easier for people to better understand the co-benefits, risks, trade-offs and opportunities to advance equitable and holistic solutions. MEH

10th Global Conference on Health Promotion charts a path for creating 'well-being societies'

Past epidemics showed us the importance of resilient health systems. The COVID-19 pandemic brought into sharp focus the importance of resilient societies. The 10th Global Conference on Health Promotion on 13-15 December 2021 marked the start of a global movement on the concept of well-being in societies. A focus on well-being encourages different sectors to work together to address global challenges and help people take control over their health and lives.

Over 4,500 participants of the Global Conference, who met virtually and in Geneva, Switzerland, agreed on a Geneva Charter for Well-being. The Charter builds on the Ottawa Charter for Health Promotion and the legacy of nine global conferences on health promotion. It highlights the need for global commitments to achieve equitable health and social outcomes now and for future generations, without destroying the health of our planet. This charter will drive policymakers and world leaders to adopt this approach and commit to concrete action.

"Health does not begin in a hospital or clinic. It begins in our homes and communities, with the food we eat and the water we drink, the air we breathe, in our schools and our workplaces," said Dr Tedros Adhanom Ghebreyesus, WHO Director General. "We have to fundamentally change the way that leaders in politics, the private sector, and international institutions think about and value health, and to promote growth that is based on health and well-being for people and the planet, for countries in all income levels."

The Charter outlines the necessary elements of a 'well-being society' and what needs to be done in order to better prevent and respond to the multiple health and ecological crises we face globally. It identifies key action areas and offers instruments for implementation.

The document encourages five key actions:

- Design an equitable economy that serves human development within planetary boundaries;
- Create public policy for the common good;
- Achieve universal health coverage;
- Address the digital transformation to counteract harm and disempowerment and to strengthen the benefits; and
- Value and preserve the planet.

"It is time to look at how the economy can support the societal goal of well-being, as an investment that is the foundation of productive, resilient and inclusive economies," said Dr Rüdiger Krech, WHO Director for Health Promotion. "We cannot, we must not, go back to the same exploitative patterns of production and consumption, the same disregard for the planet that sustains all life, the same cycle of panic and neglect, and the same divisive politics that fuelled this pandemic."

To change the global development landscape, both the well-being of people and the planet must become central to defining humanity's progress. This Charter calls upon non-governmental and civic organizations, academia, business, governments, international organizations and all concerned to work in society-wide partnerships for decisive implementation of strategies for health and well-being. These will drive the transformation towards well-being societies in all countries, centring around the most marginalized populations.

Moving forward, countries must prioritize health as part of a larger ecosystem that encompasses environmental, social, economic, and political factors. Universal health coverage, based on strong primary health care, must be at the core of all our efforts, as the cornerstone of social, economic and political stability. And the narrative around health should be reframed, not as a cost, but as an investment in our common future. MEH

Latest child mortality estimates reveal world remains off track to meeting Sustainable Development Goals

The world remains significantly off track to meet the Sustainable Development Goals (SDGs) on ending the preventable deaths of newborns and children under five, according to the latest estimates released by the United Nations Inter-agency Group for Child Mortality Estimation (UN IGME).

According to the report, more than 50 countries will not meet the under-five mortality target by 2030, and more than 60 countries will miss the neonatal mortality target without immediate action. The SDGs call for an end to preventable deaths of newborns and children under age 5, with all countries aiming to have a neonatal mortality rate of 12 or fewer deaths per 1,000 live births, and an under-five mortality rate of 25 or fewer deaths per 1,000 live births, by 2030.

The report states that more than 5 million children died before their fifth birthday in 2020 alone, along with 2.2 million children and youth aged 5 to 24.

"We are still losing too many young lives from largely preventable causes, often because of weak and underfunded health systems which have faced enormous pressure over the pandemic. And the burden of these deaths is not carried equally around the world. Children in sub-Saharan Africa and Southern Asia continue to face the highest risk of death in the world, and to bear the brunt of this child mortality burden," said Mark Hereward, UNICEF's Associate Director on Data and Analytics. "If we are going to achieve the child mortality SDGs in all countries, we must redouble efforts to ensure access to effective and high-quality care along with the continued expansion of coverage of life-saving interventions."

The UN IGME report also said that recent and reliable data on child, adolescent and youth mortality remains unavailable for most countries of the world, particularly for low-income countries, and the COVID-19 pandemic has posed additional challenges to improving data availability and quality. Only about 60 countries, mainly high-income, have a well-functioning Civil Registration and Vital Statistics System which produces timely, high-quality mortality data.

In low- and middle-income countries, huge data gaps remain – two thirds (97 out of 135 countries) have had no reliable mortality data in the past 3 years. Likewise, the COVID-19 pandemic posed more challenges to data collection and highlighted the urgent need to fill data gaps.

"Countries must invest in quality health services, nutrition, and other life-saving interventions for women and children to ensure the hard-won gains in combating child mortality are not lost and to meet the SDGs," said Feng Zhao, Practice Manager for the Health, Nutrition and Population Global Practice of the World Bank. "The World Bank continues to be committed to helping low- and middle- income countries improve health outcomes for women and children and accelerate reductions in child mortality, including through partnerships like the Global Financing Facility (GFF)."

The UN IGME analyzed COVID-19-related excess mortality based on mortality data the group received from over 80 countries, half of which are low- or middle-income countries. Following analysis of these data and recommendations from its Technical Advisory Group, the UN IGME has not adjusted the 2020 rate for COVID-19-related mortality. However, as more good-quality data become available, further monitoring is needed for a more complete picture of child, adolescent and youth mortality, as well as the relevant contributing factors. Future investments in the COVID-19 response and in global health should strengthen all elements of global healthcare infrastructure, including leaving a lasting impact on data and primary health systems to help end preventable child deaths.

"Intensified efforts are needed to deliver quality health care services for all children and adolescents, which also means collecting the necessary data to ensure that their physical, developmental and emotional needs are being met throughout their life," said Dr Anshu Banerjee, Director of Maternal, Newborn, Child and Adolescent Health and Ageing at the World Health Organization (WHO). "Investing in children is one of the most important things a society can do to build a better future."

The report warns that because the data remains poor, outcomes for children and adolescents in 2021 and beyond remain unknown. For example, the COVID-19 pandemic may affect child mortality differently by age group and socioeconomic status. Timely and accurate data and close monitoring will be needed to understand the long-term impact of COVID-19. MEH

on the WEB • Download the child mortality report: *https://data.unicef.org/resources/levels-and-trends-in-child-mortality/*

the laboratory

Medical research news from around the world

Adapted from Environmental Science & Technology 2021, doi: 10.1021/acs.est.1c03924

Higher numbers of microplastics of various shapes, such as sheets (left) and fibres (right) were found in the faeces of people with IBD than in healthy controls.

People with IBD have more microplastics in their faeces, study finds

Microplastics – tiny pieces of plastic less than 5 mm in length – are everywhere, from bottled water to food to air. They have been found in the deepest part of the ocean and the top of Mount Everest. According to recent estimates, people consume tens of thousands of these particles each year, with unknown health consequences. Now, researchers reporting in *Environmental Science & Technology* found that people with inflammatory bowel disease (IBD) have more microplastics in their faeces than healthy controls, suggesting that the fragments could be related to the disease process.

The prevalence of IBD, which includes Crohn's disease and ulcerative colitis, is rising globally. Characterized by chronic inflammation of the digestive tract, IBD can be triggered or made worse by diet and environmental factors. It has been shown that microplastics can cause intestinal inflammation, gut microbiome disturbances and other problems in animal models, so Faming Zhang, Yan Zhang and colleagues wondered if they could also contribute to IBD. As a first step toward finding out, the researchers wanted to compare the levels of microplastics in faeces from healthy subjects and people with different severities of IBD.

The team obtained faecal samples from 50 healthy people and 52 people with IBD from different geographic regions of China. Analysis of the samples showed that faeces from IBD patients contained about 1.5 times more microplastic particles per gram than those from healthy subjects. The microplastics had similar shapes (mostly sheets and fibres) in the two groups, but the IBD faeces had more small (less than 50 µm) particles. The two most common types of plastic in both groups were polyethylene terephthalate (PET; used in bottles and food containers) and polyamide (PA; found in food packaging and textiles).

People with more severe IBD symptoms tended to have higher levels of faecal microplastics. Through a questionnaire, the researchers found that people in both groups who drank bottled water, ate takeaway food and were often exposed to dust had more microplastics in their faeces. These results suggest that people with IBD may be exposed to more microplastics in their gastrointestinal tract. However, it's still unclear whether this exposure could cause or contribute to IBD, or whether people with IBD accumulate more faecal microplastics as a result of their disease, the researcher say.

- **doi:** *https://doi.org/10.1021/acs.est.1c03924*

For severe heart disease, bypass surgery slightly better than stenting – with caveats, study finds

Patients with severe coronary artery disease generally fared better with bypass surgery than with stents to open blocked arteries, according to a major new multinational study led by Stanford Medicine investigators.

However, some patients benefited more from stents, particularly if their disease wasn't complex, the researchers found.

"The good news for patients is that both groups did better than what was found in previous studies, and the differences between the two strategies has lessened," said William Fearon, MD, professor of cardiovascular medicine and principal investigator of the trial. He said the trial, the largest of its kind, will serve as a guide for determining which approach is best for individual patients.

"I think it will have an immediate impact on how patients and physicians choose treatment," said Fearon, who is also the director of interventional cardiology at Stanford.

A paper describing the study, called the FAME 3 trial, was published online November 4 in *The New England Journal of Medicine*. Fearon shares lead authorship on the paper with Frederick Zimmermann, MD, of Catharina Hospital in the Netherlands. Nico Pijls, MD, PhD, of Catharina Hospital, was the paper's senior author.

Most previous studies of the two heart procedures have shown that bypass surgery produces better results than stents, Fearon noted. But these studies didn't take into consideration a number of recent advances in stent technology, he said. The goal of the latest trial, which involved 1,500 patients in 24 countries, was to determine if these advances have shifted the balance and prove stents to be as good, or better, than bypass.

For years, clinicians relied exclusively on angiograms to determine whether the vessels were sufficiently narrowed by plaque build-up to warrant intervention. But angiograms can be misleading, showing a tight space within a vessel when none exists, Fearon said.

A better diagnostic tool, known as fractional flow reserve, or FFR, can measure whether blood flow has been reduced to a dangerous level. Doctors thread a wire with a small sensor on the tip into the artery to measure the pressure of the flow. In a significantly narrowed vessel, the blood pressure will drop in that segment of the vessel beyond the narrowing, signalling the need for intervention.

In the FAME 1 study, whose results were published in 2009, Fearon and his colleague found that use of FFR led to fewer stent placements and fewer complications when compared with stenting based on angiogram images alone. Among patients with FFR-guided stents, the rates of death, heart attack and the need for repeat procedures were significantly less, they found.

The good news for patients is that both groups did better.

Now, clinicians also are using second-generation stents with thinner struts that are less likely to lead to blood clots or re-narrowing, common complications of earlier-generation stents, Fearon said. In addition, today's stents are coated with a bio-friendly polymer that doesn't cause inflammation, as previous ones did, he said. The stents are designed to slowly release a drug that helps prevent re-narrowing of the artery.

In the latest study, the researchers compared these new stents, guided by FFR, with bypass surgery in patients who had three blocked coronary vessels. The patients, whose average age was 65, were randomly assigned to two groups, with 757 receiving the stents and 743 undergoing surgery. In the bypass procedure, doctors take a healthy blood vessel from the patient's leg, arm or chest and stitch it above and below the blocked artery to create a clear channel.

Among the stent group, the incidence of a major complication – death, heart attack, stroke or the need for a repeat procedure – was 10.6% after a year. Among bypass patients, the rate was 6.9%. However, when the need for a repeat procedure was excluded from the equation, the figures were more aligned: 7.3% for stents versus 5.2% for bypass. The difference is not statistically significant, Fearon said.

The researchers looked at results based on the patients' underlying coronary disease. They found that patients with less complex coronary artery disease did better with stents, as physicians could limit the number of the mesh tubes they had to place. (Complex coronary artery disease includes conditions such as plaque build-up that is calcified, causes complete blockage of a blood vessel, occurs at branching points or is very extensive.)

"I think the study results will guide both physicians and patients on the best strategy for their circumstances," Fearon said. "If patients have very complex disease that would require numerous stents, then bypass might be a better option. If they have less complex disease, they can feel reassured that by receiving the latest generation of drug-eluting stents guided by FFR, their outcomes would be just as good as they would be with surgery."

He said stents also have an advantage in that they entail shorter hospital stays and faster recoveries. Patients who receive stents generally go home the same day and recover quickly. Bypass patients, on the other hand, may remain in the hospital for as many as five days or longer, with a recovery time of six to eight weeks. In the study, bypass patients also had a higher incidence of major bleeding, arrythmia, acute kidney injury and rehospitalization within 30 days.

Overall, Fearon said the study shows just how much care for these patients has improved over the years.

Researchers from 47 other institutions in the United States and abroad also contributed to the work.

• doi: https://doi.org/10.1056/NEJMoa2112299

Researchers develop novel form of fast, precise histopathology using holographics

A common strategy to make vaccines more powerful is to deliver them along with an adjuvant – a compound that stimulates the immune system to produce a stronger response.

Researchers from MIT, the La Jolla Institute for Immunology, and other institutions have now designed a new nanoparticle adjuvant that may be more potent than others now in use. Studies in mice showed that it significantly improved antibody production following vaccination against HIV, diphtheria, and influenza.

"We started looking at this particular formulation and found that it was incredibly potent, better than almost anything else we had tried," says Darrell Irvine, the Underwood-Prescott Professor with appointments in MIT's departments of Biological Engineering and Materials Science and Engineering; an associate director of MIT's Koch Institute for Integrative Cancer Research; and a member of the Ragon Institute of MGH, MIT, and Harvard.

The researchers now hope to incorporate the adjuvant into an HIV vaccine that is currently being tested in clinical trials, in hopes of improving its performance.

Irvine and Shane Crotty, a professor at the Center for Infectious Disease and Vaccine Research at the La Jolla Institute for Immunology, are the senior authors of the study, which appears in *Science Immunology*.

Saponin

Although the idea of using adjuvants to boost vaccine effectiveness has been around for decades, there are only a handful of FDA-approved vaccine adjuvants. One is aluminium hydroxide, an aluminium salt that induces inflammation, and another is an oil and water emulsion that is used in flu vaccines. A few years ago, the FDA approved an adjuvant based on saponin, a compound derived from the bark of the Chilean soapbark tree.

Saponin formulated in liposomes is now used as an adjuvant in the shingles vaccine, and saponins are also being used in a cage-like nanoparticle called an immunostimulatory complex (ISCOM) in a Covid-19 vaccine that is currently in clinical trials.

Researchers have shown that saponins promote inflammatory immune responses and stimulate antibody production, but how they do that is unclear. In the new study, the MIT and La Jolla team wanted to figure out how the adjuvant exerts its effects, and to see if they could make it more potent.

They designed a new type of adjuvant that is similar to the ISCOM adjuvant but also incorporates a molecule called MPLA, which is a toll-like receptor agonist. When these molecules bind to toll-like receptors on immune cells, they promote inflammation. The researchers call their new adjuvant SMNP (saponin/MPLA nanoparticles).

"We expected that this could be interesting because saponin and toll-like receptor agonists are both adjuvants that have been studied separately and shown to be very effective," Irvine says.

The researchers tested the adjuvant by injecting it into mice along with a few different antigens, or fragments of viral proteins. These included two HIV antigens, as well as diphtheria and influenza antigens. They compared the adjuvant to several other approved adjuvants and found that the new saponin-based nanoparticle elicited a stronger antibody response than any of the others.

One of the HIV antigens that they used is an HIV envelope protein nanoparticle, which presents many copies of the gp120 antigen that is present on the HIV viral surface. This antigen recently completed initial testing in phase 1 clinical trials. Irvine and Crotty are part of the Consortium for HIV/AIDS Vaccine Development at the Scripps Research Institute, which ran that trial. The researchers now hope to develop a way to manufacture the new adjuvant at large scale so it can be tested along with an HIV envelope trimer in another clinical trial beginning next year. Clinical trials that combine envelope trimers with the traditional vaccine adjuvant aluminium hydroxide are also underway.

"Aluminium hydroxide is safe but not particularly potent, so we hope that (the new adjuvant) would be an interesting alternative to elicit neutralizing antibody responses in people," Irvine says.

Rapid flow

When vaccines are injected into the arm, they travel through lymph vessels to the lymph nodes, where they encounter and activate B cells. The research team found that the new adjuvant speeds up the flow of lymph to the nodes, helping the antigen to get there before it starts to break down. It does this in part by stimulating immune cells called mast cells, which previously were not known to be involved in vaccine responses.

"Getting to the lymph nodes quickly is useful because once you inject the antigen, it starts slowly breaking down. The sooner a B cell can see that antigen, the more likely it's fully intact, so that B cells are targeting the structure as it will be present on the native virus," Irvine says.

Additionally, once the vaccine reaches the lymph nodes, the adjuvant causes a layer of cells called macrophages, which act as a barrier, to die off quickly, making it easier for the antigen to get into the nodes.

Another way that the adjuvant helps boost immune responses is by activating inflammatory cytokines that drive a stronger response. The TLR agonist that the researchers included in the adjuvant is believed to amplify that cytokine response, but the exact mechanism for that is not known yet.

This kind of adjuvant could also be useful for any other kind of subunit vaccine, which consists of fragments of viral proteins or other molecules. In addition to their work on HIV vaccines, the researchers are also working on a potential Covid-19 vaccine, along with J. Christopher Love's lab at the Koch Institute. The new adjuvant also appears to help stimulate T cell activity, which could make it useful as a component of cancer vaccines, which aim to stimulate the body's own T cells to attack tumours.

• **doi:** *https://doi.org/10.1126/sciimmunol.abf1152*

Melatonin exacerbates asthma, study finds

Patients with asthma often experience a worsening of asthmatic symptoms at night in so-called "nocturnal asthma". According to reports, more than 50% of asthma deaths occur at night, exposing a link between nocturnal asthma symptoms and asthma deaths. Although some have proposed several triggers that explain the pathogenesis of nocturnal asthma, the precise mechanisms regulating this asthma phenotype remain obscure.

Now, a research group led by Kentaro Mizuta from Tohoku University Graduate School of Dentistry has discovered that melatonin, a sleep hormone, worsens asthma.

Asthma patients suffer from bronchoconstriction, where the smooth muscles of the bronchus – the pathway that moves air to and from your lungs – contract. To ease this, many take a bronchodilator, a medicine which widens the bronchus.

However, melatonin, which is often prescribed for insomnia, favours a state of bronchoconstriction and weakens the relaxing effect of a bronchodilator through the activation of the melatonin MT2 receptor.

To elucidate this, the research group identified the expression of the melatonin MT2 receptor in human airway smooth muscle. They observed that the activation of the melatonin MT2 receptor with higher doses of melatonin or melatonin receptor agonist ramelteon greatly potentiated the bronchoconstriction. Furthermore, melatonin attenuated the relaxing effects of the widely used bronchodilator βadrenoceptor agonist.

"Although serum concentration of melatonin did not significantly induce

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Arab Health January 26th, 15:30pm

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AV Neo is a revolutionary procedural technique to reconstruct the aortic heart valve using the patient's own pericardial tissue.
Arab Health January 24th 15:00pm

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Arab Health
By Informa Markets

Abdul Latif Jameel HEALTH

1945 - 2020 75 YEARS

the airway constriction, greater doses of melatonin, which is clinically used to treat insomnia, jet lag, or cancer, worsened asthma symptoms and impaired the therapeutic effect of bronchodilators," said Mizuta.

First author of the paper Haruka Sasaki added: "The pharmacological therapy that blocks the melatonin MT2 receptor could inhibit the detrimental effects of melatonin on airways."

The research paper was published in the *American Journal of Physiology Lung Cellular and Molecular Physiology* on November 16, 2021.

- **doi:** *https://bit.ly/3GbrjjP*

Scientists explain why neurons consume so much fuel even when at rest

_DJ_/Flickr

Pound for pound, the brain consumes vastly more energy than other organs, and, puzzlingly, it remains a fuel-guzzler even when its neurons are not firing signals called neurotransmitters to each other. Now researchers at Weill Cornell Medicine have found that the process of packaging neurotransmitters may be responsible for this energy drain.

In their study, reported December 3 in *Science Advances*, they identified tiny capsules called synaptic vesicles as a major source of energy consumption in inactive neurons. Neurons use these vesicles as containers for their neurotransmitter molecules, which they fire from communications ports called synaptic terminals to signal to other neurons. Packing neurotransmitters into vesicles is a process that consumes chemical energy, and the researchers found that this process, energy-wise, is inherently leaky – so leaky that it continues to consume significant energy even when the vesicles are filled and synaptic terminals are inactive.

"These findings help us understand better why the human brain is so vulnerable to the interruption or weakening of its fuel supply," said senior author Dr. Timothy Ryan, a professor of biochemistry and of biochemistry in anaesthesiology at Weill Cornell Medicine.

The observation that the brain consumes a high amount of energy, even when relatively at rest, dates back several decades to studies of the brain's fuel use in comatose and vegetative states. Those studies found that even in these profoundly inactive states, the brain's consumption of glucose typically drops from normal by only about half, which still leaves the brain as a high energy consumer relative to other organs. The sources of that resting energy drain have never been fully understood.

Dr. Ryan and his laboratory have shown in recent years that neurons' synaptic terminals, bud-like growths from which they fire neurotransmitters, are major consumers of energy when active, and are very sensitive to any disruption of their fuel supply. In the new study they examined fuel use in synaptic terminals when inactive, and found that it is still high.

This high resting fuel consumption, they discovered, is accounted for largely by the pool of vesicles at synaptic terminals. During synaptic inactivity, vesicles are fully loaded with thousands of neurotransmitters each, and are ready to launch these signal-carrying payloads across synapses to partner neurons.

Why would a synaptic vesicle consume energy even when fully loaded? The researchers discovered that there is essentially a leakage of energy from the vesicle membrane, a "proton efflux", such that a special "proton pump" enzyme in the vesicle has to keep working, and consuming fuel as it does so, even when the vesicle is already full of neurotransmitter molecules.

The experiments pointed to proteins called transporters as the likely sources of this proton leakage. Transporters normally bring neurotransmitters into vesicles, changing shape to carry the neurotransmitter in, but allowing at the same time for a proton to escape – as they do so. Dr. Ryan speculates that the energy threshold for this transporter shape-shift was set low by evolution to enable faster neurotransmitter reloading during synaptic activity, and thus faster thinking and action.

"The downside of a faster loading capability would be that even random thermal fluctuations could trigger the transporter shape-shift, causing this continual energy drain even when no neurotransmitter is being loaded," he said.

Although the leakage per vesicle would be tiny, there are at least hundreds of trillions of synaptic vesicles in the human brain, so the energy drain would really add up, Dr. Ryan said.

The finding is a significant advance in understanding the basic biology of the brain. In addition, the vulnerability of the brain to the disruption of its fuel supply is a major problem in neurology, and metabolic deficiencies have been noted in a host of common brain diseases including Alzheimer's and Parkinson's disease. This line of investigation ultimately could help solve important medical puzzles and suggest new treatments.

- **doi:** *https://doi.org/10.1126/sciadv.abi9027*

Researchers develop clearer, more visual pattern to diagnose and monitor drug-induced liver injury

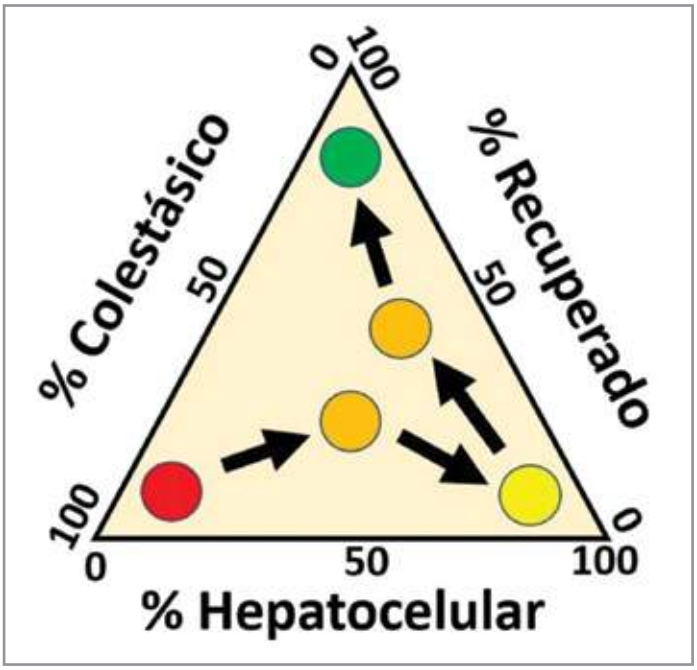
Drug-induced liver injury (DILI) is an adverse reaction to ingesting a drug, which can appear both in developmental stages, in their clinical use and even after being approved as a drug. It is the main cause of acute liver failure in Europe and the United States, and its incidence has increased as a result of the polypharmacy that goes hand in hand with the increased lifespan of the population, and from the prolonged use of parapharmacy or herbal products.

Hepatitis induced by drugs comes in three clinically differentiated forms. With a predominance of hepatocellular damage and the death of lymphocytes, as a cholestasis (decreased bile flow) or under a mixed pattern. The unpredictability of this pathology, its clinical relevance, deficient diagnosis and lack of prognostic markers represent a healthcare concern. Drug-induced hepatitis is not diagnosed directly by measuring certain specific parameters of the disease, but it is still done by diagnostic criteria of exclusion – after discarding other possible causes.

The research group of the University of Valencia Mixed Group-IIS La Fe for Experimental Hepatology and Liver Transplant, led by professor José Vicente Castell, and integrated within the CIBEREHD, has addressed this issue by combining its trajectory studying hepatotoxicity caused by drugs, with the used of advanced omics technology. This study is unique, as it is the first time that metabolomics have been used, or the study of the changes in metabolites that take place in a biological sample of the blood of the patients, in this case, during a liver disease.

Data analysis and modelling

The article 'Metabolomic analysis to discriminate drug-induced liver injury (DILI) phenotypes', published in the journal *Archives of Toxicology*, includes a longitudinal observational study conducted on 79 patients affected by DILI, diagnosed and recruited over three years in the La Fe hospital, as part of European project HECATOS, in which the University of Valencia played a significant role.



Instituto de Investigación Sanitaria La Fe

Through the metabolomic analysis of blood samples of these patients, obtained during their liver process until their full recovery (weeks/months), they assessed hundreds of metabolites in the plasma, the molecules that are part of liver cell metabolism. This made it possible to obtain a large amount of information which, duly processed using biocomputing mathematical models, "allowed us to identify a group of metabolites that, as a signature or analytical footprint, turned out to be characteristic and discriminating of the phenotype and severity of the disease", says Guillermo Quintás, first signee of the study.

The study reveals and backs the existence of relevant metabolic biomarkers for the cholestatic and hepatocellular phenotypes of DILI. Measuring these biomarkers makes it possible to establish the level of hepatocellular damage, cholestasis or level of recovery that a patient has when the sample was taken.

All the information obtained from each sample of every patient has been condensed by the authors in the form of ternary graphic diagrams which can be directly and easily interpreted.

"Each one of the apexes of the triangle represents the level of hepatocellular or cholestatic damage or level of recovery of a patient at a given moment in time. The information obtained from the metabolome makes it possible to place within said ternary diagram a point that represents the patient and whose distance to the vertexes indicates the phenotype of the DILI and its severity," says José Vicente Castell, senior researcher and promoter of this scientific initiative.

"Representing the data from the metabolomic analysis in the ternary diagram and throughout the liver process allows us to visualize very intuitively the evolution of the disease and the level of recovery," says Isabel Conde, who was in charge of recruiting and diagnosing patients with DILI.

This way of addressing the study of patients with DILI, using metabolomics, is completely innovative and offers advantages over the current way of diagnosing and monitoring these patients. This strategy paves the way for a more direct and specific diagnosis, and for an accurate monitoring of drug-based hepatitis or DILI, as well as establishing the level of functional recovery of the damaged liver, beyond the mere absence of enzymatic markers in the blood.

doi: *https://doi.org/10.1007/s00204-021-03114-z*

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Sheikh Saeed Hall 1 - S1.D10

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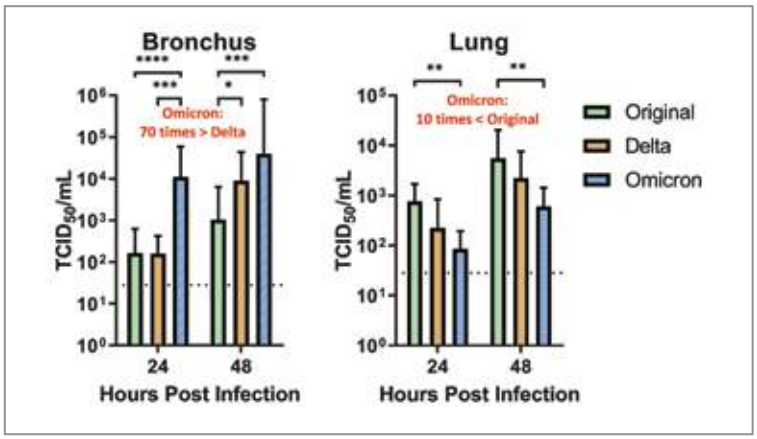
Za'abeel Hall 4 - Z4.E10

SIEMENS Healthineers

HKUMed researchers find Omicron can infect faster and better than Delta in human bronchus but with less severe infection in lung

A study led by researchers from the LKS Faculty of Medicine at The University of Hong Kong (HKUMed) provides the first information on how the novel Variant of Concern (VOC) of SARS-CoV-2, the Omicron SARS-CoV-2 infects the human respiratory tract. The researchers found that Omicron SARS-CoV-2 infects and multiplies 70 times faster than the Delta variant and original SARS-CoV-2 in the human bronchus, which may explain why Omicron may transmit faster between humans than previous variants. Their study also showed that the Omicron infection in the lung is significantly lower than the original SARS-CoV-2, which may be an indicator of lower disease severity. This research, noted in a 15 December 2021 news release, was under peer review for publication.



Dr Michael Chan Chi-wai, Associate Professor of School of Public Health and Principal Investigator, Centre for Immunology and Infection (C2i), Hong Kong Science and Technology Park (HKSTP) and Professor John Nicholls, Professor of Department of Pathology, HKUMed have pioneered the use of ex vivo cultures of the respiratory tract for investigating many emerging virus infections since 2007, such as avian influenza, coronavirus of the Middle East Respiratory Syndrome (MERS). Now this technique has been applied to understand why the Omicron variant may differ in transmission and disease severity from other SARS-CoV-2 variants.

This method uses lung tissue removed for treatment of the lung, which is normally discarded, for investigating virus diseases of the respiratory tract. Dr Chan and his team successfully isolated the Omicron SARS-CoV-2 variant and used this experimental model to compare infection with the original SARS-CoV-2 from 2020, the Delta variant and the recent Omicron variant. They found that the novel Omicron variant replicates faster than the original SARS-CoV-2 virus and Delta variant in the human bronchus. At 24 hours after infection, the Omicron variant replicated around 70 times more than the Delta variant and the original SARS-CoV-2 virus. In contrast, the Omicron variant replicated less efficiently (more than 10 times lower) in the human lung tissue than the original SARS-CoV-2 virus, which may suggest lower severity of disease.

"It is important to note that the severity of disease in humans is not determined only by virus replication but also by the host immune response to the infection, which may lead to dysregulation of the innate immune system, i.e. 'cytokine storm'," said Dr Chan. "It is also noted that, by infecting many more people, a very infectious virus may cause more severe disease and death even though the virus itself may be less pathogenic. Therefore, taken together with our recent studies showing that the Omicron variant can partially escape immunity from vaccines and past infection, the overall threat from Omicron variant is likely to be very significant."

Children with poorly controlled asthma at higher risk of COVID-19 hospitalisation

Children with poorly controlled asthma infected with COVID-19 are more likely to require hospitalisation than children with well controlled asthma, or those without asthma. The analysis is the first of its kind investigating COVID-19 hospitalisation among 5-17 year olds living in Scotland, UK, between March 2020 and July 2021.

The findings, published in *The Lancet Respiratory Medicine*, suggest that current UK recommendations to offer COVID-19 vaccination to all 12-17 year olds should now be expanded to include children with poorly controlled asthma aged 5 and older.

The authors say that prioritising this group of children for COVID-19 vaccination has important implications for vaccine delivery worldwide by reducing the risk of COVID-19 infection, associated illness and consequently the need for children to have time off school. However, the overall risk of children with asthma becoming seriously ill with COVID-19 is low, with 1 in 380 children with poorly

controlled asthma in the study hospitalised with COVID-19.

"Understanding which children with asthma are at increased risk of serious COVID-19 outcomes is critical to ongoing policy deliberations on vaccine prioritisation," says lead author Professor Aziz Sheikh from the University of Edinburgh, Scotland. "Our analysis provides the first national evidence of the risk of COVID-19 hospitalisations among school-aged children with markers of poorly controlled asthma.

"The key takeaway from this study is that keeping children's asthma under control is critical as this greatly reduces the risk of COVID-19 hospitalisation. Vaccinating those with poorly controlled asthma offers an additional important layer of protection from serious COVID-19 outcomes."

At the request of the UK's Joint Committee on Vaccination and Immunisation (JCVI), researchers analysed data from the Scotland-wide Early Pandemic Evaluation and Enhanced Surveillance of COVID-19 (EAVE II) reporting platform between 1st March 2020 and 27th July 2021 to identify which children with asthma were at increased risk of severe COVID-19, leading to hospitalisation within 14 days of a positive real-time reverse transcription-polymerase chain reaction (PT-PCR) test, or death from any cause within 28 days after a positive test for SARS-CoV-2. EAVE II allows rapid analysis of data from routinely collected electronic health records and linked national databases for 5.4 million people.

In total, 752,867 children aged 5-17 years old were included in the analysis. Among 63,463 children (8.4%) with a diagnosis of asthma, 4,339 (6.8%) had a confirmed SARS-CoV-2 infection, and 67 (1.5%) of these were admitted to hospital with COVID-19. There were nine intensive care admissions or deaths in children with asthma, which prevented detailed evaluation of these most severe outcomes. Overall, 40,231 (5.8%) of children without asthma had a confirmed SARS-CoV-2 infection, of whom 382 (0.9%) were hospitalised with COVID-19.

The study found that 5-17 year olds with poorly controlled asthma (defined as being hospitalised with asthma within the past two years) were more likely to be admitted to hospital with COVID-19 (548 COVID-19 hospitalisations per 100,000 children), compared to children with well-controlled asthma (94 hospitalisations per 100,000 children), or without asthma (55 hospitalisations per 100,000 children).

Similar analyses were done using treatment with one or more courses of oral steroids (a medication commonly used to treat asthma attacks) over the past two years as the marker of uncontrolled asthma. 5-17 year-olds with uncontrolled asthma were more likely to be hospitalised due to COVID-19 (94 and 231 hospitalisations per 100,000 children for one and two courses respectively) compared to children without asthma (54 hospitalisations per 100,000 children).

After adjusting for factors that are known to be linked with increased risk of serious COVID-19 outcomes, including age, sex, socioeconomic status, other illnesses or conditions, and previous non-asthma related hospitalisations, researchers found that children who had recently been hospitalised with asthma were six times more likely to be admitted to hospital with COVID-19 than those without asthma, while children who had recently been prescribed oral steroids faced a three times higher risk of hospitalisation due to COVID-19. MEH

- **doi:** *https://bit.ly/3rq3i2v*

Changes in the blood, not the heart, may underlie cardiac thrombosis in COVID-19 patients

Researchers examined autopsy tissue samples of hearts from patients who died early in the COVID-19 pandemic. Frequent and extensive blood clots (thromboses) within heart vessels were found as anticipated, but the type of changes in the endothelial cells lining the heart that are typically observed in thromboses were absent. Instead, data indicated the likely culprit to be hypercoagulability of the blood caused by activated neutrophils, a type of white blood cell. Their findings are published in *The American Journal of Pathology*.

"My laboratory has a long history of defining endothelial cell alterations that produce pathologies, including thrombosis, and we expected to confirm the widely held assumption that local endothelial cell alterations were responsible for thrombosis of the cardiac vessels in COVID-19 patients," explained lead investigator Jordan S. Pober, MD, PhD, Department of Immunobiology, Yale University School of Medicine. "Instead, we found that the cardiac thrombi contained neutrophils that expressed changes known to promote coagulation, including changes that are associated with cell death and inflammation."

Hospitalized patients with SARS-CoV-2 infection have an increased risk of developing myocardial injury. However, numerous studies have rarely detected viral protein or RNA within the hearts of patients who died from COVID-19, despite evidence of abundant virus presence in the lungs of the same patients. Thrombosis of micro and macro coronary vessels has most consistently characterized the hearts of individuals who succumbed to COVID-19, but the underlying cause remains unknown.

Dr. Pober and his colleagues examined heart tissue from seven autopsies of COVID-19 patients performed early in the pandemic, before anticoagulation treatment was commonly administered, and compared these specimens to autopsy tissue from 12 COVID-19–negative controls, with and without heart disease, using multiparameter fluorescence microscopy to analyse the composition of the thrombosed vessels. All patients in the COVID-19 group had severe pneumonia. One patient experienced a sudden cardiac arrest outside of the hospital, two patients developed sepsis, and one patient had recurrent acute leukaemia with thrombocytopenia. The COVID-19–negative controls included six patients with pre-existing cardiac disease.

Thrombosis was the most common pathological finding in the COVID-19 group with a greatly elevated frequency of microthrombi and total number of macrothrombi compared to the COVID-19–negative controls. Despite the widespread evidence of thrombosis, no evidence of myocyte death or acute inflammation typically associated with myocardial infarction was detected in the COVID-19 group.

The vessels of the heart were examined for signs of endothelial cell injury, which can promote thrombosis through release of microparticles containing procoagulative

tissue factor, or by endothelial cell sloughing that can expose platelet activating collagen. The investigators failed to find such endothelial changes at sites of thrombosis. Instead, they saw that the cardiac thrombi in four of the six COVID-19 patients contained neutrophils that expressed procoagulant changes in the blood, such as citrullination of histones associated with formation of neutrophil extracellular traps (NETs). Some images suggest NETS that appear to be directly associated with platelets. Neutrophil-rich macrothrombi composed of 30% or more neutrophils were common in the COVID-19 group but not in control tissue specimens.

Dr. Pober commented: "Our data challenge the view that alterations in the heart vessel wall are the primary cause of COVID-19 cardiac thrombosis. Current treatments of severe COVID-19 include anticoagulation, but the best strategy is still not clear. In light of our findings, reducing neutrophil responses could be an important target for therapeutic intervention. This and many other advances in the understanding of disease continue to be provided by autopsies, and I am grateful to the pathologists who performed them for this study at both Brigham and Women's Hospital and Yale."

Peter Libby, MD, a cardiologist and vascular biologist at Boston's Brigham and Women's Hospital and the Harvard Medical School, a long-time collaborator of Dr. Pober's, stated: "For several years we have studied neutrophils and their prothrombotic products known as NETs in the context of clots that form in the larger coronary arteries. The finding of neutrophil involvement in the smaller blood vessels that course through the heart muscle in COVID-19 extends our understanding of cardiac injury that we often see in patients with severe SARS-CoV-2 infection. Brigham pathologists Robert F. Padera, Jr., MD, PhD, and Richard N. Mitchell, MD, PhD, helped us enormously by providing tissue samples for these analyses early on in our experience with this pandemic."

• **doi:** *https://doi.org/10.1016/j.ajpath.2021.09.004*

Long-term blood sugar history predicts risk of severe COVID-19 among diabetics

People with type 2 diabetes who contract COVID-19 are nearly 50% more likely to wind up in intensive care if they have poorly managed their blood sugar levels over the long-term than those with better long-term glycaemic control, according to a study using anonymized health care data. The study, which looked at several potential impacts to COVID-19 severity among diabetics, also calculated a lower risk for patients using the common diabetes-control medication metformin, or a combination of metformin and insulin, or corticosteroids.

"We find that two- to three-year longitudinal glycaemic levels better indicate the risk of COVID-19 severity than measurements which look at a shorter period of time," said Deepak Vashishth, corresponding author, professor of biomedical engineering, and director of the Center for Biotechnology and Interdisciplinary Studies at Rensselaer Polytechnic Institute. "We hope these insights aid physicians in better treating and managing high-risk patients."

"Evaluation and management of COVID-19-related severity in people with type 2 diabetes" looked at records for more than 16,000 people with type 2 diabetes and COVID-19 between 2017 and 2020, and was published in *BMJ Open Diabetes Research & Care*.

Type 2 diabetes patients are unable to regulate the amount of the sugar glucose in their bloodstream without medication and managing their diet. Chronic high blood-sugar levels, typically tracked as the percentage of haemoglobin A1c (HbA1c) found in the blood, can damage a variety of functions, including the circulatory, nervous, and immune systems.

Poor glycaemic control creates a reaction that causes molecules known as advanced glycation end-products (AGEs) to accumulate, deteriorating the quality of bone over time, and Vashishth, an expert in bone, researches the impact of diabetes on bone. At the time the SARS-CoV-2 pandemic began, his research team was investigating whether measurements of longitudinal glycaemic control – measures of blood-sugar levels averaged over two to three years – could provide a more accurate predictor of bone fracture risk among diabetics than the current standard predictor, which relies on measurements of bone mineral density.

AGEs are known to contribute to increased oxidant stress and inflammation, which are risk factors in COVID-19 and other respiratory illnesses. The team reasoned that the same longitudinal glycaemic control measurement they were testing as a predictor of bone fracture risk might be useful in predicting the severity of COVID-19, said Bowen Wang, first author and a doctoral student in Vashishth's lab.

Wang divided the records of type 2 diabetic patients in the study into two groups, those with "adequate" longitudinal glycaemic control ranging from 6 to 9%, and those with "poor" glycaemic control of 9% or above over two to three years. His

> We find that two- to three-year longitudinal glycaemic levels better indicate the risk of COVID-19 severity than measurements which look at a shorter period of time.

analysis of the two groups revealed that those with poor glycaemic control were 48% more likely to require treatment in an intensive care unit. By another measure, a 1% increase in longitudinal HbA1c is directly associated with a 12% increase in the risk of landing in the ICU.

Other statistically significant findings showed that diabetics who were taking metformin when they contract COVID-19 face a 12% lower risk of visiting the ICU, those on metformin and insulin have an 18% lower risk, and those prescribed corticosteroids have a 29% lower risk.

"People knew that diabetes was a risk factor for COVID-19-related outcomes, but not all diabetic patients are the same. Some people have a longer history of diabetes, some have more severe diabetes, and that has to be accounted for," said Wang. "What this study does is to better stratify the level of diabetes within the population, so diabetic patients aren't treated as a single population without any differences among them."

• **doi:** *https://doi.org/10.1136/bmjdrc-2021-002299*

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Researchers use new strategy to develop potential medication for SARS-CoV-2

Vaccines against the SARS-CoV-2 virus have been made possible by an unprecedented worldwide partnership. But medications against Covid-19 have as yet seen only partial success. With the support of the Bavarian Research Foundation, a Munich research team has developed a protein which has reliably prevented infection by the virus and its variants in cell culture tests. Their research is published in the December 2021 issue of *Antiviral Research*.

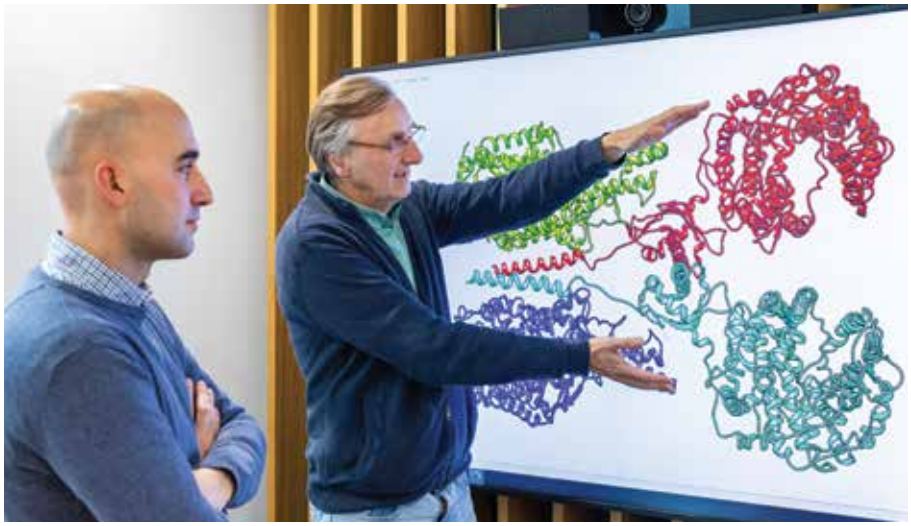
The SARS-CoV-2 virus uses a protein called Angiotensin Converting Enzyme 2 (ACE2) on the surface of human cells as an entry gate. This is where the spike protein of the virus finds a hold in order to ultimately infect the cell.

Recombinant antibodies are already being used in therapy for Covid-19 illnesses, including at the TUM University Hospital rechts der Isar; nevertheless the virus has used mutation to evade attacks by therapeutic antibodies and in part also the natural antibodies formed after vaccination.

A team of scientists from the Technical University of Munich (TUM), the Ludwig Maximilians-University of Munich, Helmholtz Munich, and Munich-based Formycon AG are pursuing a different strategy: They have combined the ACE2 protein with part of a human antibody protein and have thus created an active ingredient which blocks the spike protein of the virus. In cell culture tests they were able to completely neutralize the virus and prevent infection.

"Both vaccines and antibody medications have the same problem, that the virus manages to evade them by just a little bit more with each successful mutation," says Ulrike Protzer, head of the Institute of Virology at the Technical University of Munich and at Helmholtz Munich. "This results in what are called immune escape variants."

The team led by Prof. Protzer and Johannes Buchner, Professor of Biotechnology at the Department of Chemistry of the Technical University of Munich in Garching, is thus focusing on the most important target of the virus, the ACE2 protein.



TUM

Dr. Hristo Svilenov und Prof. Johannes Buchner

Since the simple ACE2 protein would be broken down too quickly by other enzymes in the human body, the team fused the ACE2 protein with a fragment of the human antibody immunoglobulin G (IgG).

e virus needs optimum docking on the ACE2 protein in order to survive, the virus cannot evade a medication which is based on exactly this protein," says Prof. Buchner, adding, "The fusion protein will therefore also be reliably effective against future mutations."

Laboratory testing involving the fusion protein, dubbed FYB207 internally, the original virus and the Alpha, Beta and Delta variants confirm the research team's assumption. Testing with the new Omicron variant is currently starting.

ACE2 protein provides additional protection

FYB207 can potentially be administered against all Corona virus types which use ACE2 as a docking point – not only against variants of the current SARS-CoV-2 virus. ACE2 also has a natural enzyme activity in the cardio-vascular system which could offer additional protection against the threat of organ failure for the lungs, heart and kidneys.

Research work began with the testing of various combinations of ACE2 and immunoglobulin fragments as fusion proteins in the laboratory. The team decided on a fragment of the IgG4 protein regarded as a reliable fusion partner. Minute mutations were introduced in order to increase stability. Two variants are currently undergoing thorough investigation in pre-clinical studies.

"The fusion protein can be easily created biotechnologically," says Dr. Carsten Brockmeyer, co-author of the study and CEO of Formycon AG. "In the context of the partnership we also made sure that the selected active ingredient variants have pharmacologically favorable properties. We hope to be able to begin with the first clinical studies in the first half of the upcoming year."

"The SARS-CoV-2 virus and its related variants will continue to challenge humanity in the future," says Prof. Ulrike Protzer. "Even if vaccination is a highly reliable way to prevent severe symptoms in the course of the illness, the significantly more contagious Delta and Omicron variants have shown that both recovered and vaccinated patients can be re-infected. With regard to future, possibly even more contagious variants, we need a broadly efficacious active ingredient against the virus in addition to vaccination." MEH

• doi: https://doi.org/10.1016/j.antiviral.2021.105197

All-round analysis of immune responses after COVID-19 vaccination

A powerful trio of CE-marked tests from EUROIMMUN enables comprehensive investigation of immune responses to SARS-CoV-2 following COVID-19 vaccination or infection. The analyses encompass quantitative measurement of anti-S1/RBD antibodies, detection of neutralising antibodies targeting S1/RBD and analysis of specific T cells.

Antibody detection

Quantitative detection of antibodies against S1/RBD aids assessment of the immune reaction following vaccination with spike protein-based vaccines or the individual immune response to SARS-CoV-2 after infection. The fully automatable Anti-SARS-CoV-2 QuantiVac ELISA (IgG) enables quantitative measurement of IgG antibodies against S1/RBD using a six-point calibration curve. The antibody concentration is measured in standardised binding antibody units (BAU/ml) based on the international reference material (NIBSC code: 20/136).

Measurement of the neutralising activity of anti-S1/RBD antibodies enables confirmation of their functionality in inhibiting binding of S1/RBD to the host ACE2 receptors and thus preventing infection. The SARS-CoV-2 NeutraLISA provides fast and economical determination of the inhibiting effect of anti-SARS-CoV-2 antibodies in patient samples, serving as a surrogate virus neutralisation test. It demonstrates a high (98.6%) agreement with the gold standard plaque reduction neutralisation test. The assay takes just two hours to perform and is automatable, making it suitable for high-throughput diagnostics.

T-cell analysis

T-cell immunity, in particular against the spike protein, is associated with strong protection against SARS-CoV-2 and plays a particularly important role in patients who not exhibit measurable concentrations of specific antibodies. The T-cell-mediated cellular immune response to SARS-CoV-2 can be determined using the Quan-T-Cell System, an interferon gamma release assay (IGRA). The test is performed on heparinised whole blood samples, circumventing the need to prepare purified peripheral mononuclear cells (PBMCs). The T cells in the samples are stimulated using spike protein-based antigens in the provided tubes and the released IFN-γ is subsequently measured using a fully automatable quantitative ELISA. The EUROIMMUN assay is well established in the research field and is also suitable for routine in vitro diagnostics. MEH

Mechanism for DNA invasion of adenoviral COVID-19 vaccines discovered

Adenoviruses have a linchpin protein that stabilizes their DNA until it reaches the infected cell's nucleus. The protein then detaches from the viral genome, and the virus uncoats. Only then are the genes released into the nucleus, which is necessary for the production of new viruses. This process, discovered by researchers at the University of Zurich, is a key for effective functioning of various COVID-19 vaccines.

Adenoviruses cause respiratory illnesses in humans and have been used as vectors in vaccination for many years, for example against MERS and Ebola virus. Several Covid-19 vaccines are based on replication-defective adenoviruses, including products from AstraZeneca, Johnson & Johnson, CanSino Biologics and Sputnik V. The vaccinated cells produce the SARS-CoV-2 spike protein on their surface, and thereby trigger a protective immune response in the human body.

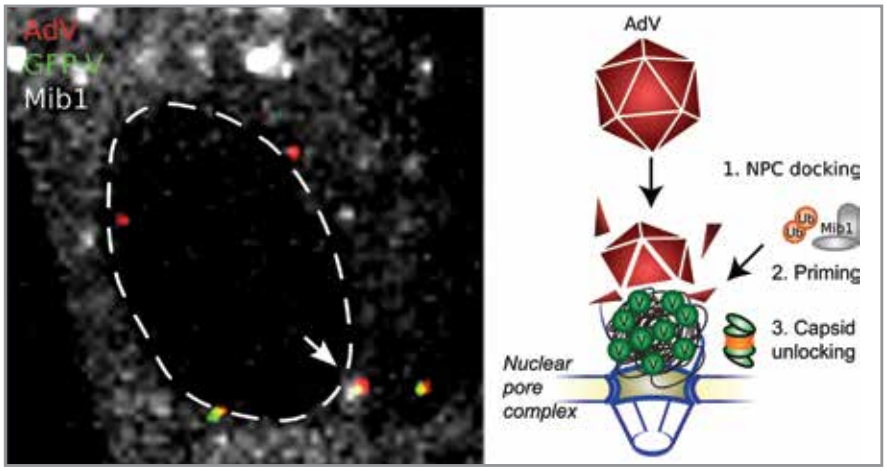


Image: Michael Bauer and Alfonso Gomez-Gonzalez, UZH

Incoming adenovirus particles (AdV) dock at the nuclear pore complexes of a human cell's nucleus (NPC, dashed line). The cellular enzyme Mind bomb1 (Mib1, grey-white structures) primes them for unlocking and removes protein V (GFP-V, green dots). The uncoated viral DNA genome is then imported into the nucleus. The arrow highlights a virus particle containing both protein V and Mib1, yellow denotes particles containing protein V, and red shows particles lacking V and Mib1.

Viral protein increases stability of virus particle

Researchers are exploiting a key feature of adenoviruses, namely their ability to infect human cells and transfer foreign DNA into the nucleus of these cells. A new study led by Urs Greber, professor at the Department of Molecular Life Sciences at the University of Zurich (UZH) now shows that this process evolved a sophisticated mechanism. "The viral protein V plays a key role. It connects the DNA with the protein coat surrounding the genome. Protein V increases the stability of the virus particle outside the cell, and also in the cytoplasm of the infected cells," explains Greber.

The protein coat prevents the cell from recognizing the invading foreign DNA and activating the alarm systems. Once the virus particle reaches the nuclear pore complex – the gateway into the nucleus – the viral DNA is released into the nucleus, where the genetic information is read by the cell's machinery, resulting in the relevant proteins being produced. In Covid-19 vaccines, the cells produce the spike protein on the coronavirus's surface. Presenting the viral protein on the outside of the cell then triggers the immune response in the human body.

Premature release of DNA activates anti-viral alarm systems

The UZH scientists have shown that an adenovirus that is missing the protein V is not only less stable than regular adenoviruses, but also releases its DNA prematurely, before reaching the nuclear pore complex. "This reduces infection and triggers reactions activating the immune system," says Greber. Too much of these reactions triggers inflammation. Notably, both vector-based and mRNA vaccines against coronavirus require just the right amount of these reactions to induce a strong immune response.

In vector-based vaccines the protective protein coat around the DNA enables the particle to reach the nuclear pore complex, where the viral DNA is released. This "uncoating" is absolutely essential for nuclear import, and success in vector-based vaccination, since the nuclear pore complex prevents large virus particles from invading the nucleus. "We were able to demonstrate that the protein V uses the activation by a cellular enzyme named Mind bomb 1, which changes its features and leads to the disruption of the protein coat. The enzyme thereby initiates the nuclear import of the viral DNA genome," says Greber.

Stopping viral infection and improving gene therapy

To demonstrate this key function of Mind bomb 1, the researchers used regular adenoviruses to infect human cells that lacked Mind bomb 1, as well as a virus mutant containing protein V, which cannot be modified by this enzyme. In both cases, nuclear import of the viral DNA was defective and the virus particles clustered at the nuclear pore complexes. In other words, the viral infection was stopped.

"Our results inspire the development of anti-viral strategies and enhance procedures to transfer genes into diseased cells for clinical therapy," says Urs Greber. Notably, adenoviruses are employed in a variety of ways – including use as DNA carriers for gene editing in genetic and metabolic diseases as well as cancer.

[1] **doi:** *https://doi.org/10.1126/sciadv.abl7150*

New study associates mask laws to reduction of COVID-19 deaths

A study of the impact of national face mask laws on COVID-19 mortality in 44 countries with a combined population of nearly one billion people found that, over time, the increase in COVID-19 related deaths was significantly slower in countries that imposed mask laws compared to countries that did not. The study, appearing in the *American Journal of Preventive Medicine*, shows that masks provide a supplementary layer of protection that could prevent unnecessary COVID-19 deaths.

"While several studies before this have looked at the impact of masks on COVID-19 cases, fewer studies were focused on whether mask wearing may reduce COVID-19 deaths, and no study had looked at the data across multiple countries," said lead investigator Sahar Motallebi, MD, MPH, from Malmo, Sweden. "The large sample of culturally diverse countries in this retrospective study covers a large population, giving us more evidence towards the life-saving potential of masks during the COVID-19 pandemic."

The top 50 countries according to the United Nations Development Programme Human Development Index, which measures life expectancy, education, and standard of living, were targeted because of comparability and reduced chance of selection bias. Four countries in the Southern Hemisphere (New Zealand, Australia, Chile, and Argentina) were excluded to avoid potential seasonality characteristics. The United States and Canada were excluded because public health policies are made at the state/province level and a unified national policy does not exist. Data from the remaining 44 countries were used to model COVID-19 mortality.

Twenty-seven countries with face mask policies and 17 countries without face mask policies, covering a combined population of nearly one billion people, were included in the study. Investigators looked at COVID-19 deaths between February 15, 2020, the date of the first confirmed death in the targeted countries, to May 31, 2020, when many countries began to lift gathering and movement restrictions. Ten relevant demographic, social, clinical and time-dependent factors were examined. Potential confounders between face mask policy and mortality reduction, such as non-pharmaceutical interventions, were identified.

The 44 countries studied reported 2,167,664 confirmed deaths, 1,253,757 in countries without face mask mandates and 913,907 in countries with face mask mandates. The average COVID-19 mortality per million population was 48.40 in countries with face mask policies and 288.54 in countries without face mask policies, and this was significantly greater compared to countries with mask mandates. Face mask countries had significantly lower average daily increase in deaths compared to no face mask countries.

Surprisingly, the countries with no mask mandate started with a lower COVID-19 daily mortality. However, the death rate accelerated so fast in those countries that they not only caught up with the death rate in mask law countries, but significantly surpassed them over time.

• **doi:** *https://doi.org/10.1016/j.amepre.2021.09.019*


Gerd Altmann / Pixabay

Global dementia cases set to triple by 2050 unless countries address risk factors

The Lancet Public Health has published the first comprehensive forecasts for dementia prevalence in 195 countries and territories and examines the impact of expected trends in exposure to four important risk factors – smoking, obesity, high blood sugar, and low education. The forecast shows that dementia cases will rise in every country, with the smallest estimated increases in high-income Asia Pacific (53%) and western Europe (74%), and the largest growth in north Africa and the Middle East (367%) and eastern sub-Saharan Africa (357%). *Middle East Health* reports.

The number of adults (aged 40 years and older) living with dementia worldwide is expected to nearly triple, from an estimated 57 million in 2019 to 153 million in 2050, due primarily to population growth and population ageing, according to a Global Burden of Disease study published in *The Lancet Public Health* [1].

The study also looks at four risk factors for dementia – smoking, obesity, high blood sugar, and low education – and highlights the impact they will have on future trends. For example, improvements in global education access are projected to reduce dementia prevalence by 6·2 million cases worldwide by 2050. But this will be countered by anticipated trends in obesity, high blood sugar, and smoking, which are expected to result in an additional 6·8 million dementia cases.

Locally tailored interventions

The authors highlight the urgent need to rollout locally tailored interventions that reduce risk factor exposure, alongside research to discover effective disease-modifying treatments and new modifiable risk factors to reduce the future burden of disease.

"Our study offers improved forecasts for dementia on a global scale as well as the country-level, giving policy makers and public health experts new insights to understand the drivers of these increases, based on the best available data," says lead author Emma Nichols from the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, USA. "These estimates can be used by national governments to make sure resources and support are available for individuals, caregivers, and health systems globally."

She continues: "At the same time, we need to focus more on prevention and control of risk factors before they result in dementia. Even modest advances in preventing dementia or delaying its progression would pay remarkable dividends. To have the greatest impact, we need to reduce exposure to the leading risk factors in each country. For most, this means scaling up locally appropriate, low-cost programmes that support healthier diets, more exercise, quitting smoking, and better access to education. And it also means continuing to invest in research to identify effective treatments to stop, slow, or prevent dementia."

Dementia is currently the seventh leading cause of death worldwide and one of the major causes of disability and dependency among older people globally – with

> Our study offers improved forecasts for dementia on a global scale as well as the country-level, giving policy makers and public health experts new insights to understand the drivers of these increases, based on the best available data.

global costs in 2019 estimated at more than US$1 trillion. Although dementia mainly affects older people, it is not an inevitable consequence of ageing. A Lancet Commission published in 2020 suggested that up to 40% of dementia cases could be prevented or delayed if exposure to 12 known risk factors were eliminated – low education, high blood pressure, hearing impairment, smoking, midlife obesity, depression, physical inactivity, diabetes, social isolation, excessive alcohol consumption, head injury, and air pollution.

Prevalence in MENA

The study predicts that the greatest increase in prevalence will occur in eastern sub-Saharan Africa, where the number of people living with dementia is expected to climb by 357% , from nearly 660000 in 2019 to more than 3 million in 2050, mainly driven by population growth – with Djibouti (473%), Ethiopia (443%), and south Sudan (396%) seeing the greatest increases. Similarly, in north Africa and the Middle East, cases are predicted to grow by 367%, from almost 3 million to nearly 14 million, with particularly large increases in Qatar (1926%), the United Arab Emirates (1795%), and Bahrain (1084%).

By contrast, the smallest increase in the number of dementia cases is projected in high-income Asia Pacific, where the number of cases is expected to grow by 53%, from 4·8 million in 2019 to 7·4 million in 2050 – with a particularly small increase in Japan (27%). In this region, the risk of dementia for each age group is expected to fall, suggesting that preventive measures, including improvements in education and healthy lifestyles are having an impact.

Similarly, in western Europe, the number of dementia cases is expected to rise by 74%, from almost 8 million in 2019 to nearly 14 million in 2050. Relatively small increases in cases are expected in Greece (45%), Italy (56%), Finland (58%), Sweden (62%), Germany (65%), and the UK (75%).

Sex differences

Globally, more women are affected by dementia than men. In 2019, women with dementia outnumbered men with dementia 100 to 69. And this pattern is expected to remain in 2050. "It's not just because women tend to live longer," says co-author Dr Jaimie Steinmetz from IHME, University of Washington, USA. "There is evidence of sex differences in the biological mechanisms that underlie dementia. It's been suggested that Alzheimer's disease may spread differently in the brains of women than in men, and several genetic risk factors seem related to the disease risk by sex."

According to co-author Professor Theo Vos from IHME, University of Washington, USA, "Low- and middle-income countries in particular should implement national policies now that can mitigate dementia risk factors for the future, such as prioritising education and healthy lifestyles. Ensuring that structural inequalities in access to health and social care services can be addressed and that services can additionally be adapted to the unprecedented needs of an increasing older population with complex care needs will require considerable planning at both local and national levels."

Countries with the highest percentage change in total number of dementia cases 2019–50

1) Qatar (1926%)
2) United Arab Emirates (1795%)
3) Bahrain (1084%)
4) Oman (943%)
5) Saudi Arabia (898%)
6) Kuwait (850%)
7) Iraq (559%)
8) Maldives (554%)
9) Jordan (522%)
10) Equatorial Guinea (498%)

Study limitations

The authors acknowledge that their analysis was limited by a lack of high-quality data in several parts of the world, including sub-Saharan Africa, eastern Europe, and Central America, and by studies using different methodologies and definitions of dementia. They also note that they were unable to consider all 12 risk factors from the 2020 Lancet Commission report because they were limited to risk factors included in the GBD study and only included risk factors with strong evidence of association. However, including additional risk factors would not have necessarily led to a change in the forecasted prevalence, unless changes in exposure to a given risk factor were expected as well. Finally, they note that the study examined the overall prevalence of dementia, and it is possible that clinical subtypes, such as vascular dementia, may have different relationships with risk factors, which could affect the results.

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Medical professionals head to South Korea for world-class training

Medical Korea Academy offers a platform for foreign specialists to learn cutting-edge techniques and treatments

South Korea's healthcare industry is one of the finest in the world. Supported by an advanced medical infrastructure, specialists in the country lead the way conducting a large number of clinical trials and recording high survival rates for chronic diseases and best results in surgery and recovery. With such positive outcomes, it isn't surprising that medical specialists from around the world have been travelling to South Korea to learn the latest techniques.

One of the most renowned surgeons to visit Korea to learn some of these methods was Dr James Eason, Director of the Methodist University Hospital Transplant Institute in the United States, who also performed the liver transplant on Apple founder Steve Jobs.

Medical Korea Academy (MKA), hosted by the Korea Health Industry Development Institute (KHIDI), is a training programme that aims to pass on the successful cutting-edge Korean medical knowledge and skills to foreign specialists.

Each year, doctors from the US, Europe and the Middle East travel to Korea to participate in training programmes that various hospitals provide. Between 2007 and 2020, 1,392 medical professionals from 53 countries took part in the esteemed MKA programme. The top five countries to send the highest number of medical practitioners for the training programme were Saudi Arabia (314), Mongolia (250), Russia (146), China (116), and Kazakhstan (115).

Korea Medical Training Programme for Middle Eastern Physicians and Dentists

For doctors here in the Gulf, the Middle Eastern Physicians and Dentists Korea Medical Training Programme (KMTP) has been proving highly successful. Following an agreement with Saudi Arabia in September 2013, the programme commenced in the region, which allowed physicians from the country to study in Korea. A total of 161 Saudi physicians completed the programme between 2014 and 2020. An agreement was later signed with the Ministry of Health, Kuwait, in May 2016, and with the Dubai Health Authority and Bahrain Defence Force-Royal Medical Services in 2018. The Oman Medical Specialty Board started sending medical professionals to Korea in 2019. A total of 311 Middle Eastern physicians have participated in the programme since 2014.

Thanks to these agreements, medical professionals in the Middle East have an opportunity to delve into the latest medical advances available in Korea. In addition, they also have access to research activities, academic conferences and other insightful opportunities to learn about the cutting-edge care provided in the country.

Dr Adel Saeed Alghamdi, from Saudi Arabia, is one of the professionals from the region who visited Korea for specialisation. "I decided to come to Korea because I knew that Korea has a high level of education in medical science and is scientifically and technologically advanced," he says. "Also, because I came to Korea with my family, I was able to experience many aspects of Korean culture and environment. I have not only learned medical skills, but also how to allocate difficult tasks, continuously update new medical information, and work as a team with new technology from the professors and my colleagues."

As Dr Alghamdi discovered, the programme provides advanced training through selected hospitals so that medical staff from the Middle East can acquire clinical experience in their specialist field. Clinical specialities include everything from anaesthesiology and pain medicine diagnostics to radiology and neurosurgery.

How to join the programme

To join the programme, participants can apply online and select their chosen department and hospital faculty. Visas are then organised and a pre-training programme follows, which consists of mandatory Korean language training, followed by observational training at a hospital. Candidates can then apply for hands-on medical practice and spend a year to two years partaking in clinical training at the hospital.

By participating in these programmes medical practitioners looking to expand their knowledge can now bring back the latest state-of-the-art treatments to their own hospitals and regions. And, with the Covid-19 pandemic having changed how people work and learn, there is also the opportunity to pick up some of the innovative techniques without leaving their countries. MKA currently provides an e-class, offering online education for medical practitioners who want to learn more about the latest techniques, including surgical skills, such as pancreatic gastrointestinal and colorectal surgery.

- To learn more, visit: *http://mka-eclass.or.kr* MEH

Many female patients from the Middle East visit South Korea for cancer treatment

Advanced infrastructure, cutting-edge techniques and a sensitive approach make Medical Korea an attractive destination

South Korea's expertise in cancer treatment and assisted reproductive technology is attracting a steady stream of female patients from the Middle East. The country is renown for having the world's highest breast cancer survival rate as well as the world's highest survival rate for thyroid cancer.

For decades, South Korea has witnessed a high incidence of cancer, which has resulted in the country making significant investments in research and development, and enabling it to pioneer many innovative treatments.

It has built a world-class infrastructure, developed cutting-edge technology and invested in human resources, which has improved outcomes for patients. In addition, researchers regularly conduct studies to enhance treatment techniques, particularly for complex operations. Thanks to these efforts, the five-year survival rate for cancer patients has risen to 70.4 per cent.

The country has achieved outstanding results in the treatment of various cancers affecting the liver, gall bladder, pancreas, stomach and prostrate in addition to the most common cancers seen in women, such as breast, colorectal, lung, cervical and thyroid cancer.

Breast cancer

With the world's highest survival rate for breast cancer, South Korea attracts many foreign female patients. The country is renown for its top-class oncoplastic breast reconstruction with free tumour margins, which is done by leading plastic surgeons immediately following breast cancer surgery.

South Korea's physicians have proved the safety and feasibility of using sentinel lymph node biopsy in patients clinically suspected of axillary lymph node metastasis, which has now become the standard for breast cancer surgery.

Colorectal cancer

For colorectal cancer, South Korea's surgeons use a sphincter-saving minimally invasive laparoscopic procedure for low rectal cancer. The country was the first in the world to successfully perform both the operations. It has attained survival rates of 95-98 per cent for stage 1 colorectal cancer cases and the world's highest survival rate for advanced colorectal cancer patients.

South Korea is also a leader in bronchoplasty, the reconstruction or repair of the bronchus to restore function. The country's five-year survival rate of 62.8 per cent is higher than the worldwide average.

South Korea also has the world's best treatment outcomes for stages 2 and 3 lung cancer patients.

World leader in thyroid cancer treatment

Thyroid cancer is another field where South Korea shines, with its expertise in endoscopic and robotic thyroidectomy. It has the world's highest survival rate of 99.8 per cent, which makes it a hugely attractive destination for foreign patients seeking treatment for thyroid cancer. In fact, it is for this treatment, that the largest number of medical travellers visit the country each year.

South Korea's development of the world's first advanced robotic thyroidectomy through incisions in the armpit rather than through the neck has improved patients' quality of life has contributed significantly to its success in this field.

The country's focus on providing the most advanced treatment using state-of-the-art equipment at a reasonable cost compared to developed nations makes it a particularly attractive destination for patients from around the world. Its cancer centres are designed to be one-stop destinations for prevention, examination, treatment, rehabilitation and aftercare, where multidisciplinary teams of medical oncologists, radiation therapists and other specialists work together under one roof to provide 360-degree care.

Assisted reproductive technology

Just like cancer treatment, South Korea has established itself as a global leader in assisted reproductive technology (ART) with its sensitive approach, providing hope to women and couples from around the world including the Middle East. The country has been able to develop its expertise and experience in ART with the national support extended to couples facing infertility issues. It offers advanced treatments in ART, such as in vitro maturation for IVF, cryopreservation and fertility preservation, blastocyst transfer, preimplantation genetic diagnosis (PGD)/preimplantation genetic screening (PGS), time-lapse embryo monitoring, treatment of male infertility, reproductive surgery, treatment of recurrent miscarriage and repeated IVF failures, and third-party reproduction including surrogacy. MEH

Most mothers born with heart defects can become pregnant and give birth safely, large study

Expert medical care and counselling are essential

Most women who are born with heart defects can safely become pregnant and give birth to healthy babies with few or minor problems if they are supported by expert medical care and counselling, according to research published in the *European Heart Journal* [1].

In the past few decades, advances in heart surgery have meant that more babies born with congenital heart disease (CHD) have survived and have reached reproductive age but, until now, the risks to women with CHD of becoming pregnant and giving birth have not been clear. Doctors often advised them not to attempt pregnancy because of the risks of dying and other health problems for both mothers and babies.

The current study of 7,512 pregnancies in 4,015 women with CHD in Germany is the largest to investigate the issue and shows that no women died, although there were more health complications for these mothers and babies compared to a control group of 11,225 pregnancies in 6,502 women without CHD. There was a small but increased risk of still births or babies dying within the first month of life among those born to CHD mothers, and these children had a six-fold greater risk of CHD than in the control group.

"The most important finding from our study is that many women born with a congenital heart defect are able to get through pregnancy and give birth safely. This is important because only a few decades ago many women would not even have reached adult age themselves. It is very encouraging to see that such a large number of mothers with a congenital heart defect can give birth to healthy children," said Dr Astrid Lammers, who is the first author of the study and a consultant in paediatric cardiology, currently working in the department for adults with CHD at University Hospital Münster, Germany.

"We do report health problems around the time of birth, which are relevant and important. However, thanks to advanced neonatal support and techniques, a majority of these problems can be overcome with medical support, albeit with surgery and prolonged hospitalisation."

An accompanying editorial by experts not involved with the research describes the result of zero deaths among mothers from the "well-performed" study as "unexpected and fantastic news".

The study

Dr Lammers and her colleagues analysed all pregnancies in women with CHD between 2005 and 2018 from one of the largest German health insurance companies. They matched them with women of similar ages who did not have CHD.

They found no women in the CHD group died during pregnancy and up to 90 days after delivery; one woman in the non-CHD group died. Although complications were low overall, women with CHD had a significantly higher rate of stroke (1.13% versus 0.17%), heart failure (0.84% versus 0.03%) and abnormal heart rhythm problems (0.82% versus 0.12%) compared to women without CHD. Caesarean deliveries were also more common in CHD patients: 40.5% versus 31.5%.

Increased risk of stillbirths and babies with CHD

Among babies born to mothers with CHD, there was an increased risk of stillbirths (1.4% versus 0.4%), death within the first month of life (0.83% versus 0.22%), low and extremely low birthweight (1000-2499g or less than 1000g), being born prematurely, requiring mechanical ventilation, having major visible abnormalities, and having Down's syndrome or other genetic syndromes. Eighteen percent of babies born to mothers with CHD had CHD themselves compared to 3% of babies of mothers without CHD, and 6% versus 0.4% needed heart surgery with heart-lung machine support by the age of six years.

The researchers found that the complexity of the mother's heart defect, high blood pressure, heart failure, blood-thinning treatment with vitamin K antagonists in the year before pregnancy and prior fertility treatment were all significant predictors of medical problems in the new-born.

In their paper, the researchers point out that the mothers they studied were managed jointly by paediatric and adult cardiologists, gynaecologists and general practitioners, as well as regional and national adult CHD centres, in a well-funded, decentralised health system where they would have had access to appropriate counselling. The same results would be unlikely in less well-resourced countries.

"Our findings should help to inform mothers-to-be with congenital heart disease what to expect in terms of neonatal complications and to direct them to appropriate care providers if they wish to start a fam-

Kelly Sikkema / Unsplash

> The most important finding from our study is that many women born with a congenital heart defect are able to get through pregnancy and give birth safely. This is important because only a few decades ago many women would not even have reached adult age themselves.

ily. Counselling is a very important part of the care of every woman with a congenital heart defect and should start at an early age. It appears to work in developed countries such as Germany, as suggested by the lack of deaths among the mothers. This is probably due to avoiding very high-risk pregnancies and appropriate management of pregnancy," said Dr Lammers.

"Health problems seem to occur mainly in the offspring and so counselling should focus on the potential health problems for them. For some women whose heart defects place them at very high risk of death or serious complications, the risks associated with pregnancy need to be discussed during counselling and these women should be discouraged from becoming pregnant. Sometimes the desire to have a child outweighs these risks and women still choose to get pregnant. It remains an individual decision for the woman and her partner. In this case, it's important to provide close medical supervision by all the specialists involved throughout the whole course of the pregnancy." [2]

No women died

In the accompanying editorial, Professor Jolien Roos-Hesselink and Dr Karishma Ramlakhan, from Erasmus University Medical Center Rotterdam (The Netherlands) write that the study is an important contribution to knowledge on the subject. "Not only is this the largest study, but it includes all women with ACHD [adult congenital heart disease], without a possible bias of only including patients seen at a tertiary centre or including patients with other kinds of heart disease. Furthermore, because it is performed in a western country with optimal health care system, the results are applicable to other western countries with comparable systems of care organisation with appropriate counselling in place and good collaboration between cardiac and obstetric care. The pregnancy outcomes in studies with a global perspective, including patients from developing countries, show less favourable results. These differences illustrate how the health care system and environment of women have great impact on their pregnancy outcomes and show that we still need to work to improve these outcomes for all women worldwide."

They point out that the fact that no women with CHD died "makes it possible to reassure the large majority of ACHD patients about the mortality risk of pregnancy. This is an important message and should lead to a change in policy from approaching pregnancy as potentially very dangerous, to considering pregnancy as relatively safe and explaining the possible risks, on the condition that women in mWHO IV [the very highest risk group] should not become pregnant."

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and

"Promising perspectives on pregnancy in women with congenital heart disease," by Karishma P. Ramlakhan and Jolien W. Roos-Hesselink. European Heart Journal. *https://doi.org/10.1093/eurheartj/ehab571*

[2] Heart defects of complex severity include univentricular hearts, in which there is one chamber rather than two, transposition of the great arteries, and cyanotic congenital heart disease, which is any heart defect that results in deoxygenated blood bypassing the lungs and entering the circulation, leading to lack of oxygen reaching other tissues in the body. Medium heart defects include Tetralogy of Fallot (pulmonary stenosis, ventricular septal defect, over-riding aorta, thick right ventricle) and narrowing of the largest artery, the aorta. Simple heart defects include defects in the in the 'collecting' atrial chambers, or defects in the wall (the septum) that divides the left and right ventricles in the heart. MEH

Diabetes medication could revolutionise heart failure treatment

A medication originally used for patients with diabetes is the first to help people with heart failure and could revolutionise treatment, according to new research from the University of East Anglia.

Early research had shown that sodium-glucose co-transporter-2 (SGLT2) inhibitors could help around half of heart failure patients – those with a condition known as reduced ejection fraction.

But new findings [1] show that the medication could be beneficial for all heart failure patients – including those with a second type of heart failure called preserved ejection fraction.

It is the first drug to provide a real benefit in terms of improving outcomes for these patients. And the research team say it will revolutionise treatment options.

Lead researcher Prof. Vass Vassiliou, from UEA's Norwich Medical School and an Honorary Consultant Cardiologist at the Norfolk and Norwich University Hospital, said: "Heart failure is a condition where the heart is not pumping as well as it should, and it affects about one million people in the UK.

"There are two types of heart failure. Heart failure with a reduction in ejection fraction happens when the heart is unable to pump blood round the body due to a mechanical issue. And heart failure with preserved ejection fraction happens when, despite the heart pumping out blood well, it is not sufficient to provide oxygen to all the parts of the body.

"Patients are equally split between the two types of heart failure.

"For many years there was not a single medicine that could improve the outcome in patients with the second type of heart failure – those patients with preserved ejection fraction.

"This type of heart failure had puzzled doctors, as every medicine tested showed no benefit.

"One class of heart medication, called SGLT2 inhibitors, was initially used for patients with diabetes. However, it was noticed that it also helped patients who had heart failure.

"Previous studies had shown that this medication would be beneficial in heart failure with reduced ejection fraction.

"But we found that it can also help heart failure patients with preserved ejection fraction," Prof. Vassoliou said."

SGLT2 inhibitors

SGLT2 inhibitors are more commonly known under their trade-names Forxiga (Dapagliflozin), Invokana (Canagliflozin), and Jardiance (Empagliflozin).

The research team undertook a meta-analysis of all studies published in the field and brought together data from almost 10,000 patients. They used statistical modelling to show the specific effect of these medicines.

Prof Vassiliou said: "We found that patients taking SGLT2 inhibitors were 22 per cent less likely to die from heart-related causes or be hospitalised for heart failure exacerbation than those taking placebo.

"This is very important because this is the first medication that can provide a benefit to this previously untreatable group of patients – in terms of heart-related deaths or hospitalisation.

"This is the first medication that can really improve the outcomes for this patient group and it will revolutionise the treatment offered to heart failure patients," he added.

This is the first medication that can really improve the outcomes for this patient group and it will revolutionise the treatment offered to heart failure patients.

This study was led by researchers at UEA in collaboration with the Norfolk and Norwich University Hospital, Imperial College London and Imperial College NHS Trust, and Cambridge University Hospitals.

Reference:

[1] Vasiliki Tsampasian, Hussein Elghazaly, et. al., Sodium glucose co-transporter 2 inhibitors in heart failure with preserved ejection fraction: a systematic review and meta-analysis, *European Journal of Preventive Cardiology*, 1 Dec 2021; https://doi.org/10.1093/eurjpc/zwab189

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Artificial Intelligence predicts risk of death in patients with suspected heart disease

A novel artificial intelligence score provides a more accurate forecast of the likelihood of patients with suspected or known coronary artery disease dying within 10 years than established scores used by health professionals worldwide. The research was presented[1] at EuroEcho in December 2021, a scientific congress of the European Society of Cardiology.

Unlike traditional methods based on clinical data, the new score also includes imaging information on the heart, measured by stress cardiovascular magnetic resonance (CMR). "Stress" refers to the fact that patients are given a drug to mimic the effect of exercise on the heart while in the magnetic resonance imaging scanner.

"This is the first study to show that machine learning with clinical parameters plus stress CMR can very accurately predict the risk of death," said study author Dr. Theo Pezel of the Johns Hopkins Hospital, Baltimore, US. "The findings indicate that patients with chest pain, dyspnoea, or risk factors for cardiovascular disease should undergo a stress CMR exam and have their score calculated. This would enable us to provide more intense follow-up and advice on exercise, diet, and so on to those in greatest need."

Risk stratification

Risk stratification is commonly used in patients with, or at high risk of, cardiovascular disease to tailor management aimed at preventing heart attack, stroke and sudden cardiac death. Conventional calculators use a limited amount of clinical information such as age, sex, smoking status, blood pressure and cholesterol. This study examined the accuracy of machine learning using stress CMR and clinical data to predict 10-year all-cause mortality in patients with suspected or known coronary artery disease, and compared its performance to existing scores.

Dr. Pezel explained: "For clinicians, some information we collect from patients may not seem relevant for risk stratification. But machine learning can analyse a large number of variables simultaneously and may find associations we did not know existed, thereby improving risk prediction."

The study included 31,752 patients referred for stress CMR between 2008 and 2018 to a centre in Paris because of chest pain, shortness of breath on exertion, or high risk of cardiovascular disease but no symptoms. High risk was defined as having at least two risk factors such as hypertension, diabetes, dyslipidaemia, and current smoking. The average age was 64 years and 66% were men. Information was collected on 23 clinical and 11 CMR parameters. Patients were followed up for a median of six years for all-cause death, which was obtained from the national death registry in France. During the follow up period, 2,679 (8.4%) patients died.

Building an algorithm

Machine learning was conducted in two steps. First it was used to select which of the clinical and CMR parameters could predict death and which could not. Second, machine learning was used to build an algorithm based on the important parameters identified in step one, allocating different emphasis to each to create the best prediction. Patients were then given a score of 0 (low risk) to 10 (high risk) for the likelihood of death within 10 years.

The machine learning score was able to predict which patients would be alive or dead with 76% accuracy (in statistical terms, the area under the curve was 0.76). "This means that in approximately three out of four patients, the score made the correct prediction," said Dr. Pezel.

Using the same data, the researchers calculated the 10-year risk of all-cause death using established scores (Systematic COronary Risk Evaluation [SCORE], QRISK3 and Framingham Risk Score [FRS]) and a previously derived score incorporating clinical and CMR data (clinical-stressCMR [C-CMR-10]) – none of which used machine learning. The machine learning score had a significantly higher area under the curve for the prediction of 10-year all-cause mortality compared with the other scores: SCORE = 0.66, QRISK3 = 0.64, FRS = 0.63, and C-CMR-10 = 0.68.

Dr. Pezel commented: "Stress CMR is a safe technique that does not use radiation. Our findings suggest that combining this imaging information with clinical data in an algorithm produced by artificial intelligence might be a useful tool to help prevent cardiovascular disease and sudden cardiac death in patients with cardiovascular symptoms or risk factors."

Reference:

[1] The abstract 'Machine-learning score using stress CMR for death prediction in patients with suspected or known CAD' was presented by Dr. Theo Pezel (Hospital Lariboisiere - Paris, France) during the session 'Young Investigator Award - Clinical Science' at EuroEcho 2021.

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NewYork-Presbyterian's Pediatric Heart Center achieves superior outcomes in complex cases

Physicians at NewYork-Presbyterian's Congenital Heart Centre – a combined program of Morgan Stanley Children's Hospital and NewYork-Presbyterian Komansky Children's Hospital – see not just a lot of cases, but a lot of complex cases. A nuance that allows paediatric cardiac surgeons and interventional cardiologists to think outside of the box when leading clinical initiatives and conducting groundbreaking research.

First CICU for newborns with CHD

As the first cardiac intensive care unit (CICU) in the nation exclusively dedicated to the care of newborn infants with congenital heart disease (CHD) – including those in need of and recovering from a heart transplant – NewYork-Presbyterian is especially adept at caring for babies with some of the most complex and challenging cases. From the beds to the medical and surgical equipment, everything in the unit is designed for the tiniest newborns.

Advanced paediatric heart care

Our renowned paediatric cardiology and cardiac surgery experts are committed to an integrated approach to the treatment of complex heart conditions providing the safest, most advanced paediatric heart care – from the prenatal and newborn period, through adolescence to adulthood. Our smallest patient to undergo cardiac surgery weighed just 500 grams (1.1 pound). For babies with complex heart conditions, our high-risk OB team collaborates with cardiovascular surgeons, interventional cardiologists, cardiologists as well as multiple subspecialties to provide advanced care.

"We offer the entire range of surgical treatment options for complex congenital aortic valve disease," says Emile Bacha, MD, Chief of Congenital and Pediatric Cardiac Surgery at NewYork-Presbyterian Morgan Stanley Children's Hospital.

Lifesaving support options

Mechanical assist devices are needed in up to 50% the paediatric congenital heart patient population at NewYork-Presbyterian, illustrating the complexity and acuity of cases. As one of 7 vanguard sites across the country participating in the NIH-funded PumpKIN trial, we are examining the safety and efficacy of the Jarvik 2015, a ventricular assist device aimed to support the smallest of our patients while minimizing complications encountered with other systems of mechanical support. As part of the PumpKIN trial, we successfully bridged a toddler with dilated cardiomyopathy to heart transplant.

Paediatric heart transplant

The world's first successful heart transplant in a child was performed at Columbia Presbyterian Medical Center in June 1984 on a four-year-old boy with complex congenital heart disease. Since then, more than 550 children – ranging in age from less than one year to 24 years old – have received new hearts at what is now NewYork-Presbyterian Morgan Stanley Children's Hospital. Today, NewYork-Presbyterian is one of the highest volume paediatric heart transplant centres in the United States with outcomes exceeding national and local benchmarks, as reported by United Network for Organ Sharing (2019).

We are renowned for successfully transplanting children with complex heart conditions – many of whom are turned down by other institutions and programs. With nearly four decades of success, many of our heart transplant recipients are surviving >30 years with their heart transplant and now have families of their own.

Paediatric interventional cardiology

Many of the paediatric interventional procedures at NewYork-Presbyterian's Congenital Heart Center have moved from our operating rooms to our paediatric catheterization laboratories, offering our littlest patients' nonsurgical options to decrease the number of open-heart surgeries throughout their lifetime. As one of the first in the United States to successfully implant the Alterra adaptive prestent in patients with congenital heart disease, NewYork-Presbyterian Morgan Stanley Children's Hospital is participating in the pivotal Multicenter Study of Congenital Pulmonic Valve Dysfunction studying the SAPIEN 3 THV with the Alterra adaptive prestent. The self-expanding, partially covered stent is designed to reduce the size of large right ventricular outflow tracts and decrease the total number of surgeries a paediatric patient may need over his/her lifetime.

> We offer the entire range of surgical treatment options for complex congenital aortic valve disease.
> – Dr. Emile Bacha

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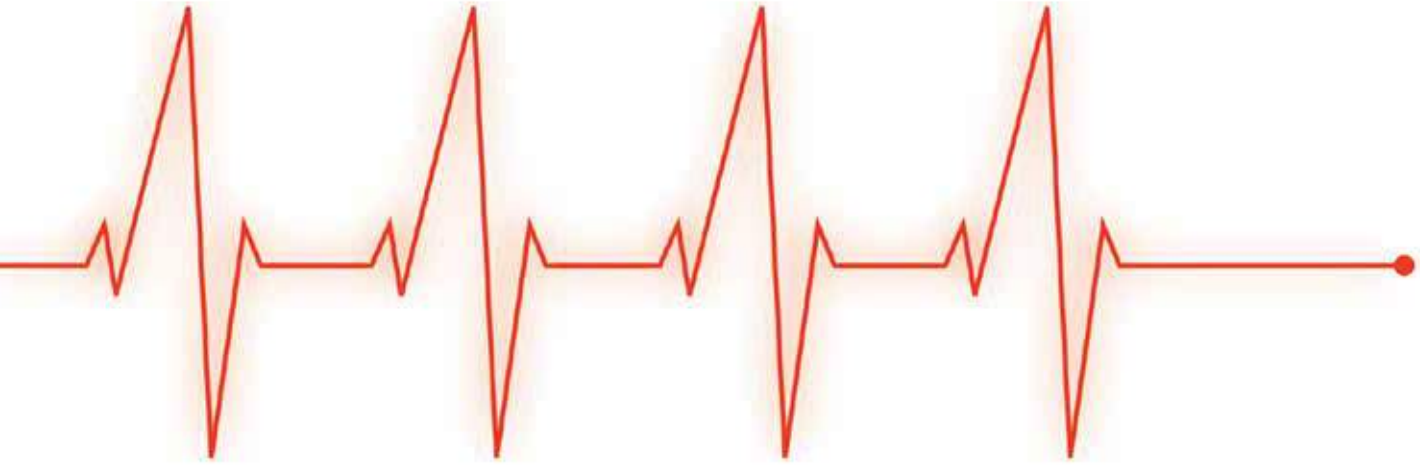

Heart repair and regeneration after a heart attack

Twenty years ago, clinicians first attempted to regenerate a failing human heart by injecting muscle myoblasts into the heart during a bypass operation. Despite high initial hopes and multiple experimental and clinical studies since then, outcomes have been neutral or marginally positive for a wide variety of attempts to remuscularize an injured heart.

Yet hope remains that current and future strategies will yield clinical regenerative heart therapies, nine experts explain in a *Journal of the American College of Cardiology State-of-the-Art Review*[1].

The challenge is this: A heart attack kills heart muscle cells, leading to a scar that weakens the heart, often causing eventual heart failure. The lack of muscle repair is due to the very limited ability of mammalian heart muscle cells to proliferate, except during a brief period around birth.

In the review, the experts – coordinated by Jianyi "Jay" Zhang, M.D., Ph.D., chair of the University of Alabama at Birmingham Department of Biomedical Engineering – focus on three topics. First are several recent clinical trials with intriguing results. Second is the current trend of using cell-derived products like exosomes rather than muscle cells to treat the injured heart. For the third topic, authors discuss likely future experiments to replace a myocardial scar with heart muscle cells by "turning back the clock" of the existing cardiomyocytes, rather than trying to inject exogenous cells. Such efforts are an attempt to reverse the inability of mature mammalian heart muscle cells to proliferate.

Clinical trials

One of the interesting clinical trials reviewed involved giving cardiosphere-derived cells to patients with Duchenne muscular dystrophy, a disease that affects both heart and skeletal muscles.

Cardiosphere-derived cells are a type of heart stromal/progenitor cell that has potent immunomodulatory, antifibrotic and regenerative activity in both diseased hearts and skeletal muscle. The HOPE-2 trial gave repeated intravenous doses of cardiosphere-derived cells to patients with advanced Duchenne disease, most of whom could not walk. Preliminary results showed safety, as well as major improvements in heart parameters such as left ventricle ejection fraction and reduced left ventricle size.

HOPE-2 is thus the first clinical trial to evaluate cell therapy delivered via a repeated sequential dosing regimen for any cardiac indication, the first to evaluate intravenous cardiosphere-derived administration, and the first clinical trial to yield evidence of therapeutic benefit in nonambulatory Duchenne patients.

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Two features of the trial may be game-changing for future trials, the reviewers say – a move away from invasive cardiac-targeted cell delivery and toward easily administered intravenous cell delivery, and the use of sequential repeated cell doses.

Cell-derived products

Experience has shown that cells transplanted into the heart fail to survive in substantial amounts, yet researchers have seem some functional benefits in heart performance despite physical clearance of grafted cells. This has led to the hypothesis that the cells were not acting as a replacement therapy but rather as boosters of endogenous repair pathways through the release of a wide array of biomolecules endowed with tissue-repair properties.

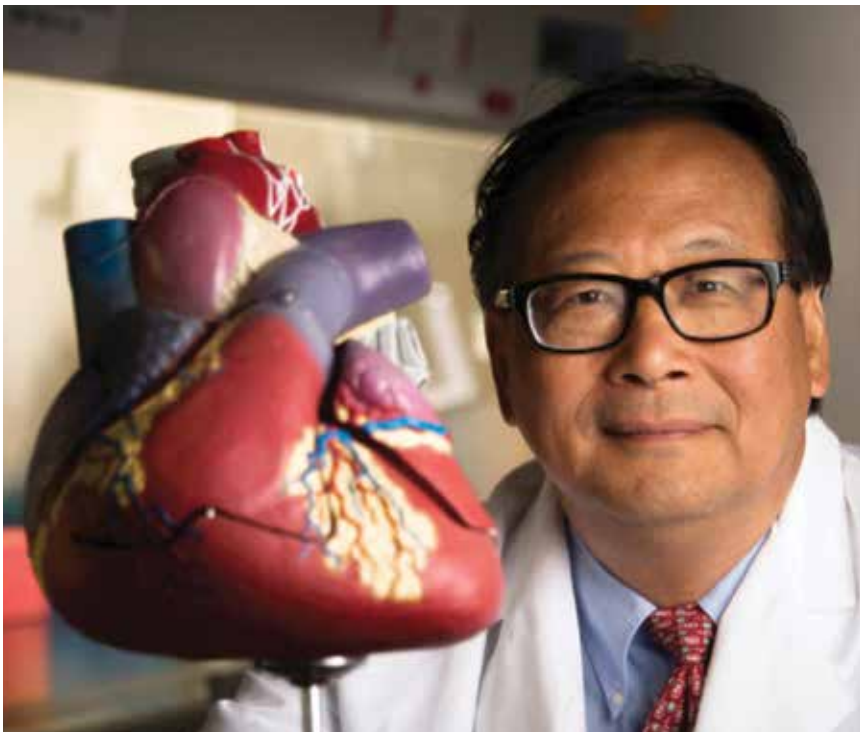
This led to investigation of using cell-derived products rather than transplanting cells. Most of these biomolecules – proteins and non-coding nucleic acids – are enclosed in tiny vesicles that cells release naturally. When the vesicles, including exosomes, merge into recipient cells, the biomolecules can modulate signalling pathways. Attractive features of using vesicles or exosomes are a simpler manufacturing process compared with live cells, the ability to control quality and potency, and the possibility of preserving the vesicles by refrigeration to make administration simpler.

An alternative approach to the vesicle cell-derived products was the finding that injected stem cells can promote cardiac repair through release of biologically active molecules acting as short-range, paracrine hormones. These molecules are distinct from the biomolecules in vesicles or exosomes.

However, before use of any of these cell-derived products for heart repair in early trials, the reviewers say, more experiments are needed in purification of the products, potential modes of delivery and the suitability of repeated doses.

Proliferation of endogenous heart cells

The final review topic looked ahead toward endogenous generation of cardiomyocytes – in other words, forcing existing native cardiomyocytes to divide, or other cells to become cardiomyocytes.



Jianyi "Jay" Zhang, M.D., Ph.D., chair of the University of Alabama at Birmingham Department of Biomedical Engineering

Pigs can regenerate heart muscle for only a few days after birth. But in one remarkable study, described in the review, researchers injured the heart by removing part of the apex of the left ventricle one day after birth, and then induced experimental heart attack 28 days after birth. Control pigs without the Day 1 resection showed no repair of heart attack damage at Day 56. In contrast, the pigs that had a resection one day after birth, and then had experimental heart attacks at Day 28, showed heart repair by Day 56 – notably an absence of dead heart muscle, known as an infarction. Furthermore, the number of cardiomyocytes in the left ventricles of these pigs was significantly higher throughout the entire left ventricle.

This is the first study to show that heart muscle cells in large mammals can be induced to proliferate and regenerate by using a Day 1 heart injury to extend the neonatal window to remuscularize heart muscle.

"If this cardiomyocyte cell-cycle activation can be activated in neonates, the same signalling pathways may be activated in adults as well," the authors write, "which is highly impactful and significant."

A possible alternative approach to endogenous generation is the direct programming of cardiac fibroblasts into cardiomyocytes, using microRNAs and additional factors. The reviewers say that inducing proliferation of cardiomyocytes will also require ways to promote growth of heart blood vessels to supply nutrients and oxygen to the new cardiomyocytes.

In conclusion, the authors believe that short-term approaches to clinical trials of post heart-attack therapies will use cells like cardiospheres or cell products. The longer-term approach, the reviewers say, will target "a more direct remuscularization of the injured left ventricle by 'turning back the clock' of the cardiomyocyte cell-cycle or generating new cardiomyocytes from other cell types such as fibroblasts".

"However, the efficiency and safety of these strategies, particularly their ability to generate cardiomyocytes seamlessly coupled with their native counterparts and to allow a regulation of these induced proliferative events preventing an uncontrolled and harmful cardiac growth, still need to be appropriately addressed before moving to clinical applications."

Reference:

[1] Jianyi Zhang, Roberto Bolli, et. al. Basic and Translational Research in Cardiac Repair and Regeneration: *JACC State-of-the-Art Review, Journal of the American College of Cardiology*, Vol 78, Issue 21, 2021. https://doi.org/10.1016/j.jacc.2021.09.019

ROSS-PEARS – A novel approach for aortic valve replacement

Aortic valve replacement is the most common form of heart valve surgery commonly used to treat aortic stenosis and aortic regurgitation.

At Royal Brompton and Harefield Hospitals (RB&HH), London, the experts are trialling a new type of combined surgical procedure for young and middle-aged adult patients called ROSS-PEARS which will ensure a long-lasting, excellent quality of life for these patients, without needing life-long anticoagulation medication.

A better approach for replacing aortic valves in younger patients

People with congenital heart disease often need monitoring and treatment throughout their lives, and some may need heart valve surgery in their 20s or 30s.

The ROSS procedure is an alternative way of replacing the aortic valve in younger patients with a biological valve made from a patient's own healthy heart valve and one from a human donor.

The procedure utilises the biological similarities between the two heart valves to replace the diseased aortic heart valve with the patient's own healthy pulmonary valve. The pulmonary valve is then replaced with a healthy valve from a donor which is cryopreserved until it is needed.

Once implanted, the pulmonary valve goes through an adaptive remodelling process, closely mimicking the function of the aortic valve it replaced. Also, as human valves are used, patients don't need anticoagulation medications.

Advancing the ROSS procedure

Although patients can expect excellent long-term results with the ROSS procedure, the pulmonary valve which is used to replace the diseased aortic valve can itself require replacing after 15 years.

Surgery to reinforce the aorta at the root with a synthetic support following the ROSS procedure has been shown to reduce the need for reoperation on the pulmonary valve autograft.

Personalised external aortic root support (PEARS) is a relatively new aortic root reinforcement system. It was originally developed at RB&HH for patients with Marfan syndrome.

"By adding aortic root reinforcement with PEARS to the ROSS procedure, the experts hope to reduce the number of patients requiring reoperation on the pulmonary valve autograft." explains consultant cardiac surgeon, Professor John Pepper, who pioneered the PEARS procedure at Royal Brompton Hospital.

- To find out more, visit: *www.rbhh-specialistcare.co.uk*

Target-Controlled Infusion anaesthesia: New more universal models

By **James Waterson,** RN, M.Med.Ed. MHE. Becton Dickinson. Medical Affairs Manager, Middle East & Africa

In simple terms Target-Controlled Infusion (TCI) means that instead of setting a dose-rate on the pump, the pump is programmed to target a required plasma concentration or effect-site concentration. A TCI pump automatically calculates how much drug is needed during induction and maintenance to maintain the desired effect-site or plasma concentration.

A TCI algorithm (the 'target' and plan on which the pump relies to deliver appropriate induction and maintenance rates to maintain anaesthesia without overdosing the patient) is based on pharmacokinetic (PK) and pharmodynamic (PD) models and on Absorption, Distribution, Metabolism, and Excretion of medications by the body.

For example, the effect-site concentration of Propofol required to produce loss of consciousness is about 3 to 6 mcg/ml, depending on the patients' demographics. Patients waking from anaesthesia generally have a blood concentration of around 1- 2 mcg/ml, although this is dependent on other drugs given during anaesthesia.

Adequate analgesia with Remifentanil is generally achieved with 3-6 ng/ml. A Remifentanil infusion of 0.25-0.5 mcg/kg/min in an 'average' man – 70 kg, 170 cm, 40 years old – produces a blood concentration of around 6ng/ml after 25 minutes.

PK models are based on body compartments

Conventionally the body compartment that the drug is injected into is V1 (plasma/blood), the next compartment is the 'vessel-rich' or 'fast re-distribution' compartment and is characterized as V2 (heart, liver, etc.). The final compartment, which is anatomically 'vessel-poor' and 'slow' in terms of re-distribution, is V3 (fatty tissue).

Drug distribution and the metabolism/elimination of each drug in each compartment is also part of each TCI model, as is the pharmacodynamics of the time taken between the plasma and effect-site effect.

Computer simulations and mathematical modelling of infusion schemes based on the above theories of compartments and clearances give models for both Target Plasma Concentration (Cpt) and Target Effect Concentration (Cet) and these can be incorporated into specialist infusion pumps.

The Marsh model for Propofol requires only age and weight to be programmed in the pump. The Schnider model is an alternative model for Propofol and has advantages in elderly patients as it is based on a lean body mass (LBM) calculation for each patient. Elderly patients receive a lower induction and maintenance dose, which can assist with hemodynamic stability.

The Remifentanil Minto model uses age, height, gender and weight, and determines LBM for its calculations.

TCI pumps deliver the infusion at a constantly altering rate, but it is useful to think of this one infusion as being a mean-average of three continually calculated infusion rates: a constant rate to replace drug elimination and two exponentially decreasing infusions to match drug removed from central compartments to other peripheral compartments of distribution.

Key features of an ideal TCI infusion system or pump are:

- Critical information such as decrement time, current Cet or Cpt and respective targets, current dose rate and concentration and type of agent being infused can be displayed at the same time on one screen.
- Patient parameters used during the setting-up of infusions appear on one screen to avoid the need for shuttling through multiple screens to check vital information.
- An Induction Time adjustable from seconds to minutes to allow for a gentle induction for patients with cardiovascular conditions or established hypotension.

Obese patients have previously presented a problem for 'classic' TCI, and the physiological differences between paediatrics and adults had required separate models for children.

Now, however, we have the Eleveld model for both Propofol and Remifentanil, and the Kim-Obara-Egan Remifentanil model which are much more universal and can potentially allow TCI in age ranges from 6 months to 99 years of age, and from 2.5 to 215 kg.

TCI, with its emphasis on evidence-based anaesthesia, and new near-universal patient models seems primed to change our approach to the management of all patients receiving sedatives and analgesic agents. MEH

Silvarita / Pixabay

Researchers sound warning on vitamin B12 deficiency for people following plant-based diets

Leading researchers are warning of the dangers of a quiet epidemic of vitamin B12 deficiency in people who follow increasingly popular plant-based diets and explain how it can be addressed. *Middle East Health* reports.

Plant-based diets (vegetarian or vegan) are becoming significantly more popular as people look to adopt a diet that is seen to be better for the environment, animal welfare, and/or personal health. Sales of plant-based foods have seen a 49 per cent increase in Western Europe since 2018.

Scientists from around the world with expertise in food, nutrition, medicine, and health have formed a vitamin B12 research discussion group called cluB-12 to raise awareness of B12 deficiency and how it can be addressed. Vitamin B12 is an essential micronutrient which plays a role in supporting red blood cell production, energy, metabolism, and nerve function, but itis not found in plants.

Professor Martin Warren of the Quadram Institute in Norwich, UK, who helped initiate cluB-12, is keen that the public and policymakers are aware of the public health implications and measures needed to mitigate Vitamin B12 deficiency.

Vitamin B12 deficiency anaemia

Vitamin B12 deficiency anaemia can cause a wide range of symptoms. These usually develop gradually but can worsen if the condition goes untreated. Anaemia is where you have fewer red blood cells than normal, or you have an abnormally low amount of a substance called haemoglobin in each red blood cell.

General symptoms may include: extreme tiredness (fatigue), lack of energy (lethargy),tinnitus, breathlessness, feeling faint, headaches, pale skin, noticeable heartbeats (palpitations),loss of appetite and weight loss.

The Quadram Institute's Professor Martin Warren said: "There is a hidden epidemic of vitamin B12 deficiency among vegetarian and vegan populations and this is a particular concern for women of child-bearing age. We are concerned that the current UK recommendations, for example, take no account of pregnancy and this urgently needs to be addressed."

"There are many good reasons to follow a planned and balanced plant-based diet but for a vegan diet especially you should be aware of the potential for nutritional deficiency and the need to take appropriate vitamin B12 supplements."

Dr Kourosh R Ahmad, co-author from the University of Surrey, said: "Millions of people across the globe are switching to a plant-based diet for a myriad of ethical reasons, whether it's because they have a love for animals or environmental reasons. Our paper is not about convincing people they are wrong for becoming vegans, but about making sure they are safe and don't sleepwalk into being B12 deficient.

"Furthermore, there clearly needs to be a global consensus on guidance on daily intake recommendations for vitamin B12, not just for adults but specifically for pregnant women and women who want to start a family."

Key recommendations

Key recommendations for people choosing a vegan or vegetarian diet:

- Take a daily supplement containing 4-7 micrograms of vitamin B12 with food
- Monitor your vitamin B12 status especially if you have not been taking supplements
- Get expert advice to support planning of a plant-based diet, particularly if becoming vegan
- Get expert advice if you're on a vegetarian diet and you are a) planning to become vegan, b) planning to become pregnant or breastfeeding and c) older than 60

International recommended nutritional intakes:

- UK – recommended nutritional intake (RNI) for vitamin B12 is set at 1.5 micrograms a day for adults and no adjustment is made for pregnancy
- USA – the RNI is 2.3 micrograms a day and increases to 2.6 and 2.8 a day for pregnant and breastfeeding women, respectively
- EU – 4 micrograms a day and increases to 4.5 and 5 for pregnant and breastfeeding women, respectively

People following a vegan diet are at much higher risk of vitamin B12 deficiency. Estimates suggest deficiency rates as high as 62% in pregnant women who are vegan. In vegetarians, B12 deficiency is as high as 40%.

on the WEB Download the cluB-12 paper (PDF) on vitamin B12 deficiency and plant-based diets here: *https://bit.ly/3HBSnsH*

Perfect for some but disastrous for others: Patients and clinicians express concerns over phone and video consultations

A study of rheumatology patients and clinicians has found that while the majority found phone or video consultations more convenient than face-to-face consultations, they viewed so-called telemedicine as less diagnostically accurate than in-person consultations and as having the potential to increase health inequalities and barriers to accessing appropriate care.

A key finding was that the vast majority of respondents – 86% of patients and 93% of clinicians – felt that telemedicine was worse than face-to-face consultations for accuracy of assessment, with some reporting misdiagnoses.

One rheumatology patient explained: "My rheumatologist cannot see or hear how I move, look at my skin, eyes, hair, hands, bones, how I am…I was diagnosed with something over the phone, which I know isn't right, and it's getting worse."

Melanie Sloan, lead author from the Primary Care Unit at the University of Cambridge, said: "The pandemic has had a major impact on the ability of healthcare professionals to see their patients face-to-face, and this has led to a significant increase in the number of telemedicine consultations. While these are undeniably safer in terms of COVID risk, there had been little research previously on the impact on patient care, particularly for more complex conditions."

In a study published in *Rheumatology*[1], researchers at the University of Cambridge, working with a wider team from the United Kingdom including expert consultants, patients and psychologists, examined the pitfalls and benefits of telemedicine for patients with chronic diseases.

Between April 2021 and July 2021, a total of 1,340 patients and 111 clinicians completed online surveys. The team also conducted in-depth interviews with 31 patients and 29 clinicians. The majority of patients were from the UK (96%) and had inflammatory arthritis (32%) or lupus (32%).

Disadvantages and risks

This is the first telemedicine study to have combined data from rheumatology patients, GPs and hospital clinicians. In addition to less accurate assessments, the team found several other major disadvantages and risks associated with telemedicine.

Telemedicine made it more difficult for patients and clinicians to build a trusting medical relationship, according to 90% of clinicians and 69% of patients – although if both parties had previously established a trusting relationship, this made it easier to continue trusting each other.

Clinicians highlighted the importance of a quick response to 'flaring' patients with a rapidly worsening condition, but only about half of patients were confident that they would receive a quick response to an urgent request for medical advice within 24-48 hours from their GP or hospital team. Many patients were grateful for prompt responses despite the challenges facing clinicians, but others reported still struggling to get through administrative systems to receive any kind of response or appointment.

"Waiting for a call back after 4 voicemails…feel sad and scared knowing that when I really need medical help I have no-one," said one young lupus patient.

There was concern, too, that telemedicine increased the potential for inequalities in treatment. Certain groups of patients were perceived to be at a substantial disadvantage. These included those with undiagnosed or more complex conditions, for whom English was not a first language or who had hearing, cognitive or speech difficulties, and patients experiencing socio-economic disadvantage or mental health difficulties.

"We've had some local Practices only allowing contact through econsult, so that means that if you can't use it, you're elderly, English not your first language, you've got learning difficulties… it's not fair. They're doing that whole barrier to protect their time," said one senior GP.

Over 60% of clinicians and patients found telemedicine more convenient than face-to face consultations, pointing to benefits that included COVID-19 safety, no travelling and reduced waiting times as benefits. This was especially the case for those in employment, and for patients feeling well for quick check-ins, prescriptions or administrative queries or those who struggled to get to appointments as discussed by this female lupus patient: "I am very glad that telemedicine has become an option as it not only makes me feel more relaxed and safer, but I often have great difficulty getting to hospital."

Patient preferences

However, some respondents, particularly clinicians, raised concerns that telemedicine may be over-used by the NHS and hospital management as a cost and time-saving measure, rather being than in patients' best interests. Clinicians – only

3% of whom felt telemedicine overall was better than face-to-face – and patients had rarely been consulted as to their preferences. Clinicians felt the NHS and managers wanted a higher proportion of appointments to be telemedicine than their own preferences.

Sloan added: "Our research exposes the inherent risks and benefits of telemedicine for patients with complex conditions, which may have important implications for patients who have other serious or unpredictable long-term conditions.

"As the NHS develops a telemedicine strategy, we hope there will be a thorough assessment of the clinical and psychological risks and steps taken to mitigate those risks, as well as action to address the possibility of worsening existing health inequalities for those less likely to be able to benefit from remote consultations."

The research team concluded that telemedicine's acceptability and safety can be improved by training for clinicians, offering patients more choice, careful selection of which patients to offer telemedicine to, and further consultation with clinicians and patients on its use.

Professor Caroline Gordon, from the Institute of Inflammation and Ageing at the University of Birmingham and study co-author, said: "Some stable rheumatic disease patients can benefit from telemedicine but new patients, those with worsening symptoms or more complex conditions such as lupus need quickly accessible, face-to face appointments to manage their conditions."

Senior author, Dr Felix Naughton, from the University of East Anglia, added: "Of greatest concern was the great variability in accessibility to care. Approximately half of all patients felt they would not receive a prompt response when very unwell, often citing increased barriers due to some remote contact and administrative systems that are not yet efficient enough to cope with the sudden move towards telemedicine."

One senior clinician study participant summed up the overall feelings of many: "The rapid digitalisation and use of telemedicine must stay but appropriate patient selection is key, it is perfect for some but disastrous for others".

Reference

[1] Sloan, M et al. Telemedicine in rheumatology: A mixed methods study exploring acceptability, preferences and experiences among patients and clinicians. Rheumatology. Nov 2, 2021; **doi**: *https://www.doi.org/10.1093/rheumatology/keab79*

Telemedicine needs to be integrated into cardiology training, experts recommend

The COVID-19 pandemic has resulted in an abrupt change in healthcare delivery, including a shift from in-person visits to telemedicine. However, a Canadian survey found that a significant proportion of cardiology trainees are uncomfortable with using telemedicine and feel that better preparation for new-tech medicine is needed. Experts draw attention to the need for a telemedicine curriculum that includes supervision to prepare trainees for the expanding role of telemedicine in cardiovascular care. Survey results are published in the *Canadian Journal of Cardiology*.[1]

"Our outpatient care shifted almost overnight from in-person visits to providing care to patients via telephone or video platforms as a result of COVID-19," explained principal investigator Parvathy Nair, MD, FRCPC, Division of Cardiology, Department of Medicine, Vancouver General Hospital, University of British Columbia, Vancouver, BC, Canada. "It was clear that training had to adapt to this change."

Virtual visits are fundamentally different from face-to-face encounters. They require providers to employ key communication

skills such as effective web-side manners, agenda setting, reflective listening, virtual physical examination skills, and understanding the medicolegal boundaries of virtual healthcare. Of equal importance is recognizing situations in which virtual visits should not replace face-to-face encounters, for example in acutely ill patients requiring full physical examination.

In December 2020, the investigators distributed a self-administered survey of 22 questions in four categories (background, exposure to telemedicine before COVID-19, current telemedicine experience, and perceived barriers to telemedicine). A total of 86 cardiology trainees from 12 programs in Canada completed the survey, a response rate of 65 percent.

Before COVID-19, 39 trainees (45 percent) reported having been exposed to telemedicine. This increased to 67 trainees (78 percent) after COVID-19. Junior trainees had less exposure to telemedicine compared with senior trainees: 16 out of 25 (64 percent) versus 51 out of 61 (84 percent), respectively. When engaged in telemedicine, only four of the 67 trainees reported full supervision with an attending physician overseeing the entire virtual visit, while 13 reported partial supervision and 50 had minimal or no supervision.

"We found that only 51 percent of the trainees were comfortable or very comfortable with providing outpatient care via telemedicine," noted Dr. Nair. "We attributed this to the lack of dedicated telemedicine training. Additionally, our finding that three-quarters of trainees had minimal or no supervision when carrying out virtual visits suggested that lack of staff oversight may contribute to this lack of trainee comfort. Trainees with higher telemedicine exposure were more likely to feel comfortable with its practice and intend to adopt it in their future careers."

Barriers to telemedicine practice

The reasons given by trainees as barriers to telemedicine practice included fear of weakening the patient-physician relationship; concerns about ease of use by patients; and unfamiliarity with telemedicine technology. Not surprisingly, the majority of trainees (78 percent) believed training in telemedicine was needed. In particular, trainees expressed the need to learn more about the medicolegal aspects of telemedicine, how to conduct virtual clinical assessment, and how to document their patients' visits.

A recent survey published by the Canadian Medical Association reported that four of every 10 Canadians would prefer to have their medical care provided via telemedicine even after the COVID-19 pandemic is resolved.

According to Dr. Nair: "The findings that only one in two trainees is comfortable with telemedicine and one in four do not plan to provide telemedicine services in the future are therefore concerning."

To address this educational gap, Dr. Nair and Dr. Aws Almufleh, the lead investigators, are now developing a telemedicine curriculum to better prepare cardiology trainees to take part in providing evidence-based, high quality virtual outpatient care.

"The pandemic has magnified the need for accessible virtual outpatient care in medicine. As educators, it is incumbent upon us to train the future generation of cardiology specialists to provide the highest quality virtual care services for all patients who need them. We are optimistic that by collaborating with educators from around the country, we can accomplish this goal," commented Dr. Nair.

Reference:

[1] Aws Almufleh, et. al. The Need for Telemedicine Integration Into Adult Cardiology Training Curricula in Canada. *Training/Practice Training in Cardiovascular Medicine and Research*. June 01, 202.

doi: *https://doi.org/10.1016/j.cjca.2021.03.001*

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DOCTOR PAZDIREK AND HIS 12 YEARS' **EXPERIENCE IN SAUDI ARABIA**

Doctor Jiri Pazdirek currently works as a consultant physiatrist for Altoa Medical Tourism and he is one of our forefront physicians who is taking care of foreign clients, mainly thanks to his work experience from Saudi Arabia. Altoa Medical Tourism ensures individual and above-standard health care at the highest possible level. We provide medical treatment in the field of orthopaedics, rehabilitatiom, aesthetic medicine and diagnostics. For those who are not able to attend the Arab Health exhibition, we bring a short interview with the doctor.

WHY HAVE YOU DECIDED TO START WORKING IN SAUDI ARABIA?

I would say it is a family tradition. My father worked as a physician abroad for many years. First in Tunisia where I was with him as a child and later on in Libya. It was an amazing experience and since then I have been trying to achieve something similar. After having a successful career in the Czech medicine I strived to add an international experience to my professional life. Working for five years as a medical director of a 100-bed rehabilitation hospital affiliated with the University hospital and with teaching experience from the Masaryk's University in Brno, I felt ready to go.

IN WHICH SAUDI HOSPITAL DID YOU WORK?

Prince Sultan bin Abdulaziz Humanitarian City in Riyadh. It was brand new hospital when I started there in 2005. My work was dedicated to the development of all rehabilitation programs at the beginning, but later on I focused on traumatic brain injury rehabilitation. I was working as a director of this programme and we expanded from 26 to 52 beds. We took this programme to an international level. With my Arab associates, we published TBI rehabilitation Pathways presented at the International Conference in San Francisco in 2014 and a TBI rehabilitation manual. I was also a member of a scientific committee of The International Brain Injury Association (IBIA).

DID YOU ENJOY YOUR FIRST YEARS IN SAUDI ARABIA?

They were difficult and amazing at the same time. Later on mostly amazing, so I stayed longer than others.

WHAT IS YOUR HIGHLIGHT MOMENT FROM SAUDI ARABIA?

It was definitely our international team success with a TBI rehabilitation Pathway and our TBI rehabilitation manual presenting at the conference in San Francisco in 2014.

DO YOU HAVE ANY BAD EXPERIENCE IN YOUR CAREER AS A CONSULTANT PHYSIATRIST?

Nothing specifically bad but some colleagues find it diffucult to tell the patients the true prognosis of their disease or disability, especially here with "Arab" culture, nobody wants to hurt anyone's feelings. But it is difficult to do serious rehabilitation medicine with such approach. Sometimes stirring emotions may bring a better motivation or adjustment to the condition.

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Altibbi consultation services expand rapidly across MENA

Altibbi is the first and largest platform in the Arab region offering telemedicine consultation services. It allows patients to connect directly with accredited doctors via audio calls and chats. Altibbi is the Middle East and North Africa (MENA) region's only comprehensive, end-to-end Digital Health Solution offering, capable of meeting regional demand.

With first mover advantage, Altibbi has leapfrogged competition in reach, scale and technology. Altibbi has experienced rapid growth and demand for its services. In 2020, Altibbi conducted 2 million consultations – with this figure increasing to over 4 million by July 2021. 16 million consultations are expected by 2025. Altibbi currently has 13 million unique monthly users – including end consumers, corporates, doctors, governments (Jordan and Egypt) and large insurance companies in KSA, Egypt and the UAE (including Tawuniya and AXA). It is the largest player in Saudi Arabia currently – and still growing – with contribution from the wider MENA region expected to increase three-fold by 2025.

In addition to providing medical consultations via the Internet in all countries of the Arab world, Altibbi works on more than a million pages of Arab medical content over the internet, providing reliable medical information to those who need it.

Altibbi was originally launched by Dr Abdel Aziz Labadi, the father of CEO Jalil Allabadi, in 2004 as a "Medical Glossary" in Arabic, creating a pioneering medical reference for Arabic-speakers. It has since expanded and become the digital health platform that it is today.

Altibbi has a quality management team hailing from the region, bringing solutions to the region. Altibbi has been accredited by 10,000 doctors in the Arab region, and its website won the World Summit Award for Best Digital Health Content and the Schwab Award for Best Social Institution.

Due to the fast-growing population, high internet penetration and need for accessible, low-cost solutions, Altibbi has the opportunity to become the first digital health unicorn in the MENA region.

Recent developments

During the pandemic, Altibbi partnered with the Egyptian and Jordanian governments to provide its telemedicine services through the respective national Covid-19 hotlines. By instantly connecting users to certified doctors, these hotlines played a central role in easing the pressure on the national healthcare systems and combatting the transmission of the coronavirus.

Earlier in 2021, Altibbi launched its medical academy, designed to strengthen virtual primary care across the Middle East. The academy's main objective is to improve the quality of care by the doctors via telemedicine and ensure it is on par with best global standards. All the courses are certified by the Royal College of General Practitioners in the UK and delivered through the partnership with Primary Care International – the social enterprise. Over 100 Altibbi doctors are currently enrolled in the Academy – with all 1,500 Altibbi doctors expected to be enrolled by end of 2022. MEH

Altibbi unveils new method of consultation in Egypt

Altibbi has unveiled a new method of consultation in Egypt, designed to provide instant, easy and affordable access to healthcare.

Egyptians can dial 1130 and connect with a certified doctor directly. Payment is taken via phone credit per minute.

By enabling those without a smartphone or internet connection to access healthcare services, Altibbi is extending healthcare coverage to a wider patient base in Egypt, thus helping to reduce inequalities in access to healthcare, which is particularly pertinent in Egypt due to social and economic challenges.

The hotline is available throughout Egypt and Altibbi's aim is to provide two million consultations in Egypt by the end of Q2 2022.

This initiative builds on Altibbi's partnership with the Egyptian and Jordanian governments to provide its telehealth services through the respective national Covid-19 hotlines. These were vital in easing the pressure on the national healthcare systems, connecting users to certified doctors and combatting the transmission of the coronavirus.

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Can we go from scarred to scarless skin?

Researchers from the University of Tsukuba, Japan, find that a species of salamander can regenerate its skin without scars and could possibly be used as a model system for studying human skin regeneration.

Although human skin heals from injuries and wounds, many of us have scars that are left behind. Scar formation happens in adult mammals because skin regeneration does not fully occur. This poses a challenge to physicians who wish to conduct surgeries without scars appearing afterwards. In a newly published article in Biomedicines, a team led by researchers at the University of Tsukuba investigated the use of the adult newt, *Cynops pyrrhogaster*, as a model system for studying scarless wound healing for technology development in surgical and cosmetic medicine.

After an injury occurs, the epidermis, which is the outer layer of the skin, can grow and migrate to fill in the wound. This is known as re-epithelialization. Although this takes place, the original skin colour and texture is sometimes not retained, leading to the appearance of what we know as a scar. Processes called granulation and dermal fibrosis underpin scar formation, making them a focus for scientists aiming to minimize scarring following clinical procedures. Amphibians have been used as animal models for studying this, because they do not scar prior to metamorphosis. However, it is not clear what happens to fully mature amphibian skin.

"We chose to examine the adult Japanese fire-bellied newt, which is a type of salamander that is well understood on the genetic level," explains Dr. Tatsuyuki Ishii, lead author of the study. "We know adult newts are capable of complicated tissue, organ, and limb regeneration. Despite that, their ability to regenerate skin has not been scientifically demonstrated."

The team excised a small piece of skin from various body parts of adult newts, including the head, trunk, limbs, and abdomen. They periodically observed the skin healing and regeneration progression for up to two years, making note of re-epithelialization and dermal fibrosis, as well as recovery of texture, appendage, and colour.

Cynops pyrrhogaster

"Interestingly, we found that the adult newts could successfully and fully regenerate their skin at each part of the body that we examined," describes Professor Chikafumi Chiba, senior author. "Re-epithelialization occurred at all locations, while no dermal fibrosis was observed at all."

However, the original color pattern of the dorsal-lateral and ventral skin was not restored. Because humans do not have such color patterns, the researchers believed this to be a newt-specific issue. Thus, they concluded that Cynops pyrrhogaster could be a perfect model system for investigating skin regeneration and scar formation in humans.

The team also further studied skin regeneration in these newts at the morphological and molecular level. The wounds tended to heal within only a few days, while skin regeneration took up to two years to complete. Inflammatory gene markers were only briefly expressed during wound healing.

"Dermal fibrosis is often characterized by prolonged inflammation at the wound site," explains Dr. Ishii. "Scar-free skin occurred in the newts through rapid re-epithelialization and skipping of granulation and dermal fibrosis."

Overall, these findings will be crucial for future studies in humans focusing on efforts to prevent scarring in human skin following various medical procedures.

Reference:
doi: *https://bit.ly/3HRFLhk*

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For cancer care, Stanford Medicine is responsible for some of the most important medical advances of the 20th century and is building on that legacy in the 21st; it is ranked #12 by U.S. News & World Report for cancer care. Recognized as a comprehensive cancer center by the National Cancer Institute, the Stanford Cancer Institute quickly translates discoveries into improved diagnostics and safer, more effective therapies.

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Smart hospital, resilient organization

Health Information Technology can enable organizational resilience

By **Benjamin Kanter**, MD, FCCP
Chief Medical Information Officer, Vocera

Clinical and operational systems push out notifications about patient care events: a patient is deteriorating, is about to fall, or has pressed the nurse call button.

For care teams to respond effectively to notifications from multiple different systems, the hospital's digital infrastructure must be able to rapidly convert this data into actionable information.

The ability to respond rapidly characterizes hospitals that successfully navigate crises and is a major factor in what makes an organization resilient.

A smart hospital leverages its digital infrastructure to continuously derive insight from its systems and rapidly address operational and clinical challenges.

Information must be communicated to be acted upon

But deriving insight is not enough. Information must be communicated if it is to be acted upon. This is why a modern clinical communication and collaboration (CC&C) platform is foundational infrastructure for a smart hospital.

Rapid sharing of organizational knowledge is critical because most problems that arise during patient care are event-driven and time-dependent. Without a modern CC&C platform, connections in the information chain depend upon fallible staff members, and this fallibility can introduce opportunities for communication delay or failure. If knowledge sharing is delayed, the consequences can be profound for both the patient and the organization. For example, the length of time taken to rescue patients with unexpected clinical deterioration has been correlated with poorer outcomes, including excess days in the ICU and increased mortality rates.

To shorten time to act and intervene, communication is essential

Smart hospitals enable caregivers to shorten their time to act and intervene by integrating systems with a comprehensive communication platform.

Most health information technology systems implemented in hospitals can send notifications about the status of a patient or the monitoring system itself. Unfortunately, these systems are often siloed, resulting in an excessive number of uncoordinated notifications while contributing to cognitive overload and burnout.

The solution: Break down silos through CC&C interoperability

The solution is a CC&C platform that can receive and analyze data from multiple systems and orchestrate the necessary actions. Smart hospitals require a solution that can make sense out of chaos, ensuring data is converted into information and distributed efficiently.

At the most basic level, a CC&C platform includes three elements: inputs, a processing layer, and outputs.

Inputs come from clinical and operational systems that send messages and alarm notifications. The Vocera CC&C platform has more than 150 integrations with health IT systems through the Vocera Engage intelligent workflow engine; those integrations serve as input to the main platform's processing layer.

The processing layer aggregates data streaming in from the various systems. It breaks down silos so data from independent sources can be merged and processed together using a system of rules. If a rule determines that information needs to be transmitted, the system routes it to the right person or team based upon role, responsibility, and availability. The same platform constructs an audit trail and provides analytics and reporting.

Given data feeds from staff assignment systems, EHRs, and digital on-call schedules, the Vocera system creates and maintains a real-time care team directory for each patient. It tracks who's currently working, their role, which patients they're caring for, and their availability. Maintenance of this up-to-the-moment care team is crucial to the outputs – delivering the right information to the right people and helping to reduce interruption fatigue.

An optimal CC&C platform integrates with multiple different systems, processes data, and intelligently distributes information to those responsible for acting. As a direct result, hospitals become more efficient and patient outcomes are improved, while communication burdens for physicians and nurses are reduced. MEH

Texas Heart Institute studying how stem cells treat heart failure

Baylor St. Luke's Medical Center | Baylor College of Medicine | Texas Heart Institute

A huge advancement in treating heart disease could be on the horizon. Researchers at the Texas Heart Institute are studying a high-tech way to use stem cells to spare lives and protect patients from the #1 killer.

Your heart is a powerful pump responsible for circulating blood that sends oxygen and nutrients to every cell in your body, but when the heart can't keep up with those important duties, it's called heart failure.

"Typically, that means someone who gets very tired for a breath. If they cross a room or go up a flight of stairs, they're very limited in what they're able to carry out and there are different degrees of that, of course," explains Dr. Emerson Perin, the Medical Director of the Texas Heart Institute.

Suffering from heart failure is life-altering and is often caused by inflammation.

"Just think of kind of a smouldering fire that's going on and it makes your own tissues kind of not work well, work against your body, and so the heart just doesn't work well," says Dr. Perin. He goes on to explain, reducing that inflammation is the key to treating heart failure.

Dr. Perin and his team are studying how well patients stabilize after treatment from stem cells.

"These cells, we're able to put them in the middle of the tissue, so we actually inject them directly into the heart. And they basically look around. They can sense their environment and they see, oh, this is a tissue that's in trouble, it's very inflamed. There are actually receptors on the cells for different things that we know are signals of inflammation," explains Dr. Perin.

He says those cells activate and counter the inflammation, not only in the heart tissue but in blood vessels all over the body. He and his team have been studying more than 500 patients for more than two years after their stem cell treatment. They're impressed with the results.

"If we look at heart attack and stroke, there was a 65% reduction in the amount of heart attack and stroke in the patients that got the cells injected into their heart versus the patients that we just simulated that and didn't inject the cells into their heart," says Dr. Perin.

It reduced death related to cardiovascular issues by 80% in those with high levels of inflammation and less damaged hearts.

Next level treatment

Treatment for heart failure typically involves dietary changes, including less salt and fluids plus prescription medications. Defibrillators and pacemakers are also sometimes necessary, but this treatment, using adult stem cells extracted from bone marrow, takes it to a new level.

"It's really fascinating! Everybody in the world walking around, has stem cells in every organ of your body. So you don't need to go searching for other sources, when we have them ourselves," says Dr. Perin.

The successful treatment sure has the Food and Drug Administration's attention, potentially becoming mainstream therapy for persistent heart failure, being developed right here in the Texas Medical Center.

"Our research at Texas Heart is really focused on what we call translational medicine. It's not doing molecular things in a laboratory, test tubes. It's how do we take things that are innovated to patients and make patients better? That is our goal in life," says Dr. Perin.

The Texas Heart Institute has presented their research on the stem cell therapy through a phase 3 clinical trial to the American Heart Association's Scientific Session. It involved a randomized, controlled 565-patient phase 3 clinical trial of patients with class II and class III persistent heart failure. This is one of many breakthroughs for the Texas Heart Institute, known for pioneering the first successful heart transplant and the first total artificial heart implant in the United States. MEH

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- Highest ranked USNWR Cardiology and Heart Surgery Program in Chicago and Illinois for at least 12 straight years
- Highest heart failure survival in Illinois and top ten in the nation, for four consecutive years
- Highest acute heart attack survival in Illinois and top ten in the nation, for five consecutive years
- Highest heart transplant volume in Illinois, including the most ever (56) in a single year
- Highest heart valve surgery and transcatheter valve procedure volumes in Illinois
- Northwestern Memorial Hospital performs 30% of the mitral valve repairs among the 63 open heart programs in Illinois
- Center for Vascular Disease was the first in the nation to be granted Accreditation for Carotid Stenting by the Intersocietal Accreditation Commission (IAC)
- Pulmonary Vascular Disease Program is a designated Pulmonary Hypertension Association "Participating Accredited Center for Comprehensive Care," and is one of the few programs in the United States that offers pulmonary thromboendarterectomy (PTE) and balloon pulmonary angioplasty (BPA) for the treatment of pulmonary hypertension.

The Bluhm Cardiovascular Institute continues to evolve and create niche clinical programs for patients with complex diagnoses and disorders such as those with atrial fibrillation, aortic dissection, high-risk aneurysms, advanced heart failure and valvular heart disease, including bicuspid aortic valve disease.

Bluhm Cardiovascular Institute is also dedicated to being on the next frontier in breakthrough medicine. Launched in 2018, the Center for Artificial Intelligence in Cardiovascular Disease is collaborating with leading innovators in the healthcare industry to utilize artificial intelligence and machine learning to advance the study and treatment of cardiovascular disease.

Cardiology Physician Pioneer

Dr. Clyde Yancy – Chief of Cardiology at Northwestern University, Feinberg School of Medicine, and Associate Director of the Bluhm Cardiovascular Institute. His research interests are in heart failure, clinical guideline generation, outcomes sciences and health care disparities. He is extensively published with well over 475 peer-reviewed publications and is Deputy Editor, JAMA Cardiology and Senior Section Editor (Heart Failure), Journal of the American College of Cardiology. He is a former President of the American Heart Association (AHA), as well as a past recipient of the AHA National Physician of the Year and the Gold Heart Award.

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Healthcare leaders in Saudi Arabia focussed on partnerships, sustainability – Philips Future Health Index 2021 report

Philips has published its Future Health Index (FHI) 2021 Saudi Arabia report: 'A Resilient Future: Healthcare leaders look beyond the crisis'. Now in its sixth year, the Future Health Index 2021 report is based on proprietary research across 14 countries, including Saudi Arabia, representing the largest global survey of its kind to analyse the current and future priorities of healthcare leaders worldwide.

Feedback from healthcare leaders – including executive officers, financial officers, technology and information officers, operating officers and more – explores the challenges they have faced since the onset of the pandemic, and where their current and future priorities lie, revealing a new vision for the future of healthcare. With a focus on patient-centred healthcare enabled by smart technology, their vision is shaped by a fresh emphasis on partnerships, sustainability and new models of care delivery, both inside and outside the hospital.

While the COVID-19 pandemic has impacted their ability to plan for the coming years, healthcare leaders in Saudi Arabia are largely optimistic (99%) in the

country's healthcare system and feel confident (86%) in the ability of their hospital/healthcare facility to deliver quality healthcare three years from now.

"It is inspiring to see how confident healthcare leaders in Saudi Arabia are in the capabilities of the country's healthcare system and our healthcare facilities to deliver on quality care." said Eng. Mohamed Sindi, CEO of Philips Healthcare Saudi Arabia.

A strong sense of optimism

As they continue to respond to the crisis as a top priority, healthcare leaders in Saudi Arabia are currently more likely than those across many of the other countries surveyed to prioritize a shift to remote or virtual care. Healthcare leaders in Saudi Arabia (71%) are among the most likely of those surveyed to pursue a shift towards value-based care in the future, potentially due to the health sector transformation program in alignment with vision 2030. The vast majority (99%) agree that current healthcare policies and plans in their country are contributing to building a resilient healthcare system.

Digital transformation

As healthcare leaders in Saudi Arabia adapt to the immense changes of the past year and prepare for the future of healthcare, they appear to be taking a three-step approach to digital transformation.

Building a lasting digital health legacy

Healthcare leaders in Saudi Arabia are currently investing in telehealth in higher numbers than those across many of the other countries surveyed, (81%) suggesting large-scale recognition of the value of virtual care delivery.

While telehealth has been crucial for both healthcare providers and patients during the pandemic, 14% of healthcare leaders in Saudi Arabia expect that investment in the technology will drop significantly in the future. One possible reason could be that innovations put in place today, will build a foundation for further digital transformation throughout the sector.

Investing in Artificial Intelligence (AI)

While healthcare leaders in Saudi Arabia say telehealth is the digital health technology their hospital or healthcare facility are currently investing most heavily in, investments will shift in the next three years, with 98% saying they would most like to invest in AI in the future. Almost three-quarters (71%) say AI technologies like those to predict outcomes or to integrate diagnostics is the digital health technology they would most like to invest in the future.

Driving change with strategic partnerships

Roughly half (47%) of the healthcare leaders in Saudi Arabia, higher than those across many of the other countries surveyed, believe that prioritizing strategic partnerships and collaborations is necessary to successfully implement digital health technologies within their hospital or healthcare facility. Healthcare leaders in Saudi Arabia (44%) want to collaborate with other private hospitals or healthcare facilities to drive digital transformation within their hospital or healthcare facility.

However, as they pursue this three-step-digital approach, healthcare leaders in Saudi Arabia face barriers that must be overcome to successfully prepare for the future and fully leverage digital health technologies, including staff inexperience and difficulties with data management.

"I am delighted by the pace at which Digi-health solutions have been so well adopted and implemented locally and this excites me about the future and the further evolution of AI solutions in healthcare," said Eng. Mohamed Sindi. "This year's report explores how healthcare leaders in Saudi Arabia want to collaborate with other private hospitals and healthcare facilities to drive digital transformation within the facility. In addition, a shift towards remote or virtual care and data privacy security remain high on the priority list."

Sustainability

"The findings of the Future Health Index (FHI) 2021 Saudi Arabia report demonstrates the resilience and commitment of Saudi Arabia's healthcare leaders in building sustainable, patient-centred healthcare systems beyond hospital walls."

Mohamed Sindi, CEO
Philips Healthcare Saudi Arabia

"By aligning ourselves to the Kingdom's Vision 2030, which includes the Health Sector Transformative Program, based on the principles of value-based care, we believe we are well positioned to continue improving people's lives," said Eng. Mohamed Sindi

In three years from now, healthcare leaders in Saudi Arabia expect about a fourth of routine care to be delivered beyond hospital walls. As they look to the future, ambulatory primary care centres are expected to account for a much greater share of out-of-hospital routine care delivery compared to today. The home, as well as pharmacies and other retail locations are also expected to grow in their use as care delivery locations in the future, potentially facilitated by the increased adoption of digital health solutions.

The healthcare sector around the world faces the task of building a more sustainable healthcare ecosystem. Healthcare leaders in Saudi Arabia expect to shift their focus to implementing sustainability practices (71%) and to a greater degree than the average of those surveyed across the 14 countries.

Since 2016, Philips has conducted original research to help determine the readiness of countries to address global health challenges and build efficient and effective health systems.

- Access the Future Health Index 2021 report: *https://bit.ly/3IRiCwN*

World Obesity Federation warns about increasing cost of obesity in KSA

The Kingdom of Saudi Arabia is witnessing fast and progressive developments in healthcare provision and delivery. These include the three programmes from Vision 2030: the Quality of Life Programme (QoL), the National Transformation Programme (NTP), and the Health in All Policies (HiAP) strategy. The HiAP strategy is a cross-sectoral strategy that aims to address the social determinants of health in the Kingdom. Together, these programmes comprise various goals for the health and wellbeing of the population. The provision of healthy foods, the performance of more physical activity, and the modification of the public environment are just some of the main goals of the aforementioned programmes.

One success story from the Ministry of Health (MOH) and governmental action is the control and management of the COVID-19 pandemic. Rapid and effective actions were taken by the health authorities and the concerned governmental sectors starting from lockdowns, enforcement of wearing face masks and social distancing in public places, and a mass vaccination campaign.

"We call for a similar multisectoral prevention and management approach against other common causes of death such as injuries from road traffic accidents and non-communicable diseases such as obesity, diabetes mellitus, hypertension, ischemic heart disease, cerebrovascular accidents among others," the World Obesity Federation said.

Obesity, however, is the most prevalent chronic disease in the Kingdom. It has been linked to multiple complications including type 2 diabetes mellitus, obstructive sleep apnoea, hypertension, and ischemic heart disease, and can have substantial consequences on the psychosocial life of individuals living with obesity. A recent study in *BMJ Global Health* estimated that in 2019, the economic impact of overweight and obesity in the Kingdom of Saudi Arabia totalled US$19.2 billion. This is the equivalent of 2.4% of the Kingdom's GDP in that year. Worryingly, if current trends continue, the same study estimated that by 2060 costs will rise fourfold to US$78.09 billion, the equivalent to 4.2% of GDP.

Despite these economic, social and health consequences, the prevalence of obesity in the Kingdom of Saudi Arabia continues to increase at alarming rates and is approaching 33% in adults, and between 10-20% in children and adolescents.

Obesity prevention initiatives

Several initiatives and programmes have been proposed to prevent and control this rise of obesity in the Kingdom. Examples of such initiatives include the Saudi Food and Drug Authority (SFDA) policies to reduce the content of sugar, salt, saturated and trans-fat, and the mandatory display of caloric content of foods overseen by the Ministry of Municipality and Rural Affairs (MOMRA). Taxation of sugary beverages by the General Authority for zakat (GAZT) have also been implemented with a tax rate of 50% for soft drinks and a tax rate of 100% for energy drinks. Another prominent initiative was the implementation of Rashaqah (fitness), a joint programme between the MOH and the Ministry of Education (MOE), which addresses the provision of healthy canteen food, structured regular exercise sessions and screening for overweight and obesity among students.

Moreover, the MOH produced the Obesity Prevention & Control Strategy 2020-2030 by Weqaya (prevention) at the Public Health Authority (PHA), which was recently established replacing the former Center for Disease Control (CDC-MOH). Under the PHA, a Committee to Combat Obesity has been established with the mandate to coordinate interprofessional education and training and manage a collaborative practice among the various sectors to help in the refinement and implementation of the various strategies and programmes to prevent and manage obesity. All of this is in addition to the several obesity prevention and management guidelines, publications, reports, conferences, workshops, and symposia that address the subject of overweight and obesity prevention and management across all age groups.

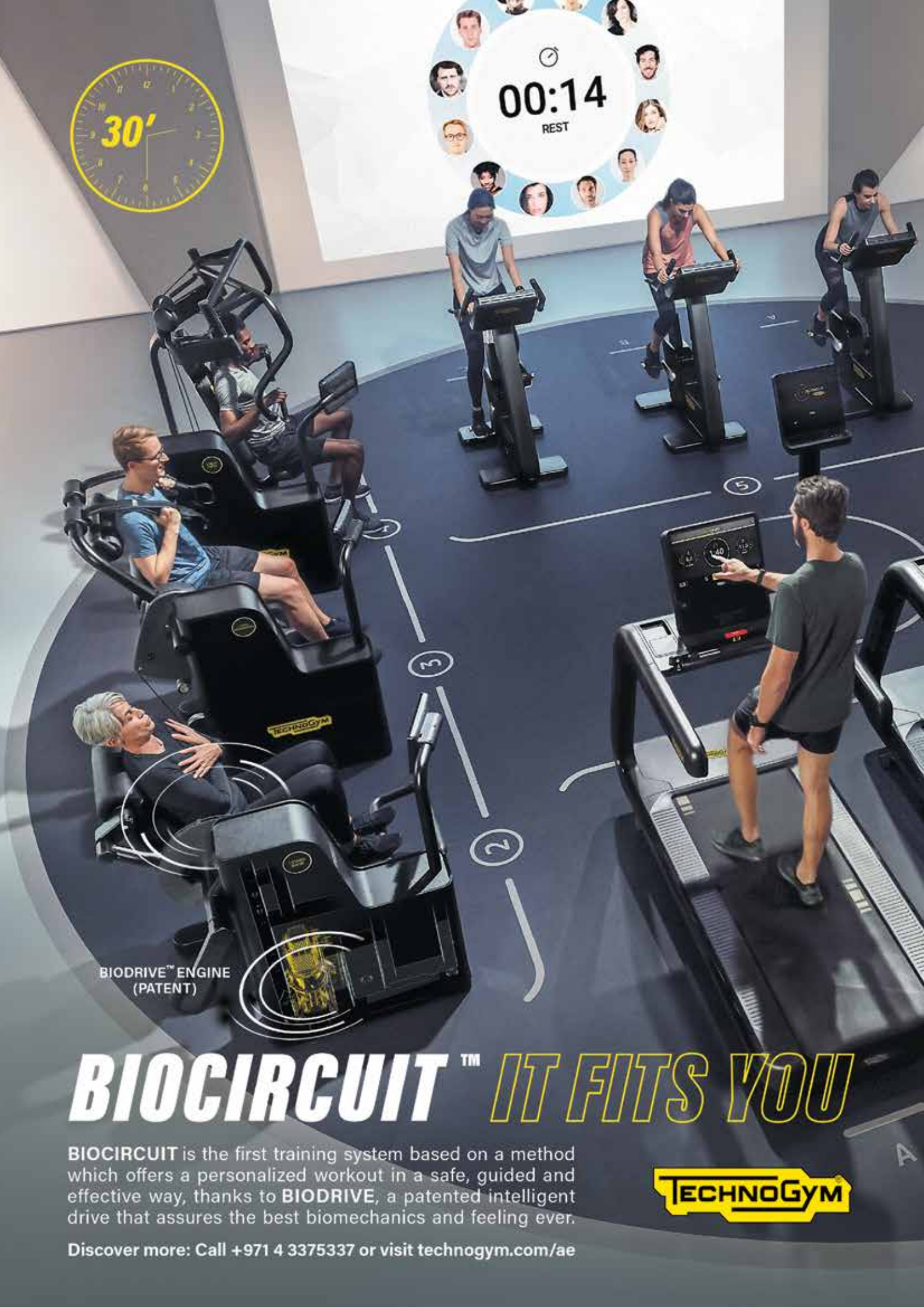
"Unfortunately, at this time, most of these strategies and programmes are lacking implementation toolkits and actions. This is a challenge that needs special consideration and further work by the government and other concerned stakeholders and actors," the World Obesity Federation said.

Implementation

Recently, the Saudi Society for Metabolic and Bariatric Surgery (SASMBS) in collaboration with the World Obesity Federation (WOF) took the initiative to discuss and address issues related to the implementation of obesity prevention and management strategies and programmes, including barriers and opportunities. This was achieved through a virtual roundtable workshop shared and attended by key experts in obesity prevention and management and other relevant stakeholders.

The main conclusions and recommendations of this workshop included:

1. Use momentum around Vision 2030 to push for implementation of obesity ef-



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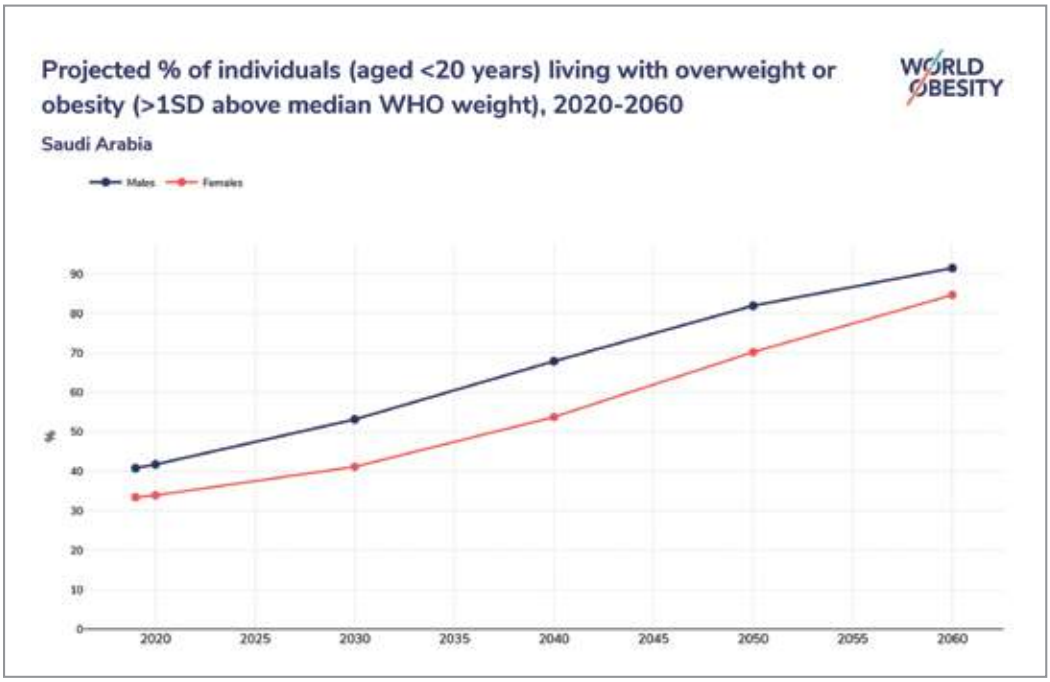

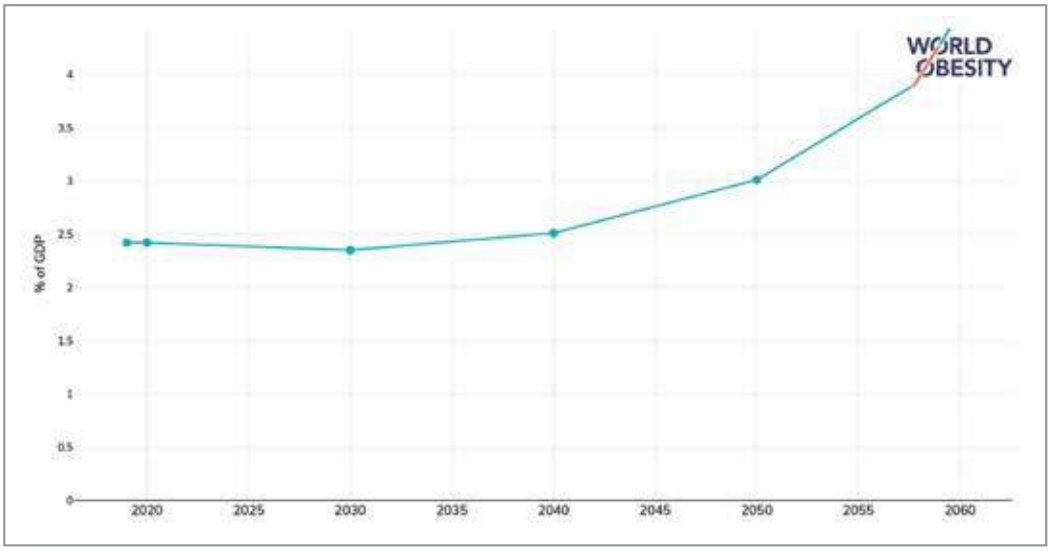

forts and employ the use of KPIs to do so.

2. Use evidence of the economic impact of obesity to encourage action.

3. Allocate budgets to obesity so that stakeholders and sectors can focus on implementation and invest in the monitoring and evaluation of all programmes and policies.

4. Unify all parties – including the MOH, SASMBS and the Public Health Authority – so that going forward there is one set of obesity and bariatric guidelines that everyone follows.

5. Mandate all parts of the healthcare sector to implement existing guidelines.

6. Encourage insurance companies to cover the full range of obesity treatment in line with existing guidelines. This was achieved through the Medical Insurance Council and will be effective in 2022.

7. Empower individuals with obesity to seek out care earlier and promote patient education.

8. Increase training and education on the use of obesity medication.

9. Increase capacity within primary care to deliver low-level interventions and follow-up care.

10. Improve public health messaging around obesity and the maintenance of a healthy lifestyle.

11. Recognize obesity as a chronic disease, not just a risk factor for other diseases, starting with a position statement from the "Public Health Authority" and/or the "SASMBS" (similar to the 2017 World Obesity Federation position statement).

12. Adopt the National Bariatric Registry initiative by Sultan Ben Abdul-Aziz Humanitarian City to improve the quality of research on bariatric surgery and to create a wide spectrum national registry that covers all disciplines.

"We believe that action on the above recommendations, with support from the Government and other interested parties, will help ensure better care is available to those living with obesity. We must build on the momentum channelled thus far, and continue our efforts," the World Obesity Federation said. MEH

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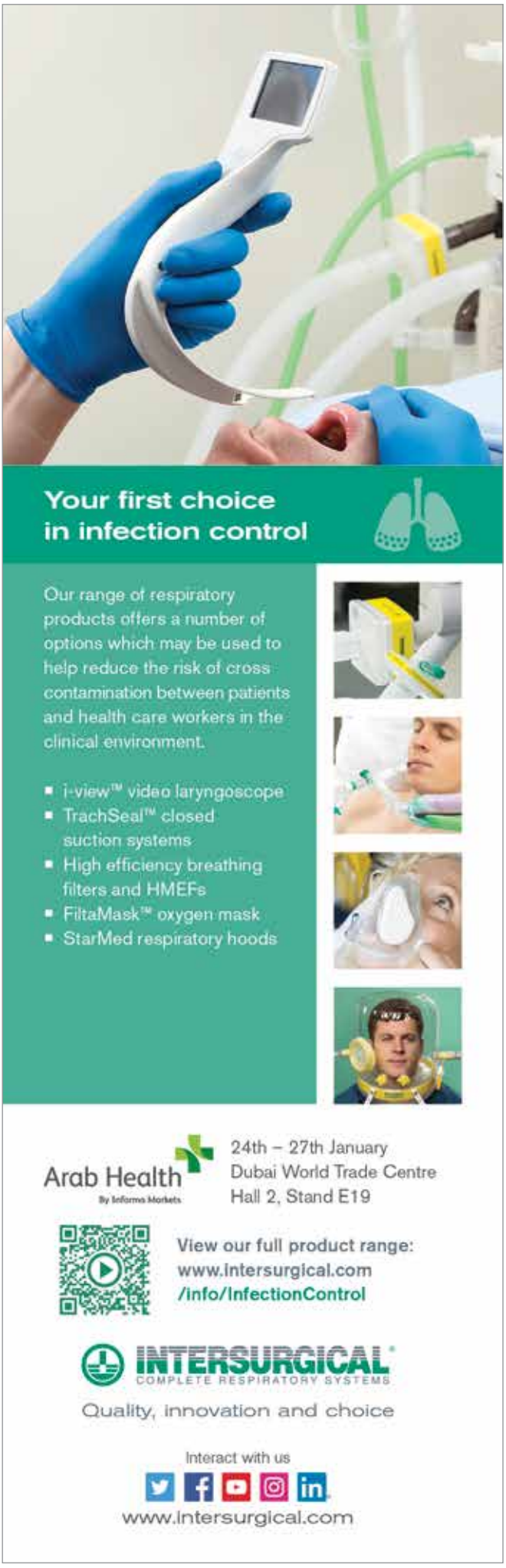

Abu Dhabi Crown Prince and Bill Gates mark decade-long disease eradication partnership

His Highness Sheikh Mohamed bin Zayed, Crown Prince of Abu Dhabi, and Bill Gates, Co-Chair of the Bill & Melinda Gates Foundation, met in Abu Dhabi in December to review the success of their global health partnership and plan future efforts, ten years after their first philanthropic collaboration to tackle diseases in the developing world.

The Bill and Melinda Gates Foundation and Reaching the Last Mile collaborate on long-term, sustained investment to eliminate persistent diseases in the developing world. The partnership, which began in 2011 with a joint commitment to eradicate polio through support of the Global Polio Eradication Initiative (GPEI), has since expanded to include other global health concerns. Reaching the Last Mile (RLM) is a portfolio of global health programs working towards disease elimination that is driven by the personal commitment of HH Sheikh Mohamed.

The meeting coincided with an important new milestone in disease eradication as the Government of Niger announced it had completed the necessary evaluations to certify the elimination of river blindness in the country. The announcement validated and reflected the work of the RLMF and countless global partners which had supported the country in its efforts to eliminate the parasitic and debilitating disease.

HH Sheikh Mohamed said: "Our partnership with the Bill & Melinda Gates Foundation continues to deliver tangible results on the ground. Together, we share the belief that every person deserves the right to live a healthy, fulfilled life. Our work to eradicate diseases is helping to improve the lives of some of the world's poorest, most marginalized communities.

"Today's announcement is not only an incredible achievement for Niger, but it also provides a blueprint for eliminating other neglected tropical diseases and thereby helping improve the lives of some of the most vulnerable people in the World. We congratulate Niger for its leadership and commend the bravery and dedication of its frontline health workers that have worked tirelessly to support their communities."

Bill Gates commented: "Niger's leadership in the fight against a disease that once seemed impossible to defeat has been exemplary. I have deep gratitude to all who contributed to this achievement, including the Nigeriens whose efforts made it an attainable dream. In particular, I want to thank HH for his vision in initiating the Reaching the Last Mile Fund, which has brought new technologies and approaches to the NTD sector and supported Niger in reaching the finish line."

Over the course of its 10-year partnership, the UAE and the Bill & Melinda Gates Foundation have collaborated on several global health priorities, helping to contribute to several meaningful milestones:

- In support of **polio eradication**, the UAE and the Bill & Melinda Gates Foundation financially support the GPEI and have co-hosted critical events gathering the global health community to drive progress and increase funding. The UAE also uses its unique access on the ground in Pakistan with the Emirates Polio Program, reaching hard-to-access communities with the polio vaccine and community health support. Thanks to these efforts and the work of other partners, progress against polio is encouraging – Africa was declared free of wild polio virus in 2020 and it is now only endemic in Pakistan and Afghanistan, with only one case reported in Pakistan this year and three in Afghanistan.
- **Malaria** remains the leading cause of death in many countries around the world with half the world's population at risk, but progress is being made. Through the long-term support of the Roll Back Malaria (RBM) Partnership to End Malaria, the UAE and the Bill & Melinda Gates Foundation work with affected countries to develop and implement tailored anti-malaria strategies. And their investment in the Global Fund (which the UAE began contributing to in 2019) is helping save lives on the ground by funding anti-malarial drugs and bed nets. Thanks to the efforts of global partners, over roughly 1.1 million lives are estimated to have been saved through preventative measures in the past decade.
- At a time when many donors have pulled back from **Neglected Tropical Diseases (NTDs)**, the UAE and the Bill & Melinda Gates Foundation have com-

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His Highness Sheikh Mohamed bin Zayed, Crown Prince of Abu Dhabi, and Bill Gates, Co-Chair of the Bill & Melinda Gates Foundation, meet in Abu Dhabi to review their their global health partnership.

mitted to keeping the effort to end NTDs on the global agenda. Launched in 2017, Reaching the Last Mile Fund (RLMF) is a 10-year, US$100 million global partnership launched by HH Sheikh Mohamed and administered by the private END Fund, with support from the Bill & Melinda Gates Foundation. RLMF aims to eliminate two life-changing diseases, river blindness and lymphatic filariasis, from the Sahel region as a proof of concept for wider elimination efforts.

The two entities also serve as global advocates for ending NTDs through their support of World NTD Day. Now an official part on the UN calendar, the day provides an important platform for global awareness, coordinated action and sustained financial commitments on tackling persistent, but often overlooked NTDs.

- The polio, malaria and NTD programs more broadly impact communities by building and strengthening health systems. These programs have played critical roles in health emergencies, including Ebola and COVID-19, while also helping to create jobs and increase education and skill-building through support of on-the-ground health workers.
- The partnership drives innovation and collaboration in global health and beyond, through initiatives like The Global Institute for Disease Elimination (GLIDE). Based in Abu Dhabi and co-funded by the Bill & Melinda Gates Foundation and the Abu Dhabi Crown Prince Court, GLIDE is the first institute of its kind in the region, focused on actively contributing knowledge and expertise to disease elimination efforts worldwide.
- Similarly, the Lives and Livelihood Fund (LLF) is the biggest multilateral development initiative based in the Middle East with over $1bn in projects across Africa and Asia. Founded by the UAE and the Bill & Melinda Gates Foundation, alongside the Islamic Development Bank, KSA and Qatar, LLF's diverse achievements have included reducing malaria deaths in Senegal and improving rice production across west Africa.
- The UAE and the Bill & Melinda Gates Foundation also play an important role as conveners through platforms like the Reaching the Last Mile Forum, which gathers the world's global health leaders in Abu Dhabi to prioritize disease elimination.

> Our partnership with the Bill & Melinda Gates Foundation continues to deliver tangible results on the ground. Together, we share the belief that every person deserves the right to live a healthy, fulfilled life.

Upcoming milestones for the partnership include the next World NTD Day on January 30, 2022 and the next iteration of the Reaching the Last Mile Forum, which is due to be held in Abu Dhabi later next year. MEH

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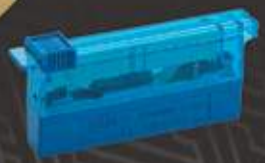

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Dr. Akram Bouchenaki,
CEO Abdul Latif Jameel Health

Accelerating access to modern medical care to drive health inclusivity

A coffee-break interview with **Dr. Akram Bouchenaki**, CEO Abdul Latif Jameel Health – on his vision for the future of health inclusivity in the developing Global South.

Q: Firstly, what is Abdul Latif Jameel Health?

■ **Akram Bouchenaki:** Abdul Latif Jameel Health was founded in 2020, as the Jameel family's response to one of the greatest problems of today's global society – the disparity in access to affordable modern medical care to those who need it most – notably this is in the fast-growing markets and economies of the developing world, particularly, the so-called 'global south'.

Q: Does the Jameel family have prior tangible health sector experience?

■ **AB:** Abdul Latif Jameel Health <*aljhealth.com*> reflects what is the Jameel Family's long-established commitment to innovating for a better future which can be seen in their global philanthropic endeavours through Community Jameel <*communityjameel.org/en*>, an international organization supporting science and technology-led solutions to global challenges. Community Jameel and MIT co-founded the Abdul Latif Jameel Clinic for Machine Learning in Health (or the Jameel Clinic <*jclinic.mit.edu/*>) in September 2018 – which has rapidly become the very epicenter of AI and healthcare at MIT – and the Abdul Latif Jameel Institute for Disease and Emergency Analytics (the Jameel Institute <*imperial.ac.uk/jameel-institute*>) co-founded with Imperial College London, in October 2019, using novel data analytics to reduce global risk of preventable disease most recently including the 2020 COVID-19 pandemic, and strengthening health systems in the most fragile settings.

Abdul Latif Jameel Health takes this commitment into the commercial environment addressing tangible real-world needs today, for a better tomorrow.

Q: How is Abdul Latif Jameel Health going about implementing this mission?

■ **AB:** The business is focused on health care inclusion, as I said, with a focus on the global south. This is accomplished under the mantra of 'accelerating access' in two main ways.

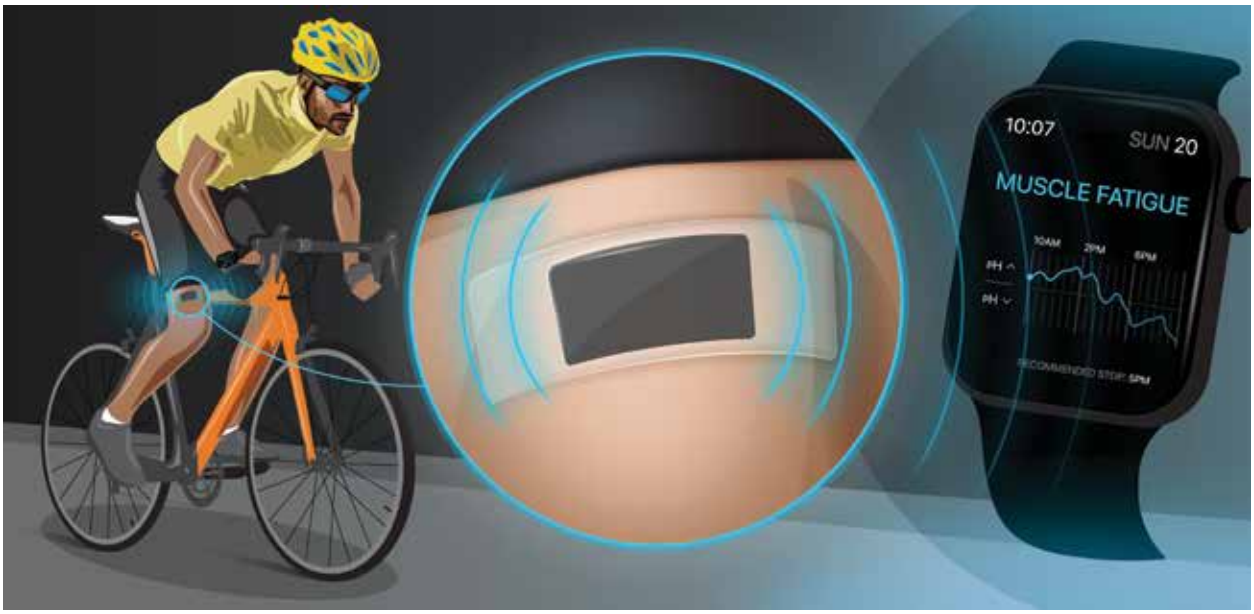
Firstly, we are rapidly developing expertise across medical devices, pharmaceuticals and diagnostics distribution – building on the solid foundation laid down by the Abdul Latif Jameel businesses over the past 75 years – and we will also provide a comprehensive range of associated healthcare business partner services. This means a single relationship solution delivering tailored services specifically designed to accommodate our partners' needs – a fully integrated proposition from registration to distribution and promotion and regulatory services.

The second approach is to constantly explore new opportunities and long-term investments to partner with innovators, global market leaders, investors, healthcare providers and government entities that share our vision. Abdul Latif Jameel Health works closely with the JIMCO Life Sciences Fund <*jimco.com/en/funds/life-sciences/*>, part of the Jameel Investment Management Company (JIMCO.com) – the global investment arm of the Jameel Family. Here JIMCO are actively investing in innovative, early-stage and breakthrough ventures and technology, aiming to positively shape the future of health.

Backed by Abdul Latif Jameel <*alj.com/*>, one of the region's most respected diversified family businesses and global investors with a 75-year heritage, deep roots, established networks and a multi-sector presence in 30 countries across six continents, Abdul Latif Jameel Health is uniquely positioned as a trusted partner in realizing major innovations and opportunities in the healthcare world.

Q: What is Abdul Latif Jameel Health offering at Arab Health in January 2022?

■ **AB:** At Arab Health 2022, we'll be introducing to the region, some of the most exciting innovative technologies and approaches from our partners who share our vision for a more inclusive health future. These are from around the world, as far away as Japan and the USA and their solutions offer a real and immediate step forward to achieving our joint ambitions. I look forward to meeting your readers there. MEH



A team of KAUST researchers has developed a prototype wearable sensor, developed with a new MXene–hydrogel compound, which may prove valuable to athletes looking for real-time performance measurements.

Fitness sensor warns when you're at your limits

Wearable device alerts users about muscle fatigue by monitoring pH levels of sweat

Ultrathin nanomaterials, known as MXenes, are poised to make it easier to monitor a person's well-being by analyzing their perspiration.

While they share a similar two-dimensional nature to graphene, MXenes are composed of nontoxic metals, such as titanium, in combination with carbon or nitrogen atoms. With naturally high conductivity and strong surface charges, MXenes are attractive candidates for biosensors that can detect small changes to chemical concentrations.

In 2019, Husam Alshareef's group developed a MXene composite electrode, which they enclosed in a wearable armband sensor. The device, which had a modular design that used MXene inserts loaded with appropriate enzymes, could absorb perspiration and detect several analytes in human sweat, including glucose and lactic acid.

Alshareef and his colleagues, in collaboration with Sahika Inal's research team, recently tried combining MXene sheets with hydrogels — water-filled polymers that are compatible with human tissue because they are able to stretch. Intriguingly, the team found that high levels of mobile ions in the hydrogel produced strong sensitivity to the mechanical strain that occurs during exercise.

"Initially the MXene sheets are randomly oriented within the hydrogel, but once you apply pressure to them, the sheets become more horizontally oriented," explains Alshareef. "Because MXenes have a high concentration of negative charges on their surfaces, horizontal arrangements strongly affect ion movements within the hydrogel, and thus we can measure different levels of pressure change."

A prototype wearable sensor, developed with the new MXene–hydrogel compound, was able to track muscle movement by producing distinct electrical resistance patterns as mechanical stress increased. These patterns in turn changed instantly when the sensor was exposed to additional ions in the form of acidic or basic solutions.

This led the KAUST team to realize their device could be used to correlate pH changes in sweat to fatigue-inducing acid build-ups in muscle cells.

"As we exercise and our muscles get tired, the sensor sees the new chemical environment and produces different electrical resistance versus stress curves," says Kang Lee, a former KAUST postdoc and lead author of the study. "By comparing these curves to reference curves for a given sensor, we can determine the pH of the sweat and how fatigued the muscle is."

With Bluetooth connectivity to nearby digital devices, the MXene-based sensor may prove valuable to athletes looking for real-time performance measurements once the technology is optimized. "The most serious challenge is the long-term stability of the sensor, so we're looking at altering compositions and designs in future experiments," says Alshareef.

Reference:
doi: *https://doi.org/10.1002smtd.202100819*

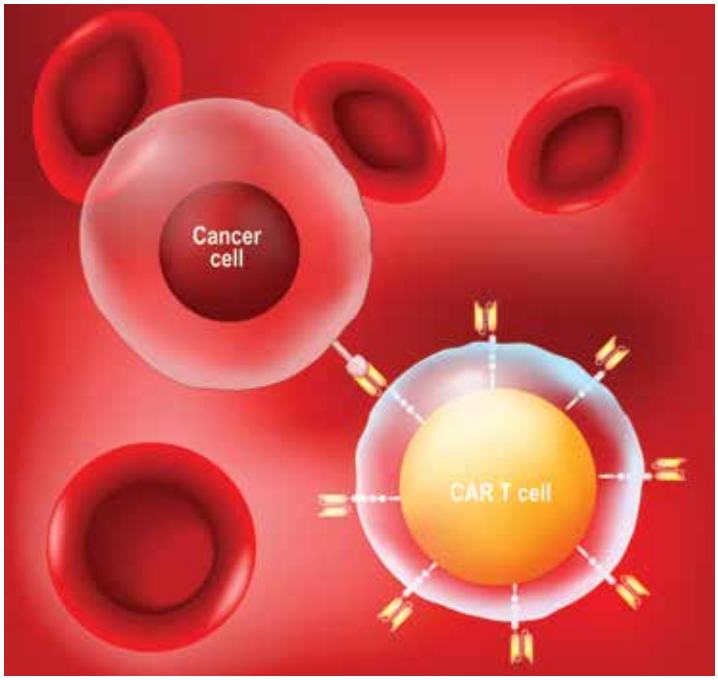
New FDA-approved paediatric cancer therapies offered at US health system

When pediatric cancer recurs, patients need access to innovative treatments and technologies that increase survival. However, these treatments require specialized expertise and complex care teams to ensure efficacy and safety.

Atrium Health Levine Children's in Charlotte, North Carolina, of the United States is bringing renewed hope to patients and families with two new FDA-approved therapies: DANYELZA and chimeric antigen receptor (CAR) T-cell therapy.

Javier Oesterheld, MD, division chief of Levine Children's Cancer and Blood Disorders, and Giselle Sholler, MD, pediatric oncologist and director of the Isabella Santos Foundation Solid and Rare Tumor Program at Levine Children's, worked together to bring these therapies to their patients.

"We were able to implement these new treatment programs so quickly because we have a very robust team that works well together in support of our patients," explained Dr. Oesterheld.



DANYELZA

DANYELZA (naxitamab-gqgk) is a drug used to treat patients who have experienced multiple relapses from neuroblastoma in the bone or bone marrow – and Levine Children's is one of the first sites in the U.S. to offer it.

Each infusion takes an hour and requires close patient observation to monitor for signs of low or high blood pressure. Patients are treated weekly for at least six cycles with the goal of getting them back into remission. Phase II clinical trials revealed an overall response rate of 34% to 45% for partial or complete remission.

Dr. Oesterheld noted serious adverse reactions were reported in 32% of patients treated with the infusions. "That's why it requires a complex care team to support patients both physically and emotionally during treatment," he said.

For additional support, patients also have access to services from the Atrium Health Levine Children's Supportive Oncology program, including child life services, art therapy, chaplain services and Reiki therapy.

CAR T-cell therapy

Levine Children's is the first in their region to offer CAR T-cell therapy, a type of immunotherapy used to treat relapsed B-cell acute lymphoblastic leukaemia in paediatric patients.

In CAR T-cell therapy, an apheresis machine collects and separates a patient's blood cells. The T-cells are modified with a special receptor called chimeric antigen receptor (CAR), then given to the patient by infusion to attack cancer cells.

"CAR T-cell therapy is considered the frontline therapy for relapsed B-cell acute lymphoblastic leukaemia, following bone marrow transplant," said Dr. Oesterheld. "Most clinical trial patients emerged with no detectable cancer. However, redosing may be required to increase survival."

According to Dr. Oesterheld, this is just the beginning of robust cellular therapy at Levine Children's. "We plan to conduct research that will allow us to administer cellular and immunotherapy for brain tumours, solid tumours and other conditions," he said. "Our cellular therapy program currently includes gene therapy for sickle cell anaemia. We're also developing a new vaccine protocol for treating neuroblastoma and brain tumours."

A world of care

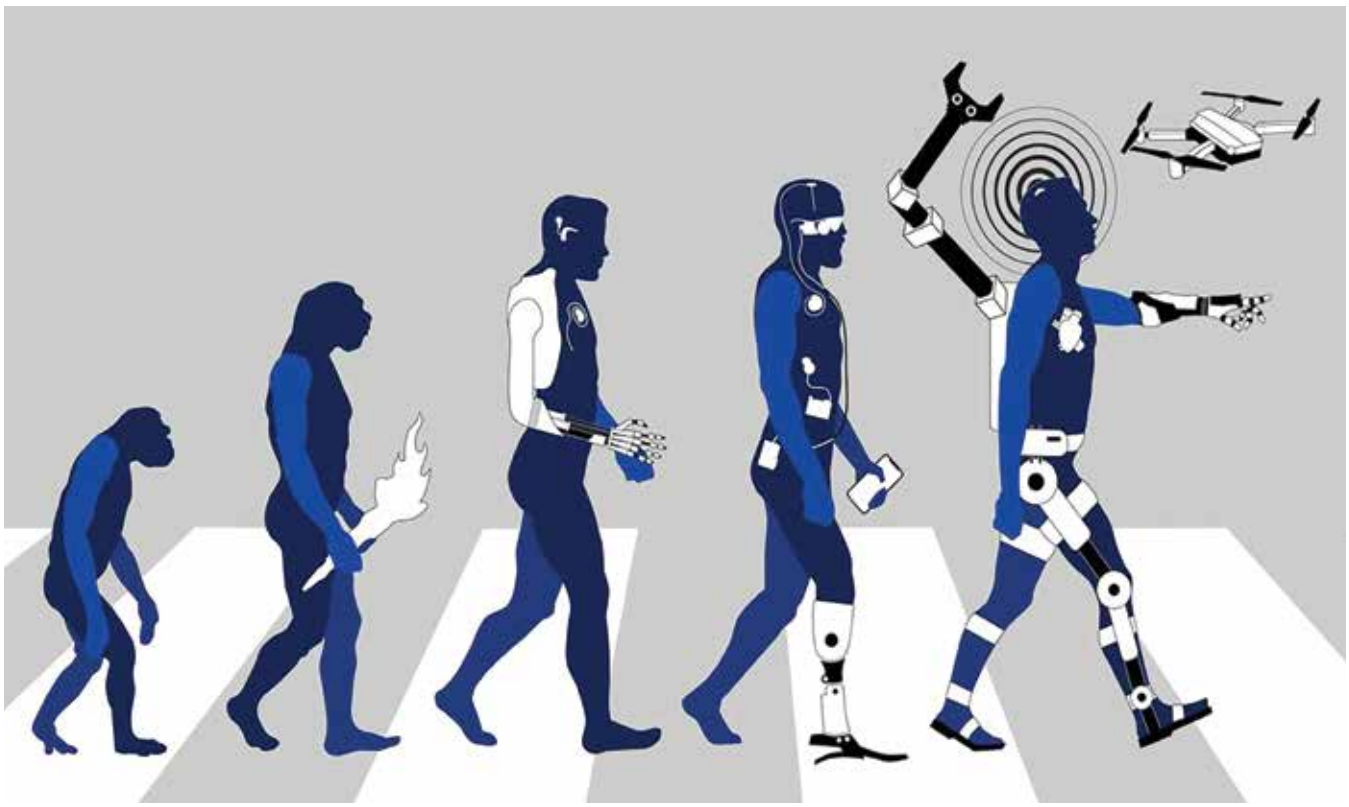
Atrium Health Levine Children's is headquarters of the Beat Childhood Cancer Research Consortium, a group of 40+ children's hospitals that connects paediatric cancer patients to clinical trials from around the world.

Though the North Carolina team works hard to provide world-class cancer care close to home, patients worldwide have access to Levine Children's care through Atrium Health Global Healthcare Services. In addition to remote second opinions, Global Healthcare Services coordinates housing, food, transportation, concierge services and insurance approvals.

"All the family has to focus on is caring for their child during their visit," explained Dr. Oesterheld.

Learn more

- Visit www.LevineChildrens.org/Cancer to learn more about the program, or call +1-704-381-9900 to refer a patient.
- For more information on Atrium Health Global Healthcare Services, email GHS@AtriumHealth.org or call +1-704-446-7028



Roberto Portillo Lara

Bionic devices offer benefits, but pose health, ethical concerns

Superhuman performance is no longer science fiction. Bionic devices of the future may be used to augment the neural system to improve our cognitive ability, as well as to enhance our hearing and vision beyond our abilities today. In particular, new materials will pave the way to high-resolution implantable bionics.

But can health and ethical risks involved in embracing bionic devices outweigh their benefits? In *APL Bioengineering*, editor Rylie A. Green highlights in an editorial for the journal the disconnect between what bionic technologies can actually provide versus public and patient expectations.

"It's very important to give the community accurate information about the risks and benefits of any medical device and ensure they understand the level of therapy a bionic device can deliver," said Green, a professor of bioengineering at Imperial College London, who has worked in bionics for more than 20 years.

She said when any device is implanted within the body, it poses significant risks beyond the surgery itself. The damage to the body, even when using the best surgical approaches, still causes cells to die.

"While we can deliver electrical therapies to help a patient, there are impacts to the neural wiring we still don't understand," Green said. "It is a major risk to intervene in any body system where there is no existing problem, so the increasing public awareness of new technologies and the propaganda around the potential for extraordinary abilities presents ethical concerns."

It is very simple, from a technology perspective, to use an infrared camera with a bionic eye to enable a user to see in the dark. But the greater issue is that the level of vision provided by the device is still very rudimentary.

Bionic eye devices provide only about 60 spots of light to render an image, where the normally seeing eye uses over 90 million cells. So night vision would be equally rudimentary and not much of a real superpower.

Green said the hype around "the bionic man" should be tempered by the risks and understanding of these technologies as medical devices.

"There's a lot of potential for development of devices that will have significant impacts on patients, enabling them to overcome the limitations of their injury or disease," she said. "The next generation of bionics will give patients better outcomes such as higher-resolution vision, with thousands of spots of light rather than less than one hundred. And we will continue to find new conditions that can be treated by bionic implants, leading to new therapies for patients."

Implants will be better integrated into the body and become safer to use, she added, but for the immediate future, "they will be medically indicated rather than applied to healthy people looking for extraordinary abilities." MEH

- **doi:** *https://bit.ly/33q1H40*

Arab Health
24-27 January 2022
Dubai World Trade Centre

Healthcare transformation and innovation to take centre stage at Arab Health

The MENA region's leading exhibition for the healthcare industry, Arab Health, which will take place from 24-27 January at the Dubai World Trade Centre, has confirmed a new addition to the popular Transformation Zone, with a host of world-renowned experts, innovators and industry leaders set to participate in the Healthcare Transformation Talks.

The theme at this year's Arab Health is '*United by business, forging ahead*' with new technologies and the latest innovations taking centre stage.

As a result of COVID-19, there has been a marked increase in investment in healthcare as innovative new technologies drive change across the sector. According to a survey by the Global Impact Investing Network, an industry research and analytics firm, some $715 billion in capital is designated to healthcare impact investments, making it the third-largest impact category behind financial services and climate change, and the fastest-growing area.

Furthermore, according to Deloitte U.S., venture capital in healthcare technology spiked to $14 billion in 2020, almost doubling 2019 levels of $7.4 billion. The previous annual record was $8.2 billion in 2018.

Ross Williams, Exhibition Director for Informa Markets, said: "Innovation and technology continue to witness incredible growth in the healthcare sector with investment in this part of the industry reaching record levels in 2020. This is clearly a vital part of the healthcare landscape and one we are keen to explore and showcase.

"As part of the new Healthcare Transformation Talks, a host of renowned experts, innovators and industry leaders will provide the latest insights, discoveries and predictions for the future of healthcare, with key highlights on Artificial Intelligence (AI), Digital Health and Virtual Reality, amongst others."

Confirmed speakers for the talks include Dr Christopher Brochhausen, vice-chair Pathology – Comprehensive Cancer Centre Eastern Bavaria, University Regensberg, who will discuss the Digital transformation of precision medicine using artificial intelligence, and Reenita Das, Senior VP and Partner, Frost & Sullivan, who will address Femtech 2030 - Growth Opportunities in Women's Health.

Other high-level speakers include Massimo Cannizo, CEO and Co-Founder, GELLIFY Middle East; Dr Michael Bradley Wallace, Chair-Committee on AI World, Endoscopy Organisation, Division Chair – Gastroenterology & Hepatology, Sheikh Shakhbout Medical City; and Brandon Rowberry, CEO – Digital Health, Aster DM Healthcare.

Innov8 Talks

Elsewhere in the Transformation Zone, Innov8 Talks returns. The popular start-up competition will feature 24 companies in various stages of maturity, with each showcasing unique and innovative solutions in prevention, management, operations, diagnostics, amongst others.

The competition will see eight different companies pitch over three rounds, with the winner of each round going through to the final. More than 16 companies from 13 countries have secured their position to participate in the competition.

Product Showcase

Rounding out the Transformation Zone will be another first for Arab Health with the launch of the Product Showcase segment. Companies confirmed include Tada Medical, a Swedish medical device company specialising in needs-based innovations for healthcare that will be presenting ReLink, an advanced breakaway connector for IV tubes.

They will be joined by MeetingDoctors, a B2B digital telehealth operator from Spain. The company will be showcasing a white label, B2B, immediate response telehealth solution, capitalising on simple technology and around the clock medical services.

Arab Health, co-located with Medlab Middle East 2022, is the largest healthcare exhibition and congress in the MENA region. The event will feature a range of scientific lectures, industry briefings, product demonstrations and networking opportunities.

Future Health Summit

This year's Arab Health will also see the launch of the Future Health Summit. The

high-level event will be attended by over 150 senior government healthcare officials, CEOs and visionaries, from across the globe who are building a future-proof healthcare strategy.

The invitation-only, in-person summit takes place on the evening of 25 January. The first session of the evening aims to address sustainability, innovation, and the future of healthcare, by examining innovative concepts in securing sustainable healthcare for all. Eminent speakers will offer solutions that can create healthcare reform while gaining efficiencies in healthcare spending by harnessing the digital era's transformative power.

Moderated by Dr Michele Barry, Director, Center for Innovation in Global Health, Stanford University, panellists include Dr Alaa Murabit, Medical Doctor, Global Security Strategist, Women's Rights Advocate and United Nations High-Level Commissioner on Health, Employment & Economic Growth; Päivi Sillanaukee, Ambassador for Health and Wellbeing, Ministry for Foreign Affairs of Finland; Dr Sameh El-Saharty, Program Leader for Human Development, GCC Country Department, The World Bank and Dr Anton Decker, President, Mayo Clinic International.

Dr Alaa Murabit, Medical Doctor, Global Security Strategist, Women's Rights Advocate and United Nations High-Level Commissioner on Health, Employment & Economic Growth.

Solenne Singer, Group Director for Informa Markets, said: "Sustainability and innovative technology are at the heart of future healthcare delivery. As such, we decided to invite visionary experts and those with influence over government policy to an exclusive gathering to discuss the way forward and how existing healthcare models need to be disrupted to provide a healthcare service fit for future generations.

"Digital healthcare technologies such as Artificial Intelligence (AI), 3D-printing, Virtual and Augmented Reality, nanotechnology and robotics have been instrumental in developing more timely processes for tests, vaccines, and pharmaceuticals and making health systems more responsive and productive during the pandemic.

"As we move forward, the importance of technology will gain pace; however, ensuring we fully utilise the opportunities it affords will be a result of partnership working and embracing these technologies by all in the healthcare industry."

Dr Murabit said: "If the last two years have highlighted anything to us, it is the incredible importance of sustainable health systems that are fit for purpose and forward-thinking. I am excited to be participating in the Future Health Summit, where the most necessary, tangible and consequential health advancements of our time will be discussed and presented. If we are to prevent future pandemics from impacting our entire lives, livelihoods, and communities, we need to start investing in ideas and solutions that bridge the gap from where we are to where we need to be."

- For more information, visit *www.arabhealthonline.com*.

Malaysian companies return to the region with a strong presence at Arab Health

Malaysia's healthcare industry has experienced unprecedented growth and development over the past two years, evidenced by the 24.9% double digit growth during 2020 to reach US$7.47 billion in the export of medical devices to major export markets such as the United States, Germany, Japan, Singapore and Belgium.

Supplies from Malaysia continue to play a crucial role in helping front liners all over the world in their fight against COVID. Healthcare companies ramped up their production capacities by increasing domestic investment to increase exports to meet the higher global demand for healthcare products.

Today in Malaysia, there are more than 200 medical devices manufacturers, mainly small and medium enterprises manufacturing medical gloves. However, the industry also includes higher value-added and technologically advanced products such as cardiac pacemakers, stents, orthopaedic implantable devices, ophthalmic lenses including contact lenses, dental instruments and appliances, and electromedical, therapeutic and monitoring devices.

Malaysia at Arab Health

Malaysia considers the Gulf region a major market for pharmaceutical and medical equipment due to government commitment to provide quality healthcare to their citizens, according to Omar Mohd Salleh – Trade Commissioner of Malaysia to the UAE.

Malaysia has been, for many years, the preferred sourcing hub for medical devices, particularly for medical disposable products. Companies participating under the Malaysia pavilion at Arab Health this year are mainly manufacturers of personal protective equipment, nutritional drinks, rubber products, as well as medical components, among others. This is Malaysia's 17th consecutive year participating in the event, which shows our strong commitment to this market, said Omar.

Bilateral trade between the UAE and Malaysia

"Despite the challenging time, we are still optimistic for 2022 with the Expo 2020 giving a strong boost to the UAE economy. Already we have seen an 26.1% growth in our exports to the UAE during the first 10 months of 2021 compared to the same period in 2020. Malaysia's total trade with UAE during this period registered at US$4.4 billion. UAE has always maintained its position as Malaysia's largest trading partner and exports destination in GCC. We foresee the bilateral trade between Malaysia and the UAE further improving with the gradual opening up in both countries," said Omar.

Omar Mohd Salleh, Trade Commissioner of Malaysia to the UAE

> Malaysia supplies 60% of the world market for rubber gloves. However, few are aware that Malaysia is also the world's leading producer and exporter of catheters, supplying 80% of the global demand.

- Arab Health booth: **Hall 8 E30**

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Dunlee delivers on liquid metal bearing CT tube promises

DA200P40+LMB-CT liquid metal bearing tube successfully installed in USA and Europe – full registration for Canada and Middle East also now available

The DA200P40+LMB with Dunlee CoolGlide technology, designed for GE Revolution Evo and Optima CT660 CT scanners, has proven to be a reliable, easy-to-install CT tube that performs well in a clinical environment.

Ease of installation and tube performance stand out

The first DA200P40+LMB CT tube was purchased by Rob Steele from Legendary Supply Chain in the USA. The in-house engineering team installed it along with a subsequent LMB tube, with no assistance, and indicated that the tube is not only "whisper-quiet," but works great.

"We purchased the first LMB tube in December 2020 and the second one shortly after. Both have been running without interruption since then – smooth and quiet," says Steele. "We calculate the cost of ownership for our customers, and product lifetime is a key part of the calculation. With Dunlee CT tubes, we have an advantage."

The DA200P40+LMB tube was also successfully installed at sites in Europe. "We are pleased that we can offer this alternative to OEM tubes to meet our customers' needs," says Guido Stoeckmann, regional sales manager, Europe. "Our customers have always trusted Dunlee tubes, and this is no exception. The customer's feedback is very positive, and they will continue to use the LMB replacement tube to replace tubes in Revolution Evo and Optima CT 660 scanners."

Less wear brings long tube life

Alexander Eitel, head of marketing and business development, is pleased with the market entry of the DA200P40+LMB. Eitel states: "Having a CT replacement tube alternative to OEM tubes helps our customers – and the patients and hospitals they serve – in offering affordable healthcare, and allows them to choose their partner of trust. The feedback we've received is that service engineers like the easy installation, while radiologists like the smooth operation, and patients appreciate the quiet environment. The ability to run without interruptions was especially important when COVID demanded high patient throughput."

He adds: "LMB technology results in less wear, and thus a longer life, than traditional ball bearings. Today, with tubes in use for nearly one year, we are on our way to confirming our expectations for the exceptionally long life of the DA200P40+LMB tube."

Future plans include validation for additional GE CT scanners types with LMB tubes, and finalizing registration for China.

Manufactured in the USA

All DA200P40+LMB tubes are manufactured in Illinois, USA with imported parts. The Liquid Metal Bearing with CoolGlide™ is designed and manufactured in Germany, based on knowledge gained from over 30 years of LMB technology development and over 100,000 LMB units sold worldwide. It was developed by the research and development team that was the first in the world to bring LMB technology to the X-ray market in 1989.

About Dunlee

Dunlee is a leading provider of CT replacement tubes. Dunlee's full line of CT replacement tubes are specifically engineered to be compatible with select GE and Siemens CT scanners and are a cost-effective alternative to OEM CT replacement tubes. All replacement tubes are manufactured in the USA with imported parts. For prompt and efficient delivery, we have regional stocking locations. MEH

ITALY @ ARAB HEALTH 2022

DATE
24 - 27 January 2022

TIME
10:00 AM - 6:00 PM

LOCATION
Dubai World Trade Centre

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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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On The Mission To Help Healthcare Providers Get Paid What They Are Owed, On Time!

KARIM DAKKI, Co-founder & CEO at KLAIM **GHAFOOR AHMAD,** Co-founder & CRO at KLAIM

The financial stability of healthcare providers is threatened by rejected medical claims and delayed payments – and KLAIM, a Dubai-based fintech, is aiming to fix it.

KLAIM is the region's first fintech dedicated to helping healthcare providers solve cash flow problems by turning delayed medical claims into available working capital within seven days once paperwork is done.

We combine decades of expertise in the healthcare industry with technological innovation to rethink healthcare financing and revenue cycle management (RCM) in the MENA region. Our mission is to optimise the RCM of healthcare providers left out by traditional banking, as well as to help small-scale providers access the funds they critically need for their operations and expansion.

We do this all through an advanced financing solution and a data-driven, artificially intelligent RCM system and access to capital.

ADVANCED FINANCING SOLUTION

With health insurers taking between 112 and 270 days to pay due 90% of medical claims, smallscale healthcare providers who don't have access to credit facilities from banks struggle to meet their operational needs.

The result of this delay in receiving cash for medical claims and the inability to access credit from banks is that many small-scale providers have to delay salary, retrench staff, or close down the hospital for 'good'.

To solve this problem, KLAIM offers to take up the medical claims of these healthcare providers and pay them cash within 24 hours once documentation is signed so they can continue to meet their operational needs.

We aim to deploy between $100 and $150 million of working capital in the UAE alone, and another $200 to $300 million in KSA to become the ATM of healthcare providers in the MENA region, allowing providers to easily access the cash they need and avoid disrupting their operations because of delayed medical claims payments.

Over the past 12 months, our platform has gathered over 12 million claims corresponding to 36 million medical activities from 300+ providers, including healthcare businesses who have greatly depended on us to provide them with the cash they need. While doing this, we won the KPMG UAE Innovation Award, were shortlisted as one of the top B2B Technology Start-ups of the year by Gulf Capital SME and secured a partnership with Etisalat.

DATA DRIVEN, ARTIFICIALLY INTELLIGENT RCM SOLUTION

The use of legacy technology to prepare medical claims means a lot of errors occur and health insurers reject many medical claims submitted by healthcare providers, resulting in revenue loss.

According to Azad Moopen, managing director of Aster DM Healthcare, a private healthcare conglomerate in the Middle East, 30% of new claims and 15% of resubmitted claims are rejected.

Fortunately, 86% of medical claims rejection are avoidable and are administrative in nature. This is why KLAIM has set in motion an automated RCM that will clean up human errors by automating medical billing, medical coding, preauthorization, eligibility check, claims submission, and claims resubmission, among other tasks.

However, we are going beyond automation to make our RCM solution data-driven and artificially intelligent so it can identify patterns and predict which claims will be accepted or rejected so the latter can be reworked before they are submitted. We have just finished R&D phase on our AI claim rejection prediction for OP that predicts at 98.9% claim denials and the company plans to patent this new algorithm.

Health is wealth, but we will not see the better healthcare outcomes we all desire if our healthcare providers are not financially healthy and sustainable.

Contact us to learn more about how we are transforming the healthcare industry:

TELEPHONE: +971 (0)4 876 40 96 **EMAIL:** hello@klaim.ai **WEBSITE:** www.klaim.ai

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Medlab Middle East
By Informa Markets

Meet DTM Medical with its full range of medical printers at stand Z6.F32 between 24 and 27 January 2022.

meh.dtm-medical.eu

Swiss HEMS save lives with SCHILLER rescue devices

For almost five decades, SCHILLER has been committed to fighting sudden cardiac death. In the rescue product range, SCHILLER has specialized in lightweight and small devices for professionals and lay rescuers.

With the emergency monitor and defibrillator DEFIGARD Touch 7 and the mechanical CPR device EASY PULSE, rescue teams are ideally equipped for any situation. The HEMS (Helicopter Emergency Medical Service) crew member Samuel Ernst from the Swiss helicopter rescue service AAA Alpine Air Ambulance confirms: "For us as HEMS, after dropping off or getting out of the helicopter, it is crucial to reach the patient as quickly as possible and to carry as little weight as possible. Both devices are extremely lightweight and user friendly, and with its harness system, the EASY PULSE is attached to the patient easily and efficiently."

SCHILLER rescue devices are powerful, intuitive, lightweight and ideal for confined spaces, for example in helicopters

The SCHILLER rescue devices EASY PULSE and DEFIGARD Touch 7 support rescue services in any situation.

Convincing key points

- EASY PULSE, the mechanical CPR device, is ideal for confined spaces, for example in helicopters, aircraft, ambulances and on rescue sites such as in crashed cars or after earthquakes.

It is possible to operate the device on patients in head-up position.

- DEFIGARD Touch 7 is a compact and lightweight monitor/defibrillator, extremely intuitive to use and equipped with high-end data transmission technology.
- FRED easyport plus is a small and lightweight defibrillator, available as fully automated, semi-automatic or manual version.

A 1-2-3 workflow, the large colour screen and the spoken instructions make it very easy to use.

- DEFIGARD HD-7 is SCHILLER's latest hospital defibrillator which minimizes the time to shock thanks to fast analysis and parallel charging.

A shock can be delivered with paddles, defibrillation pads or spoons.

The device works with SCHILLERs unique data management solution SEMA.

Touchscreen, CPR feedback options or cybersecurity are only some of the device's convincing advantages.

Around the world with 1200 employees

SCHILLER was founded in 1974 by Alfred E. Schiller. Starting in a four-room flat as a one-man business, the company has become a successful group with about 1200 employees, 30 subsidiaries and a global sales network. Today, SCHILLER is a world-leading manufacturer and supplier of devices for cardio-pulmonary diagnostics, rescue and patient monitoring as well as software solutions for the medical industry.

- Visit *www.schiller-medical.com* to discover details on the SCHILLER rescue devices. Or send your request to: *sales@schiller.ch*
- Arab Health booth: **S3.D10**

Extremely small and powerful: The defibrillator FRED easyport plus, available in fully automated, semi-automatic or manual version.

OKI

DICOM Medical Printers

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OKI's DICOM medical printers combine the cost effectiveness and high quality output of an LED printer with embedded DICOM software. This allows you to print directly from medical equipment without the use of conversion software or external print servers. Easy-to-use, the flexible medical printers are also well suited to general office use, so you no longer have the need for multiple devices.

To find out more visit **oki.com/me**

Willach's Consis H – the future of high-volume dispensing, with automated loading

Consis H robots are designed to deliver all items from one prescription within seconds and allow parallel automated loading at a superior speed.

Does your pharmacy operation demand a speedy delivery of all fast and medium-moving products? Do you want to be prepared for growing prescription volume? Would you like to increase safety, focus on better customer service and health advice, and still make more sales? The Consis H robot from Willach gives you it all.

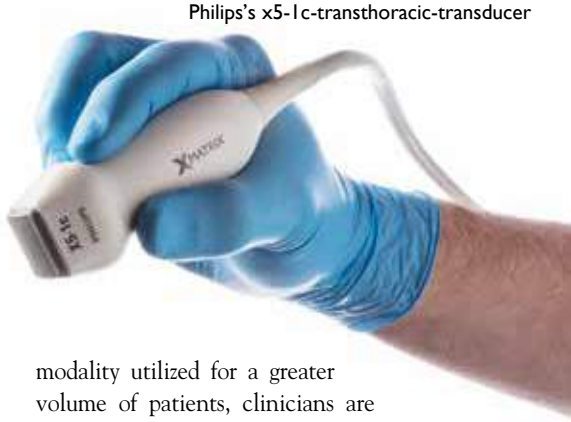
Consis H means speed: A prescription consisting, for example, of seven packages can be dispensed in an average of just 11 seconds – which means up to 2,500 packages per hour in ideal conditions. While it is useful to have dispensing reserves for peak hours, the bottleneck on all robotic systems is the loading speed – especially when it comes to automated loading. But, thanks to its automated four-channel loading station and its fast two-channel loading manipulator, the Consis H can deliver an impressive loading speed of up to 2,000 packages per hour.

Consis H means ease of use: Thanks to the intuitive Consis Navigator software, you can easily control and check all processes using the touchscreen monitor attached directly to the robot.

Consis H means saving space: The channel principle of the Consis H provides very high storage density. Up to 13,500 packages can be stored and fully automatically dispensed on a footprint of just 9.1 m².

Consis H means reliability: The Consis H is a reliable addition to any pharmacy due to its modern technology and ease of use. Even if your electricity cuts out, the dispensing can be continued manually thanks to the dedicated medicine-channel allocation.

- For more information, visit *https://bit.ly/3qtRLhX*
- Arab Health: booth - **SA H19**



Philips's x5-1c-transthoracic-transducer

Philips introduces fully integrated echocardiography experience

Royal Philips has expanded its ultrasound portfolio with new robust imaging tools and features for cardiology to increase diagnostic confidence and workflow efficiency. The company recently unveiled the EPIQ CVx and Affiniti CVx ultrasound platforms, automated analysis, Collaboration Live remote diagnosis and Cardiovascular Workspace – IntelliSpace Cardiovascular – an end-to-end workflow, for a fully integrated experience in echocardiography.

Advanced technology is helping to foster first-time-right diagnosis and timely treatment. Philips nSIGHT Plus is a proprietary imaging architecture that touches all aspects of image acquisition and processing, creating images with optimal resolution down to the pixel level, in contrast with conventional systems that form the image line by line. In addition, the new Philips X5-1c transducer facilitates easier access to imaging windows between the ribs.

Clinician feedback showed that diagnostic confidence in 3D left ventricular function quantification was improved in 80% of patients undergoing transthoracic echo (TTE) exams using the X5-1c transducer. Philips' AI-enhanced Auto Measure application delivers fast and consistent measurements in half the time of manual methods. Using Auto Measure on Philips EPIQ CVx and Affiniti CVx ultrasound systems can reduce the time for standard 2D echo measurements by 51%, according to the company. Auto Measure AI and AutoStrain Left Atrium (LA) and Right Ventricle (RV) are now available across the Philips CVx portfolio.

Enabling remote access and limiting risk of COVID-19 exposure, Philips echocardiography suite also includes Collaboration Live, an integrated tele-ultrasound solution providing remote access to clinical staff in real-time during exams.

"With echocardiography the first imaging modality utilized for a greater volume of patients, clinicians are relying on ultrasound to provide care more than ever before," said Jeff Cohen, General Manager of Ultrasound at Philips. "Cardiac imaging workflows need to be streamlined at every step to address the volume and complexity of cases. Philips echocardiography provides a connected ecosystem of integrated workflow solutions for cardiology. Combined with advanced diagnostic tools, our integrated solutions deliver clear insights on the patient's condition quickly. These recent introductions also reinforce how our ultrasound capabilities bring strong clinical value to areas outside of echocardiography, including liver disease management, to help improve decision support and care at each step in the patient journey."

- For more information on Philips' latest innovative technology across its portfolio of cardiology ultrasound solutions, visit: *https://bit.ly/3ncIrhx* MEH

Hillrom launches digital physical assessment innovations to advance connected care

Hillrom has introduced major technological advances to its market-leading physical assessment tools with the European Union and UK, Middle East and Africa launch of the new Welch Allyn PanOptic Plus Ophthalmoscope and the Welch Allyn MacroView Plus Otoscope. The new devices represent advancements that build on more than 100 years of the company's innovation in physical assessment tools and a new standard of care in exam rooms.

"The extraordinary innovations built into the new PanOptic Plus and MacroView Plus technologies are complete game-changers in our drive to help improve patient outcomes through routine physical exams," said John Groetelaars, Hillrom President and CEO. "Together, these devices are highly advanced tools designed to help clinicians make earlier and more accurate diagnoses of ear and eye conditions that may provide more options for effective treatment."

Examining the structure of the eyes and ears is a critical part of assessing patient health. The first-to-market innovations in Hillrom's new otoscope and ophthalmoscope enable brighter, larger views: a 20-times larger viewing area compared to the current Welch Allyn coaxial ophthalmoscope, and a three-times larger viewing area compared to the traditional otoscope.

The new Welch Allyn MacroView Otoscope features a new, one-of-a-kind, LumiView clear ear speculum, with four times the brightness through an adult speculum when compared to a standard ear speculum.

The MacroView Plus Otoscope and PanOptic Plus Ophthalmoscope enables clinicians to move quickly from an optical exam to digital image capture. When used along with Hillrom's free iExaminer Pro App, clinicians can securely save and share ear images for tracking, trending and easy consultations with specialists.

The PanOptic Plus Ophthalmoscope features Quick Eye Alignment technology to help better direct a patient's gaze. The innovative disc-alignment lights help the clinician direct and guide the patient's gaze, to help enable easier exams.

Following the successful launch in the U.S. in May, these products are now available in the European Union and UK, Middle East and Africa. Individual country specific launch dates may vary due to Regulatory/Registration requirements. These devices are scheduled for availability later this year in Japan, Australia, New Zealand, Mexico, Colombia and Brazil.

- To learn more visit: *www.hillrom.com*

New Welch Allyn PanOptic Plus Ophthalmoscope and Welch Allyn MacroView Plus Otoscope give caregivers better, bolder, brighter views to help support earlier diagnosis and treatment

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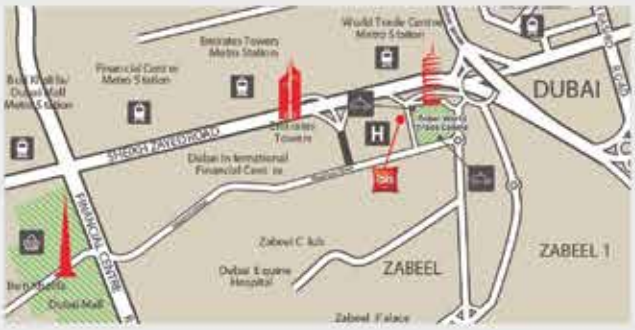

Canon Medical launches Vantage Fortian 1.5T MRI with AI to accelerate workflows

Canon Medical recently unveiled the Vantage Fortian – a new, advanced productivity, open bore 1.5T MRI system. The new system features innovative workflow solutions, image enhancement and accelerated scan technology, which together, can contribute to reducing the time required for MRI procedures.

Featuring a mobile interface that allows remote monitoring and seamless data integration, and in-room scan assist technology that automatically checks coils and correct patient position, Vantage Fortian is designed to get patients moving from waiting-room to scan-room to home.

Advanced AI technology

In line with Canon's new approach to AI innovation, the Vantage Fortian uses Advanced intelligent Clear-IQ Engine (AiCE), which leverages deep learning reconstruction (DLR) technology to remove noise and restore SNR to MRI images. It also automates many scan procedures, and confirms set-up steps to save time and reduce errors.

Wider prospects

With the release of the Vantage Fortian, Canon Medical now offers a comprehensive range of open bore 1.5T MRI systems to meet every customer need in the growing 1.5T MR market segment.

Other systems in the range, such as the Vantage Orian – Canon's open bore 1.5T system, will also soon have the new solutions featured in the Vantage Fortian. And Canon plans to expand the offer further to systems within their 3T MR portfolio, pending applicable regulatory approval.

- To learn more, visit: *https://global.medical.canon*.

Meet the Trio mobile computing workstation, Capsa Healthcare's newest generation point-of-care platform

Trio is a blended design of the most innovative and reliable computing carts ever offered. Trio offers an ergonomic design combined with innovative advances in ease of use, manoeuvrability, and power system runtime.

– An intuitive control centre provides simple touch screen navigation to a host of informative tools
– Personally adjustable for optimal comfort with "memory" presets that can be stored in a users' profile
– A slim workstation profile, lightweight design and N-Stride steer assist make each step a little easier
– Scalable power system with power options that can be integrated with swappable power to meet any runtime requirement
– 'N-Sight' cloud-based fleet management software to assist IT in managing cart assets in a facility or across a health system.

- Visit *www.CapsaHealthcare.com* to learn more about Trio and additional point-of-care solutions that support the delivery of superior patient care.
- Arab Health: booth – SA E60

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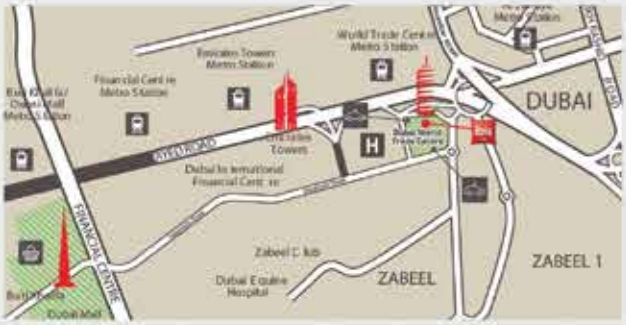

Omnicell's solutions-based approach addresses Gulf region's key healthcare challenges

Close partnerships between the healthcare and technology sectors are essential for driving long-term improvements. Omnicell is using its presence at this year's Arab Health to share its message about closer engagement, which is key to unlocking the specific challenges of each provider.

Globally, the key areas which are causing the greatest issues for healthcare providers are patient safety, pressure on costs and lack of resources – the latter issue has particularly risen in prominence as medical staff have become "burned out" during the pandemic.

Through its solutions-based strategy, Omnicell is helping its clients to understand how best to apply technology in order to eliminate errors, minimise waste and drive efficiencies.

Salim Hammoud, Director of Middle East Sales for Omnicell International, says: "Each healthcare provider is unique, so our partnering approach is based on carefully understanding their pain points, as well as their long-term strategies. This enables the formulation of appropriate solutions, which can be integrated seamlessly within the complex and constantly evolving health system infrastructure.

"Connected technology and intelligence rich solutions help our customers solve the most pressing challenges in medication and supplies management. Omnicell's hardware, software and service solutions connect to give clients the data they need to make informed decisions and significantly improve quality, efficiency, safety and reduce costs across the entire healthcare setting."

In the Gulf region, one of the biggest issues is the fact that around 25% of the total cost of medication goes to waste. This represents a huge opportunity for improvement by swapping manual tasks, such as inventory keeping and re-ordering, for digital automation. Furthermore, digitalization frees up valuable staff time, which can be dedicated instead to patient care.

The benefits

Solutions-based technologies offer benefits across all aspects of the healthcare environment, including:

For the Hospital

- Optimizing hospital labor productivity
- Freeing-up nursing time to spend more time with patients
- Supporting compliance with regulatory standards
- Creating streamlined operational efficiency
- Improving patient outcomes

For Central Pharmacy

- Lowering inventory costs – with documented inventory reductions of up to 38%
- Streamlining the medication repackaging process
- One system that supports distribution for both cart-less and cart-fill models, while giving unprecedented inventory visibility, accuracy and insight.

For Wards

- Closed-loop inventory trail from dispense to restock when used with automated central pharmacy systems
- 54% reduction in nurse retrieval time
- 100% reduction in unaccounted floor stock

Salim adds: "By fully automating their pharmacy and supplies operations, healthcare providers can fulfil a vision of zero errors, zero paper and zero waste across their whole care continuum. Our approach is based on supporting clients on every step of their journey, when and where they need it most, while offering a market leading level of interoperability."

Omnicell's portfolio of solutions include: Automated Dispensing Cabinets, MedX and SupplyX software, Robotic Dispensing Systems and VBM automated medication adherence pack filling machine – and will be available at Arab Health 2022.

- Arab Health booth **H4:C10**
- For more information, visit *www.Omnicell.com*

NewTom GiANO HR – the complete hybrid cone beam CT for 2D/3D imaging

NewTom's GiANO HR is one of the most innovative, high-performance 2D/3D devices available. Available in 3 configurations, radiologists or dental surgeons can choose the most suitable version according to their needs, with the knowledge that technological upgrading is possible every step of the way.

3D Prime configuration with a 10 x 8 FOV is ideal for applications in general dentistry, implantology, endodontics, gnathology and general orthodontics.

3D Advanced configuration, thanks to a 13 x 16 FOV, extends the potential to the fields of dentistry and otorhinolaryngology (ENT), including examination of upper airways.

3D Professional configuration boasts an exceptional 16 x 18 FOV thereby giving access to a new dimension that includes applications for the entire dental-maxillofacial area and cervical spine.

NNT software

The powerful NNT software provides specific instruments and interfaces for different diagnostic applications: data acquired during scanning can be processed in just a few simple steps to produce 3D images with a resolution among the highest available on the market. Low-dose protocols, 'SafeBeam' technology and servo-assisted alignment always ensure low radiation doses for patient protection. A choice of three different emission levels lets users adjust patient exposure by taking into account the actual diagnostic needs, while the new 10" touch screen control panel makes workflow even more versatile and user-friendly.

Exclusive features

Exclusive features include advanced ApT technology which improve every 2D image to ensure the best result for every projection. Patented algorithms for 3D reconstruction always lead to an optimal outcome. SafeBeam technology and servo-assisted alignment protect patient health, and the 10" on-board touch screen control panel featuring NewTom's powerful imaging software suite with specialist interfaces and tools, allows for user-friendly workflow and provides professionals with access to online assistance.

Unlike traditional sensors, the Cadmium Telloride (Cd-Te) Direct Conversion Detector, now available on NewTom GiANO HR, does not require the conversion of X-rays into visible light – as it is capable of sensing it directly and converting it into precise, accurate digital signals. This enables extremely high resolution diagnostic images obtained at low X-rays doses.

- For more information, visit: *www.newtom.it/en/medicale/prodotti/giano-hr/*

Technogym's BIOCIRCUIT provides the perfect adaptive circuit training workout

Technogym's BIOCIRCUIT provides the perfect guided and personalised fitness programme and doesn't require supervision. Biocircuit has different programmes tailored to varying fitness goals: "Start Moving", "Stay Young", "Lose Weight", "Tone Your Body", or "Boost Performance".

Technogym, brand leader in the field of fitness, wellness and health solutions and services, thanks to its over 35 years of experience and collaborations with prestigious universities around the world, has taken this concept to the extreme and is currently working with universities on the effect of exercise with cancer patients that were originally believed to not benefit from strength training.

The four core elements to exercise

Exercise must be simple, efficient, assisted and quick.

Technogym's BIOCIRCUIT embodies these core elements, making it the perfect solution.

The fully automated circuit guides members from start to finish on where to go and for how long and specific loads related to repetition number, tempo and range of motion.

Through inputting an individual's anthropometrics, the equipment will position itself to ensure comfort and full effect.

The most exciting feature is the BIODRIVE, the ultimate resistance training solution, which incorporates research from the aeronautical industry. The BIODRIVE can replicate up to 7 different resistance types and even acts as a built-in spotter through generating resistant adjustments in response to certain movements in position, acceleration and velocity. This method embodies the core of what BIOCIRCUIT offers. An efficient personalised experience for the user, and an easy to manage solution for the operator … a win-win!

- For more information, visit: *www.technogym.com/int/biocircuit-training/*

Al Futtaim Health joins forces with Wolters Kluwer to deliver efficient evidence-based care to patients with UpToDate clinical decision support

Wolters Kluwer, Health, a global provider of healthcare technology, announced that the UAE's Al-Futtaim Health has chosen 'UpToDate' – the company's flagship clinical decision support solution – to deliver evidence-based care across their multi-specialty group of clinics and pharmacies in the United Arab Emirates.

The resource is available to doctors, nurses, and pharmacists across Al-Futtaim Health verticals including clinics, pharmacies and day surgery care centres as well as PCR testing and vaccinations stations, to help advance the healthcare provider's evidence-based clinical practice and support a strategy built on world-class service delivery.

Dr. Tholfkar Al-Baaj, Chief Clinical Officer of Al-Futtaim Health said: "We decided to provide our clinicians with a world-leading decision support tool to help them practice evidence-based medicine and deliver the best outcomes for patients."

UpToDate is used by over two million clinicians around the world to make point of care decisions based on the latest evidence and recommendations by leading global experts. It is the only clinical decision support solution associated with improved hospital performance and clinical outcomes.

"We plan to integrate UpToDate within our Hospital

Paragonix Technologies launches LIVERguard Donor Liver Preservation System

Paragonix Technologies, the leading provider of donor organ preservation and transport systems, jas launched LIVERguard Donor Liver Preservation System in both the US and Europe, along with the launch of its clinical global registry, GUARDIAN-LIVER (Global Utilization And Registry Database for Improved preservAtion of doNor LIVERs).

The LIVERguard System provides a highly controlled, state-of-the art environment for hypothermic liver preservation, coupled with real-time digital monitoring to safeguard a donor liver throughout the transplant journey from donation to transplantation. Like all Paragonix systems, the LIVERguard System represents a fundamental advance over the use of ice and off-the-shelf coolers that have been the standard-of-care in organ transplantation for over 50 years. Abdominal transplant teams throughout the US and Europe will now have access to an FDA-cleared and CE-marked hypothermic liver preservation device.

The commercial availability of the LIVERguard system aligns with the launch of the GUARDIAN-LIVER global registry, a comprehensive study that seeks to evaluate a missing piece of the organ procurement process: the impact of methods and technologies used for liver preservation and transportation and their contribution to the clinical outcome and success of transplant surgery. At the outset of the program, a total of 10 leading Liver Transplant Centers have joined the GUARDIAN-LIVER Registry.

Studies have shown ice storage can result in transport conditions close to 0°C, below the 4-8°C commonly cited as a standard in the literature. The LIVERguard system provides a highly controlled transport environment validated to maintain temperatures of 4-8°C. The device's performance is continuously reported to the user and is captured in a data log download following the procurement.

Length of Cold Ischemic Time (CIT), the time the donor organ is out of the body, is commonly cited as a direct influence on outcomes in liver transplantation. Longer CIT is associated with an increased risk of a variety of clinical complications, including: increased risk of Primary Non-Function, increased Early Allograft Dysfunction, prolonged length of stay, and an increased risk of graft loss.

"Donor livers are being shared across large geographies," said Lisa Anderson, PhD, President & CEO of Paragonix Technologies. "This means livers are broadly shared among Organ Procurement Organizations and transplant teams and it creates an obvious need and opportunity to standardize methods of preservation. The LIVERguard system is designed to ensure consistent and repeatable standardized cold storage of livers, regardless of teams, time, geography, or the unforeseen.

"Further, Paragonix will be unrelentingly diligent in the pursuit of identifying and measuring the impact of advanced liver preservation with the GUARDIAN-LIVER global registry. The impact of both the GUARDIAN-HEART and -LUNG registries has been clear to transplant teams around the world. Insights gathered from the initial heart registry not only inform new approaches to organ preservation but show that preservation could be crucial in overcoming other considerations of the transplant procedure that may be challenging, such as donor and recipient characteristics, and ischemic time. Expanding this research into liver and the abdominal market is the next logical step and an exciting opportunity to better understand the impact of organ preservation conditions on patient outcomes."

- For more information about the LIVERguard system, visit *www.paragonixtechnologies.com*

Information System (HIS) in order to embed an evidence-based approach in the clinical workflow and make it easier to access guidance when clinicians need it most," added Dr. Al-Baaj.

"We are proud to partner with Al-Futtaim Health in their mission to ensure the delivery of high quality, safe care to every patient through the provision of UpToDate, which will help clinical teams maintain medical knowledge and global best practice," said Alaa Darwish, Country Manager for Middle East, Turkey, Africa and Europe Growth and Emerging Markets at Wolters Kluwer, Clinical Effectiveness, Health

- For more information, visit: *https://www.wolterskluwer.com/en/health*

GE Healthcare introduces industry-first modular, scalable CT platform

GE Healthcare has unveiled its Revolution Apex platform – an industry first computed tomography (CT) platform with built-in scalability for onsite CT detector upgrades from 40 mm to 80 mm or 160 mm detector coverage – all without replacing the gantry.

Offering uncompromised clinical capabilities, the new Revolution Apex platform will help radiology departments stay ahead of the technology curve with a modular design that offers a seamless path to continuous hardware and software scalability and upgradability that will extend the lives of CT systems into the future.

Twenty years ago, new CT technologies were introduced every four-to-five years; however, nowadays new solutions introduced annually. This is largely due to the current pace of innovation, which has greatly accelerated due to the speed and growth of modern engineering, artificial intelligence (AI) and cloud computing. Because of these advancements, CT technology is becoming obsolete more quickly than before, resulting in many facilities expressing challenges during their attempts to keep systems up to date.

With this challenge in mind, GE Healthcare developed a new, modular CT system design that enables hardware scalability so radiology departments and healthcare facilities can add service lines to accommodate evolving patient needs. Revolution Apex platform's Gemstone Clarity Detector is the foundation of this approach – enabling users to update their service line from a 40 mm detector and 0.28 second rotation speed up to a 160 mm detector and 0.23 second per rotation speed – the world's fastest gantry speed. This enables healthcare facilities to keep up with the latest technology while minimizing technology obsolescence and optimizing clinical capabilities now and in the future. This also helps streamline fleet management, allowing facilities to minimize overall operating costs and address budget constraints.

The Revolution Apex platform was also developed with operational efficiency in mind. Studying radiology departments' entire workflows and identifying opportunities to simplify and streamline processes, GE Healthcare developed Effortless Workflow, which utilizes Artificial Intelligence (AI) technologies to automate much of the workflow, from pre-scan to post-scan – helping to reduce clicks, save time, and achieve exceptional efficiency and consistency in imaging.

The Revolution Apex platform is also designed to produce high quality CT images at the lowest possible radiation dose through TrueFidelity deep learning image reconstruction. TrueFidelity is GE Healthcare's exceptional image reconstruction technology that uses a dedicated Deep Neural Network to generate high-definition, low-noise CT images. Fully integrated with both single-energy and dual-energy imaging, TrueFidelity produces images with exceptional sharpness, low-contrast performance and preferred noise texture, even with low dose.

Furthermore, the Revolution Apex platform is equipped with GE Healthcare's patented Quantix X-ray tube – a powerful tube designed to provide the output necessary to comfortably image all anatomies regardless of patient size without compromising image quality. A key application of this technology is next-generation Gemstone Spectral Imaging, which reduces image noise in low energy monochromatic images to detect and assess small lesions.

After installation Revolution Apex platform, facilities can stay ahead of evolving technological advancements with regular software upgrades that include new capabilities and workflow enhancements, as well as image quality, dose management, cybersecurity and service tools – all without learning a new user interface. The Revolution Apex platform also provides the industry's first subscription-based service for CT applications, Smart Subscription, which enables easy access to the latest technology so radiologists can continue to deliver high-quality patient care.

• For more information on GE Healthcare's Revolution Apex platform, visit: *https://bit.ly/3r1BWiH*

3D printing and virtual reality are helping anaesthesiologists prepare for surgery

New research being presented at Euroanaesthesia, the annual meeting of the European Society of Anaesthesiology and Intensive Care (ESAIC), held online this year, suggests that using 3D printing and virtual reality can improve patient care and reduce anaesthesiologist stress and equipment wastage.

An anaesthesia team from the Tel Aviv Sourasky Medical Center in Israel report on the use of 3D technology to prepare for operations in 20 patients, including a 35-week-old foetus who required caesarean delivery and an 83-year old woman requiring open heart surgery.

The majority of cases reported in the study involve children undergoing lung surgery, but the technology was also used to devise personalised plans for patients with large mediastinal masses (MM) in the chest that compress the heart and lung, including one pregnant woman.

"Using imaging scans, our anaesthesia team were able to print highly accurate models of patient airways on which to plan and practice their procedures," explained Dr Ruth Shaylor, lead author of the report. "This is particularly important in children because they are smaller and so is our margin for error. Being able to see, hold and rotate a precise replica of their patient's airway gives a new angle on their cases, providing information on the most appropriate airway equipment that might be invisible on a flat scan."

A 3D model can be made in 30 minutes, and a single print can be turned around in 3-4 hours on entry-level 3D printers. Although the technology is widely used in other medical specialities like orthopaedic surgery, paediatric cardiology and dentistry, the use of 3D printing and virtual reality in anaesthesia has been primarily for education and training.

In 2019, the anaesthesia department at Tel Aviv Medical Center started using 3D printing and virtual reality modelling to routinely assess patients before surgery who had a potentially difficult airway due to narrowing or a large MM, as well as children requiring one-lung ventilation so surgery could be performed on the other lung.

To examine the potential benefits of these technologies to anaesthetic management, Shaylor and colleagues retrospectively reviewed all 20 patients referred for 3D modelling as part of their anaesthesia plan between July 2019 and July 2021. In general, 3D printing was used for airway cases (15 patients) with virtual reality for large MM cases (3 patients).

Results showed that when 3D printing was used, the airway plan practiced on the model ended up being the final airway plan in 13 of the 15 (87%) patients. This reduced the potential for trial and error during surgery. There were two cases where the model plan was either more conservative (the equipment used was larger than the model suggested), and one case in which a model could not be made because of poor initial imaging scans.

Using imaging scans, our anaesthesia team were able to print highly accurate models of patient airways on which to plan and practice their procedures.

After reviewing virtual reality images, none of the MM patients had to have invasive procedures performed before being anaesthetised. In addition, there were no reports of any anaesthetic complications in patients referred for 3D modelling.

"3D printing is still underutilised for patient-specific pre-operative planning in anaesthesia", says Dr Shaylor. "Our 2-year experience shows that with a specific plan in place, trial and error are reduced, and there is less trauma to the patient and wastage of equipment. The anaesthesiologists involved in these cases reported less stress, and by reviewing them with the surgeons, there was a greater understanding of the challenges involved for each patient. We also found that sharing these models with patients gave them a deeper understanding of their upcoming surgery and helped improve communication." MEH

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