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September - October 2022

## Qatar

Research investment advances healthcare for the Arab world

### Alzheimer's

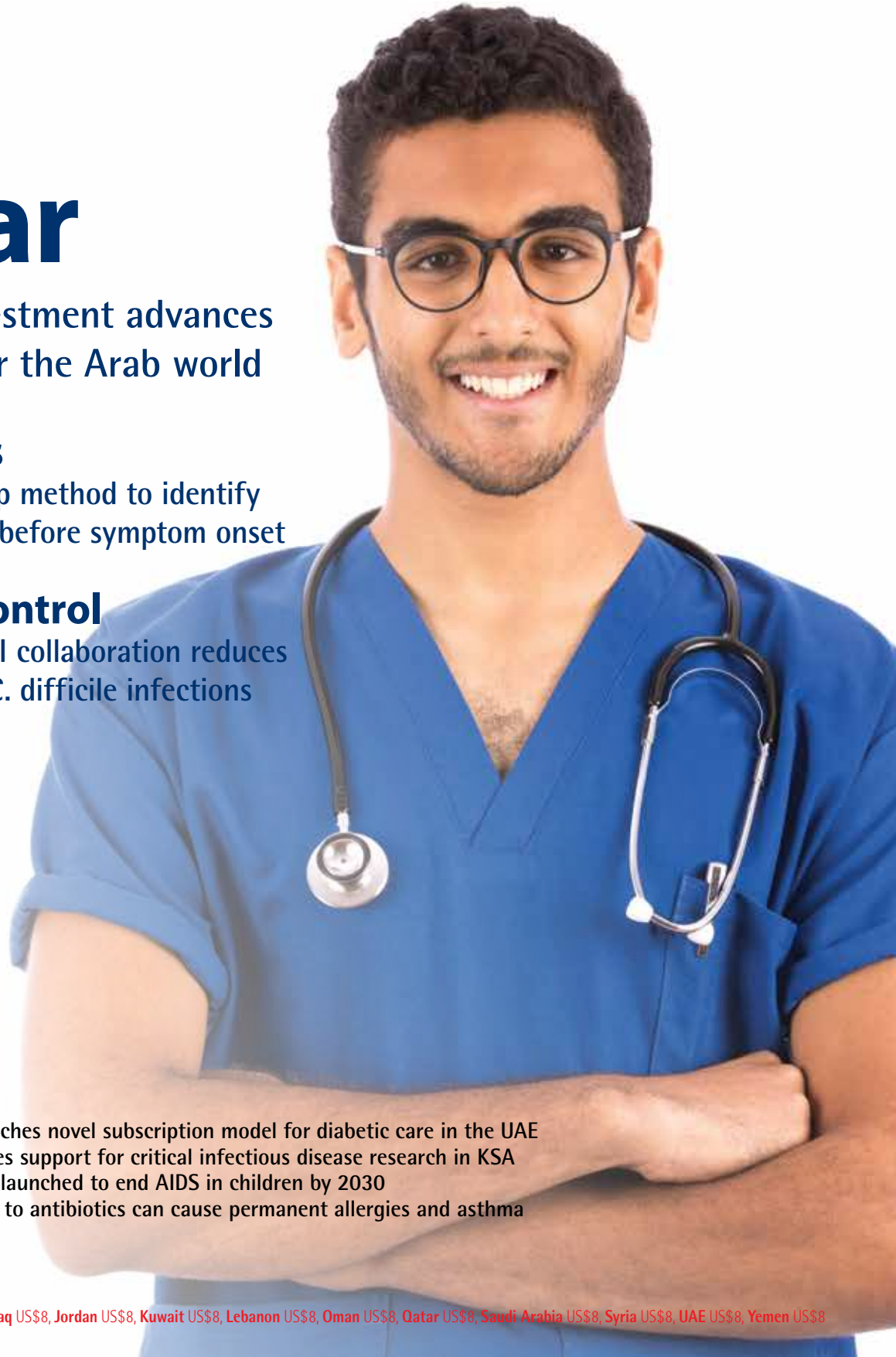
Scientists develop method to identify disease 17 years before symptom onset

### Infection Control

Interprofessional collaboration reduces hospital-onset C. difficile infections

#### In the News

- GluCare.Health launches novel subscription model for diabetic care in the UAE
- Jameel Fund provides support for critical infectious disease research in KSA
- New global alliance launched to end AIDS in children by 2030
- Childhood exposure to antibiotics can cause permanent allergies and asthma





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# Prognosis

## Qatar makes great strides in healthcare

Qatar continues to take major strides in the provision of healthcare for people living in the country and the wider region. In this issue of *Middle East Health* we sample some of the latest developments taking place there, such as the recent opening of the advanced Al Maha Pediatric Specialized Care Centre. Taking care of paediatric patients has always featured highly on Qatar's healthcare agenda and this new purpose-built specialised medical and rehabilitation centre designed for long-term care of paediatric patients is testament to this.

In addition, significant investment in healthcare research from the likes of the Qatar National Research Fund, a member of the Qatar Foundation, is starting to pay dividends. We outline two recently published studies by Qatar-based research scientists that look set to make a significant impact in their respective fields. The high prevalence of diabetes is a major issue across the Middle East and in one of the studies we outline, researchers have identified important metabolites associated with type 2 diabetes which goes some way to advancing our understanding of the disease. A second study, conducted at Sidra Medicine, has unveiled a detailed genomic map of Arab and Middle Eastern populations which has important implications for the Arab world by providing new insights into human history and ancestral patterns in the region.

Also in this issue, we cover a few of the latest research findings in the fields of neurology and infection control. With an ageing population around the world, studies of dementia are becoming increasingly important. In one of the studies, scientists in Germany show a method of detecting Alzheimer's up to 17 years before symptom onset. If this proves to be viable it will be a major leap forward in efforts to prevent this dreaded disease.

In our focus on orthopaedics, guest writer Bernard Ross, discusses the increasing demand for total hip replacement surgery and what this means for the region. He urges the adoption of innovative wearable devices to improve post-operative recovery to reduce the burden of readmissions.

Remember to keep an eye on our website – [www.MiddleEastHealth.com](http://www.MiddleEastHealth.com) – where we post regular updates of healthcare developments in the region and research news from around the world.

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The View Hospital is a new state-of-the-art healthcare facility in Qatar. Committed to delivering high-value care for patients, the hospital aims to advance integrated and team-delivered care and will offer a seamless experience through a wide range of medical signature services including women's health, heart health, diabetes care, executive health and family health.

# middle east monitor

Update from around the region



The founders of GluCare.Health, Dr Ihsan Almarzooqi and Ali Hashemi

## GluCare.Health launches novel subscription model for diabetic care in the UAE

GluCare.Health, a hybrid digital therapeutics (“DTx”) company, has launched a value-based, insurance-free monthly subscription model for the management of diabetes in the United Arab Emirates.

A recent survey by GluCare.Health found that coverage for diabetic patients remains challenging due to the extremely high cost of purchasing insurance. Many insurance companies add up to 500% additional premiums for those declaring themselves as Type 1 or 2 diabetic, resulting in premiums of up to AED100,000 per annum in some cases. The survey has also found that despite having medical insurance, many patients are routinely denied access to medical services and products required as part of their diabetes care. According to the survey, 42% of respondents value the coverage of specialty medical devices such as CGMs and insulin pumps above all else when searching for a health insurance provider.

According to the Abu Dhabi’s Department of Health, 75% of all people with diabetes in the UAE are classified as poorly controlled, with healthcare facility visits usually exceeding the quarterly visit

guidelines. The over-utilization of diabetes services is generally due to patients being dissatisfied with their existing clinical care and looking for alternatives due to the episodic, primarily therapeutic diabetes management practised by most healthcare providers. This over-utilization can lead to insurance providers denying specific services, a frustration echoed by 70% of respondents.

As a result, GluCare.Health is launching the world’s first value-based subscription model for the management of diabetes by offering three overlapping patient pools access to hyper-personalized care – diabetics whose insurance coverage remains inadequate; diabetics who cannot afford optimal coverage for their condition; and diabetics who are not experiencing any improvement in their condition with their current healthcare providers.

“We are launching this offering as there is an utter misalignment between patient needs, insurance policies and healthcare providers. Insurance companies are more concerned about medical expenses, not a patient’s improvement. In addition, health insurance premiums are increasing, regard-

less of whether patients get better. Looking at the healthcare provider’s landscape, under the existing fee-for-service reimbursement model of care, providers will only do what they will be paid for, not what is needed to optimize outcomes. Finally, patients are not being rewarded for better health, so it is no wonder we are failing in the battle against diabetes,” said Dr Ihsan Almarzooqi, co-founder and managing director, GluCare.Health.

How does it work? The subscription allows patients unlimited access to GluCare.Health’s diabetes-related services, both physical and virtual. Physical services include all required physician consultations, laboratory tests and imaging. Continuous glucose monitors (CGMs) and wearables are also included, allowing GluCare.Health to practise its unique machine-assisted continuous model of care. Most insurance companies would not usually cover these devices or services. In addition, all patients will have access to GluCare.Health’s continuous diabetes management platform, meaning they have constant access to their entire care team without needing to visit the facility physically.

According to the GluCare.Health survey, 63% of diabetics surveyed would consider, with a high probability, an insurance-free, monthly subscription health product that simplifies their chronic disease management.

“Diabetes is a 24/7 condition and does not stop when patients leave our facility. At GluCare.Health, using wearable and connected technology, with the right technological platform, we can understand what happens to patients between doctor visits and use that information to support them and empower both the patient and clinical team,” said Ali Hashemi, co-founder and chairman, GluCare.Health.


Monthly subscription costs will be priced with affordability in mind and will be cheaper than the cost of a single consultation at most private healthcare facilities.

GluCare.Health, which became the first provider globally to be accredited by the International Consortium of Health Out-



comes Measurement (ICHOM) in July, will also practice an outcome-based approach, meaning savings will be passed on to patients, with reductions in the future monthly subscription costs. This is the second time value-based healthcare – rewarding providers or patients when clinical outcomes are achieved – will be practised in the MENA region after GluCare. Health and Novo Nordisk UAE signed a strategic partnership focusing on value-based approaches to obesity management in May 2022.

“In the 18 months we have been managing patients, we have proven that our model of care works. We know that patients managed by us are better engaged and are provided with all the necessary tools to engender sustainable behaviour change. We see vastly better patient outcomes under our platform than in traditional care, and on average, patients under our care are well-controlled in as little as 90 days with fewer medications. A prime example of this being 94% of our Type 2 diabetic patients who were on insulin are no longer using this medication,” added Dr Almarzooqi.

- For more information, visit: [www.gluhealth.com](http://www.gluhealth.com) 

## Amana Healthcare earns CARF accreditation for highly specialized Amputee Rehabilitation Program

Amana Healthcare has received a three-year accreditation from the US-based Commission on Accreditation of Rehabilitation Facilities (CARF) for its highly specialized Amputee Rehabilitation Program.

The sought-after CARF accreditation requires the strictest levels of accountability and adherence to internationally accepted standards within the health and human services fields. Following the rigorous audit of Amana Healthcare’s inpatient rehabilitation facility, programs, and services, CARF awarded the health provider with a three-year specialty accreditation



for its Amputee Rehabilitation Program. Accreditation by CARF assures patients that the organization has undergone extensive auditing and inspection to ensure that its services are the best-in-class.

With the new specialty accreditation, Amana Healthcare, which was the first in the UAE to receive accreditation in Comprehensive Intensive Inpatient Rehabilitation from CARF in 2016, and the first provider in the country to be specifically accredited in rehabilitation after stroke in 2019, is now, uniquely, the first provider in the UAE to receive a three-year CARF accreditation for amputee rehabilitation. This fulfills a key part of its mandate to provide residents with healthcare of the highest international standards.


In addition to CARF’s accreditation for amputee rehabilitation services, Amana Healthcare also earned a three-year reaccreditation for Comprehensive Intensive Inpatient Rehabilitation, and a three-year reaccreditation for its Stroke Rehabilitation Program.

Dr Jason Gray, Senior Director, Amana Healthcare, said: “We are incredibly proud to have been awarded the three-year Amputee Rehabilitation accreditation by CARF International, one of the world’s leading independent, nonprofit accrediting bodies. At Amana Healthcare, our specialized inpatient rehabilitation facility caters to patients who require intensive rehabilitation after a life-changing event, such as



Dr Jason Gray, Senior Director, Amana Healthcare

an amputation, and other neurological conditions. We offer our patients access to a wide range of multidisciplinary specialists who collaborate closely to provide holistic care as part of our Amputee Rehabilitation program. Amana Healthcare strives to empower patients throughout their recovery journey so that they can return to normal and continue leading happy and fulfilling lives. This CARF accreditation reinforces the trust we have earned from our patients and the larger community and recognizes the hard work and dedication of our specialists and caregivers.”

Dr Gray added, “This accreditation also underpins the UAE’s vision to ensure that the community receives world-class specialized comprehensive healthcare services locally, without having to seek treatment abroad.” 



Dr Raffi Gurunian, Department Chair and Chief of Plastic Surgery at Cleveland Clinic Abu Dhabi

## Cleveland Clinic Abu Dhabi introduces lymphedema preventive supermicrosurgery for post-operative breast cancer patients

Cleveland Clinic Abu Dhabi has recently introduced bypass lymphedema surgery for breast cancer patients in the UAE. This follows findings that show that one in five breast cancer patients is at risk of developing lymphedema.


Lymphedema is often triggered by cancer, axillary lymph node dissection surgery for cancer, or radiation treatment. It is a debilitating condition that manifests as acute swelling of the upper arm after metastasized lymph nodes are removed. The condition brings an increased possibility of infection, along with social, mental and physical implications for those already undergoing cancer treatment.

According to the World Health Organization (WHO), 2.3 million women were diagnosed with breast cancer in

2020, making it the most prevalent form of cancer worldwide. The WHO's Global Cancer Observatory also cited that in 2020, breast cancer was the most common cancer in the UAE, with 1,030 new cases reported that year.

In partnership with Cleveland Clinic in the U.S., Cleveland Clinic Abu Dhabi has introduced this preventive surgery to the UAE, having recently conducted the procedure on a local patient whose breast cancer had metastasized to her lymph nodes. The surgery, which is normally conducted in tandem with other primary cancer surgeries, such as a mastectomy, serves as a preventive measure for lymphedema and may negate the need for further surgery.

Dr Raffi Gurunian, Department Chair and Chief of Plastic Surgery

at Cleveland Clinic Abu Dhabi said: "Performing this lymphedema preventive supermicrosurgery at Cleveland Clinic Abu Dhabi will lay the foundation for greater access to this treatment and a better chance of a positive outcome, especially for post-operative breast cancer patients who have a higher risk of developing lymphedema. This type of surgery is part of our wider efforts at Cleveland Clinic Abu Dhabi to advance a healthcare model that focuses on patient-centered and preventive care. This approach aligns closely with the Department of Health – Abu Dhabi's increased focus and investment in preventive and precision medicine. 

## Jameel Fund for Infectious Disease Research and Innovation provides new funding to several critical research projects in Saudi Arabia

Community Jameel and Community Jameel Saudi Arabia have announced the second wave of funding from the Jameel Fund for Infectious Disease Research and Innovation for projects tackling the threat of respiratory diseases.

Pioneering research projects at Imperial College London and King Abdulaziz University (KAU) will receive new support to help tackle the ongoing threat of COVID-19 and other respiratory viruses.

Following on from the success of the first round, which supported 12 projects focused on coronaviruses such as SARS-CoV-2, SARS and MERS, the second round of funding will additionally focus on other respiratory viruses, investigating their pathogenesis and transmission.

A total of 11 projects at Imperial College London and KAU have received funding in the second round, including two joint projects between the two institutions. The selected projects will launch on October 1 at their respective institu-

tions and will spend one-year conducting research supported by the Jameel Fund.

The scope of research for projects under the second round of the Jameel Fund spans a diverse array of topics in the field of respiratory diseases, including: long COVID; pregnancy-related immunity post-COVID; immunopathology post-COVID infection; early warning and surveillance systems for human coronaviruses; and tetravalent vaccines against MERS and COVID-19, among others.

Professor Abdulrahman bin Obaid Al-Youbi, President of King Abdulaziz University, said: "King Abdulaziz University is appreciative of the continuous support it has received from the Jameel Fund through Jameel Fund for Infectious Diseases Research and Innovation, which confirms the joint commitment of both sides to find solutions to existing problems such as infectious diseases by supporting research and innovations that are capable of reducing the burden posed

by such diseases locally and globally. The university thanks Community Jameel and looks forward to strengthening this collaboration with other partnerships to serve the community."

Hassan Jameel, Vice Chairman of Community Jameel, said: "Community Jameel's primary aim is to empower communities to thrive by advancing science. A core pillar of this is promoting partnerships across the Global South to drive scientific breakthroughs.

"The Jameel Fund is an embodiment of this mission and we hope, through promoting cross-institutional collaboration, to support research and innovations able to curtail the risks posed by infectious diseases globally."

Professor Ian Walmsley, Provost of Imperial College London, said: "The Jameel Fund will provide the vital support needed for research scientists to help protect the world from respiratory viruses and the ongoing threat of Covid-19. The grants will rapidly accelerate our understanding of infectious

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diseases and how to prevent, diagnose and treat them. We are grateful to Community Jameel for their continued support towards our work in global health.”

Established in 2021 by Community Jameel and Community Jameel Saudi Arabia, the Jameel Fund provides funding for short-term, high-impact projects at Imperial College London and KAU that advance our ability to understand, prevent, diagnose, and treat coronaviruses and other infectious diseases, and to strengthen research collaborations between Imperial and Saudi universities in this field.

Previous projects selected under the first round of the Jameel Fund included:

Dr Rowa Alhabab of the Faculty of Applied Medical Sciences at KAU, was granted funding from the Jameel Fund for Infectious Disease Research and Innovation last year for her research: ‘Combining serological testing and RT-PCR test for efficient detection of COVID-19’.

- Creating a 3D facial scanning mobile app for mass customisation of respiratory protective equipment (e.g. masks and face shields)
- Developing rapid diagnostic screening
- Understanding severe illness in children linked to COVID-19
- Exploring if DNA sequencing technology can be engineered to detect new variants.

The full list of projects under the second round of the Jameel Fund can be found at: <https://bit.ly/3KClsqW>

## G42 Healthcare signs distribution agreement for Oxford Nanopore Technologies’ sequencing products

G42 Healthcare, the Abu Dhabi-based health-tech company, has signed a distribution agreement with Oxford Nanopore as a channel partner for their DNA/RNA sequencing products across Gulf Co-operation Council (GCC) countries, Jordan, Pakistan, Egypt, and Iraq.

Oxford Nanopore’s sequencing devices include the MinION, GridION, PromethION, VolTRAX and Flongle. This agreement is aligned with G42 Healthcare’s vision to make UAE the regional hub of health and life sciences by offering technology for real-time, accurate, accessible, and

scalable analysis of DNA and RNA. The technology supports scientific analyses to further understand the biology of humans, bacteria, viruses, and environments as well as to understand diseases such as cancer.

With this channel partnership, G42 Healthcare aims to build on its current sequencing capabilities by offering Oxford Nanopore’s sequencing technology, which offers a range of features including the ability to sequence any length of DNA/RNA fragments, thereby offering richer genomic insights; the ability to stream data in real-time for rapid insights;

the ability to sequence native DNA/RNA strands to elucidate richer information including real-time methylation data. A range of analyses from whole genome assembly to targeted sequencing or metagenomic analysis can be performed.

In addition to distribution of the technology, G42 Healthcare has the option to provide sequencing services internationally, with the potential to offer sequencing of human and non-human samples to a range of customers including governments, research institutes, hospitals, and omics centres in the GCC and beyond.

## Aspen Medical inaugurates first of six Primary Care Centres in Abu Dhabi and Al Ain

Aspen Medical, the Australia-based provider of global healthcare solutions, has launched a new community Primary Healthcare Centre in Al Wathba, Abu Dhabi. The launch follows the signing of a Memorandum of Understanding (MoU) with the Department of Health – Abu Dhabi (DoH), to provide comprehensive primary healthcare across nine areas in Abu Dhabi and Al Ain.

The new community Primary Healthcare Centre (PHC) seeks to serve thousands of residents who live and work in the Al Wathba region and the surrounding

areas. Services include General Practice and Family Medicine, Obstetrics, Gynaecology, Paediatrics and Dentistry.

Aspen Medical has launched an initial network of six new world-class healthcare centres to serve residents across nine areas in Abu Dhabi and Al Ain, including Shakhbout City, Umm Ghaffa, Al Dhahra, Al Maleeh and Al Salamat.

The healthcare centres will provide patient-focused primary care and local access to some specialist care to the tens of thousands of residents who live in those areas. The PHCs will also refer patients to

specialist centres if and when required, and each centre will act as a community hub for health, preventive medicine and wellbeing.

The DoH has been working closely with healthcare providers in the Emirate to implement its primary care model that makes primary healthcare services more accessible to all patients. It seeks to have primary care clinics available within the community areas to all members. The model enhances and maintains patient-doctor relationships through providing patients with the best quality of healthcare services and clinical outcomes.

# Post-Covid respiratory challenges facing elite athletes

Some professional athletes who perform in competitive sport and have been infected by the Covid-19 virus, have developed severe illnesses.

Usually the “neck check” has been used to decide if and when an athlete with a respiratory condition should train. If their symptoms are confined to the above or in the neck, he or she usually would be cleared to train and play. However, Covid-19 is cause for concern because in some people, the illness can seem benign at first, then they rapidly go downhill.

Royal Brompton Hospital’s respiratory expert, Dr James Hull, explains: “Due to the potential disease trajectory, it’s important athletes do not resume very rapidly to vigorous exercise when symptoms start to initially to

improve, especially in those first seven days.”

Instead, it is recommended athletes who have tested positive for the coronavirus, or suspect they might be positive, to rest without any exercise for at least 10 days from the point when they first feel symptoms. Then, assuming their illness remains mild, they should continue to rest for another week, even after their symptoms resolve. After this, they can return to a graduated training strategy.

## Return to training after Covid-19

It is advisable athletes who have tested positive for the virus but have mild or no symptoms, to stay home and rest for a minimum of two weeks from the date of their first symptoms or positive test. After

this period, and assuming symptoms have improved, they should return to exercise training with caution.

Some athletes have pre-existing asthma or respiratory issues, so it is important these are well managed and diagnostic testing is carried out before returning to training.

If an individual has symptoms below the neck, such as chest pain, breathlessness, production of sputum, or a fever, then it is recommended they do not continue to exercise. Any athletes who have been hospitalised or bedridden by the virus should seek extensive pulmonary and cardiac testing and clearance from their physicians before working out again.

- To find out more, visit: [www.rbhh-specialistcare.co.uk](http://www.rbhh-specialistcare.co.uk)



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# worldwide monitor

Update from around the globe



## ICCPR puts focus on women in new cardiac rehabilitation programme guidelines

A panel of experts from International Council of Cardiovascular Prevention and Rehabilitation (ICCPR) has noted that women are less likely to attend a cardiac rehabilitation programme and will experience worse outcomes than men. The panel was convened recently to develop new clinical practice guidelines for cardiac rehabilitation programmes.

The new guidelines were endorsed by 24 clinical societies worldwide, each providing guidance on how to create a more effective, women-focused, cardiac rehabilitation programme. The guideline appears in the *Canadian Journal of Cardiology*.

“It has long been established that women are significantly less likely to access and complete a cardiac rehabilitation programme and that their outcomes are often poorer, despite greater need than men,” explained lead author Sherry L. Grace, PhD, from the Faculty of Health at York University.

The new ICCPR clinical practice guideline provides guidance on how to design better cardiac rehabilitation programmes for women with cardiovascular

disease, including peripheral artery disease and stroke. The new guidelines will aim to increase engagement and optimise outcomes for women around death, hospitalisation, function, well-being, psychology, and quality of life. Additionally, the ICCPR provides advice on the cost and resource implications of a new cardiac rehabilitation programme.

The ICCPR identified women-focused researchers who had previously worked on a cardiac rehabilitation programme. These researchers formed a writing and consensus panel that included experts from diverse geographic backgrounds and were made up of multidisciplinary healthcare providers, a policymaker, and patient partners. These individuals drafted and reviewed the recommendations.

The draft was then reviewed externally by the 24 cardiac clinical societies before being posted online for public feedback. The guidelines present 15 recommendations relating to referral, setting, and delivery. When compiled these recommendations, and the associated tools can provide support as part of any women-focused cardiac rehabilitation programme.

Some of the key recommendations are:

- All women should be systematically referred to their women-only virtual education or exercise sessions or peer support programmes to avoid bias

- When developing a woman’s tailored cardiac rehabilitation programme plan, full consideration should be given to their full clinical histories, such as any mental health and psychosocial issues, menopausal status, frailty, and cancer history

- Any new women-only virtual education or exercise sessions or peer support programmes should offer women-focused programming, comprising as many of the definitional elements of women-focused cardiac rehabilitation as possible. Where resources are limited, this should include offering women-only virtual education or exercise sessions, or peer support programmes

- Women should be given a choice in where they participate in their cardiac rehabilitation programme. Whether this is home-based or centre-based they should be delivered in a women-friendly environment and their needs and preferences should be taken into consideration when forming their cardiac rehabilitation programme

- Programmes should include a strong psychosocial component, a choice of exercise modalities, and specific education on women and cardiovascular disease.

“For the first time, there are a consensus definition and recommendations for women-focused CR, so it is hoped now that many programmes will incorporate these elements into their programmes,” said Professor Grace. “If implemented, more women may engage in CR, and as a result have significantly greater quality and quantity of life.”

Cardiovascular disease is the leading cause of death among women globally, with 6,400 cases per 100,000 women. While the global burden of cardiovascular disease has declined since 1990, it has increased in many African, Asian, and western pacific countries.

“The ICCPR acknowledges that across the globe women have experienced worse outcomes from CVD and worse uptake to prevention and rehabilitation programmes,” commented Robyn Gallagher, professor at Sydney Nursing School, Faculty of Medicine and Health, at the University of Sydney and ICCPR chair. “The Women-Focused Cardiovascular Prevention and Rehabilitation Clinical Practice Guideline provides recommendations that will help clinicians and health service designers to develop and deliver programmes that address this inequity for women, regardless of resource contexts.”

### Reference

Women-Focused Cardiovascular Rehabilitation: An International Council of Cardiovascular Prevention and Rehabilitation Clinical Practice Guideline.

<https://doi.org/10.1016/j.cjca.2022.06.021>

## Monkeypox: experts give virus variants new names

A group of global experts convened by WHO has agreed on new names for monkeypox virus variants, as part of ongoing efforts to align the names of the monkeypox disease, virus and variants – or clades – with current best practices. The experts agreed to name the clades using Roman numerals.

The monkeypox virus was named upon first discovery in 1958, before current best practices in naming diseases and viruses were adopted. Similarly for the name of the disease it causes. Major variants were identified by the geographic regions where they were known to circulate.

Current best practice is that newly-identified viruses, related disease, and virus variants should be given names with the aim to avoid causing offense to any cultural, social, national, regional, professional, or ethnic groups, and minimize any negative impact on trade, travel, tourism or animal welfare.

**Disease:** Assigning new names to existing diseases is the responsibility of WHO under the International Classification of Diseases and the WHO Family of International Health Related Classifications (WHO-FIC). WHO is holding an open consultation for a new disease name for monkeypox.

**Virus:** The naming of virus species is the responsibility of the International Committee on the Taxonomy of Viruses (ICTV), which has a process underway for the name of the monkeypox virus.


**Variants/clades:** The naming of variants for existing pathogens is normally the result of debate amongst scientists. In order to expedite agreement in the context of the current outbreak, WHO convened an ad hoc meeting on 8 August to enable virologists and public health experts to reach consensus on new terminology.

Experts in pox virology, evolutionary biology and representatives of research institutes from across the globe reviewed the phylogeny and nomenclature of known and new monkeypox virus variants or clades. They discussed the characteristics and evolution of monkeypox virus variants, their apparent phylogenetic and clinical differences, and potential consequences for public health and future virological and evolutionary research.

The group reached consensus on new nomenclature for the virus clades that is in line with best practices. They agreed on how the virus clades should be recorded and classified on genome sequence repository sites.

Consensus was reached to now refer to the former Congo Basin (Central African) clade as Clade one (I) and the former West African clade as Clade two (II). Additionally, it was agreed that the Clade II consists of two subclades.

The proper naming structure will be represented by a Roman numeral for the clade and a lower-case alphanumeric character for the subclades. Thus, the new naming convention comprises Clade I, Clade IIa and Clade IIb, with the latter referring primarily to the group of variants largely circulating in the 2022 global outbreak. The naming of lineages will be as proposed by scientists as the outbreak evolves. Experts will be reconvened as needed.

The new names for the clades should go into effect immediately while work continues on the disease and virus names. 



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## New global alliance launched to end AIDS in children by 2030

Globally, only half (52%) of children living with HIV are on life-saving treatment, far behind adults where three quarters (76%) are receiving antiretrovirals, according to the data released in the UNAIDS Global AIDS Update 2022. Concerned by the stalling of progress for children, and the widening gap between children and adults, UNAIDS, UNICEF, WHO and partners have brought together a global alliance to ensure that no child living with HIV is denied treatment by the end of the decade and to prevent new infant HIV infections.

The new Global Alliance for Ending AIDS in Children by 2030 was announced by leading figures at the International AIDS Conference which took place in Montreal, Canada.

In addition to the United Nations agencies, the alliance includes civil society movements, including the Global Network of People living with HIV, national governments in the most affected countries, and international partners, including PEPFAR and the Global Fund. Twelve countries have joined the alliance in the first phase: Angola, Cameroon, Côte d'Ivoire, the Democratic Republic of the Congo (DRC), Kenya, Mozambique, Nigeria, South Africa, Uganda, the United Republic of Tanzania, Zambia, and Zimbabwe.

Consultations by the alliance have identified four pillars for collective action:

1. closing the treatment gap for pregnant and breastfeeding adolescent girls

and women living with HIV and optimizing continuity of treatment;

2. preventing and detecting new HIV infections among pregnant and breastfeeding adolescent girls and women;

3. accessible testing, optimized treatment, and comprehensive care for infants, children, and adolescents exposed to and living with HIV; and

4. addressing rights, gender equality, and the social and structural barriers that hinder access to services.

The alliance will run for the next eight years until 2030, aiming to fix one of the most glaring disparities in the AIDS response. Alliance members are united in the assessment that the challenge is surmountable through partnership. MBH

## Now 7 million enrolments strong: Join the OpenWHO.org learning community

The World Health Organization is celebrating a new milestone in online learning: 7 million enrolments in OpenWHO.org's free public health courses!

The record-setting participation comes as health emergencies continue to affect communities across the globe, generating demand for trusted and accessible public health knowledge. OpenWHO course enrolments have surged more than 4000% percent in just over 2.5 years, increasing from 160,000 in January 2020 to 7 million in August 2022.

The OpenWHO platform hosts courses on 165 public health topics, including training to support the response to outbreaks like the COVID-19 pandemic, monkeypox, polio, cholera, Marburg virus disease and plague, as well as for ongoing events like food insecurity and the crisis in Ukraine.

Courses are available in 65 languages so that communities can access life-saving public health information in their native languages, making it easier to understand. This includes the 15 most commonly spoken languages worldwide and the official languages of 44 out of 46 of the least-developed countries.

More than 3.7 million course certificates have been issued

to OpenWHO learners, who have shared more than 50,000 digital badges on social media to celebrate their achievements.

"We want to make it as easy as possible for people across the world to access the trusted, science-based public health information that they need," said Heini Utunen, acting Head of the WHO Health Emergencies Programme's Learning and Capacity Development Unit, which manages the OpenWHO platform. "Equity is the cornerstone of our learning response to health emergencies."

OpenWHO's global community of learners recently shared examples of how they have benefited from the learning platform at an open webinar celebrating OpenWHO's 5th anniversary <<https://bit.ly/3B0zLCl>>

"I have learned many things about the COVID-19 pandemic from courses of the OpenWHO programme," one learner said. "It literally helps me to speak with my local community. Because I am a pharmacist, I have been asked so many questions about risk, possibilities and about medications and I have shared the knowledge that I got from professionals from these courses." MBH

- OpenWHO: Open to all, anytime, from anywhere. <https://openwho.org>





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# the laboratory

Medical research news from around the world



Suzy Hazelwood

The practical implication is simple: Avoid antibiotic use in young children whenever you can because it may elevate the risk of significant, long-term problems with allergy and/or asthma.

## Childhood exposure to antibiotics can cause permanent allergies and asthma

Early exposure to antibiotics kills healthy bacteria in the digestive tract and can cause asthma and allergies, a new study demonstrates.

The study, published in *Mucosal Immunology*, provides the strongest evidence so far that the long-observed connection between antibiotic exposure in early childhood and later development of asthma and allergies is causal.

“The practical implication is simple: Avoid antibiotic use in young children whenever you can because it may elevate the risk of significant, long-term problems with allergy and/or asthma,” said senior author Martin Blaser, director of the Center for Advanced Biotechnology and Medicine at Rutgers.

In the study, the researchers, who came from Rutgers, New York University and the University of Zurich, noted that antibiotics, “among the most used medications in children, affect gut microbiome communities and metabolic functions. These changes in microbiota structure can im-

pact host immunity.”

In the first part of the experiment, five-day-old mice received water, azithromycin or amoxicillin. After the mice matured, researchers exposed them to a common allergen derived from house dust mites. Mice that had received either of the antibiotics, especially azithromycin, exhibited elevated rates of immune responses – i.e., allergies.

The second and third parts of the experiment tested the hypothesis that early exposure to antibiotics (but not later exposure) causes allergies and asthma by killing some healthy gut bacteria that support proper immune system development.


Lead author Timothy Borbet first transferred bacteria-rich faecal samples from the first set of mice to a second set of adult mice with no previous exposure to any bacteria or germs. Some received samples from mice given azithromycin or amoxicillin in infancy. Others received normal samples from mice that had received water.

Mice that received antibiotic-altered samples were no more likely than other

mice to develop immune responses to house dust mites, just as people who receive antibiotics in adulthood are no more likely to develop asthma or allergies than those who don't.

Things were different, however, for the next generation. Offspring of mice that received antibiotic-altered samples reacted more to house dust mites than those whose parents received samples unaltered by antibiotics, just as mice that originally received antibiotics as babies reacted more to the allergen than those that received water.

“This was a carefully controlled experiment,” said Blaser. “The only variable in the first part was antibiotic exposure. The only variable in the second two parts was whether the mixture of gut bacteria had been affected by antibiotics. Everything else about the mice was identical.

Blaser added that “these experiments provide strong evidence that antibiotics cause unwanted immune responses to develop via their effect on gut bacteria, but only if gut bacteria are altered in early childhood.” 

### Reference:

1. Borbet, T.C., Pawline, M.B., Zhang, X. et al. Influence of the early-life gut microbiota on the immune responses to an inhaled allergen. *Mucosal Immunol* 15, 1000–1011 (2022). <https://doi.org/10.1038/s41385-022-00544-5>

## New findings may reduce the risk of infection for patients with urinary catheters

Patients who have indwelling urinary catheters often suffer from urinary tract infections, which can be difficult to treat. Now, researchers at Karolinska Institutet in Sweden have discovered that the synthetic peptide CD4-PP has a good bactericidal effect against urinary tract bacteria, even those resistant to antibiotics. The study, published in the journal *Cellular and Molecular Life Sciences*,<sup>[1]</sup> opens up for new possible treatment methods.

Patients, who are treated with indwelling catheters through the urethra, often have bacterial colonisation in their urine after a period of time. However, these bacteria can cause infections that are sometimes difficult to treat and can even be life-threatening.

“Increased antibiotic resistance further reduces the chances of successful treatment, therefore alternatives to traditional antibiotic treatment are an important aspect,” says John Kerr White, researcher at the Department of Microbiology, Tumor and Cell Biology, Solna, Karolinska Institutet, and shared first author.


A possible alternative treatment focuses on the use of antimicrobial peptides, naturally found in the body. They have among other things, antibacterial qualities, but the disadvantage is their relatively short lifespan. In recent years, antimicrobial peptides have been synthetically developed to improve their stability and efficacy against bacteria, whilst being harmless to the body’s own cells.

Annelie Brauner’s research group has studied a specific synthetic antimicrobial peptide, CD4-PP, which was developed by professor Ulf Göransson’s research group, Uppsala University. In the study, the researchers examined what effect CD4-PP had on the most common bacterial strains that cause urinary tract infections, such as *E. coli*, *K. pneumoniae* and *P. aeruginosa*.

“The study shows that CD4-PP has good bactericidal effect against these urinary tract bacteria as well as being effective against antibiotic-resistant bacteria, which can be very difficult to treat,” says Annelie Brauner, professor of Clinical microbiology, at the Department of Microbiology, Tumor and Cell Biology, Solna, Karolinska Institutet, and the study’s senior author.

CD4-PP was also shown to be active against biofilm, a kind of mucus blanket that bacteria form, which increases their resistance to the body’s immune system as well as to different antibiotics. CD4-PP was found to prevent the formation of new biofilm and also dissolved existing biofilm. The beneficial effect was further enhanced by the fact that CD4-PP also activated the immune system to protect cells against infection.

Preventing bacteria from attaching to the catheter itself is an important part of reducing the risk of infections.

“When we applied CD4-PP together with a saline fluid on urinary catheters, we found that the adhesion of *E. coli* to the catheters decreased. Since bacterial adhesion is the first step of the infection process, this effect is important in preventing urinary tract infections. We now plan to further develop and refine how CD4-PP can be applied when using catheters. We will also be investigating how CD4-PP reacts to other types of bacterial strains, such as those that cause infections in wounds,” says Annelie Brauner. 

### Reference:

1. White, J.K., Muhammad, T., Alsheim, E. et al. A stable cyclized antimicrobial peptide derived from LL-37 with host immunomodulatory effects and activity against uropathogens. *Cellular and Molecular Life Sciences* 79, 411 (2022). doi: <https://doi.org/10.1007/s00018-022-04440-w>

## Clinical trial reveals new treatment option for Covid-19 patients progressed to ARDS

A clinical trial conducted by researchers from RCSI University of Medicine and Health Sciences and Beaumont Hospital Dublin has indicated an effective treatment for critically ill COVID-19 patients.

The study, published in *Med*, investigates the effects of using an anti-inflammatory protein, alpha-1 antitrypsin (AAT), to treat COVID-19 patients who have progressed to acute respiratory distress syndrome (ARDS).

ARDS is a highly inflammatory state hallmarked by airway damage, respiratory failure and increased risk of death. Treatment options for COVID-19 patients who have ARDS are particularly limited.

AAT is a naturally occurring human protein produced by the liver and released into the bloodstream which normally acts to protect the lungs from the destructive

actions of common illnesses.

In this randomized controlled trial, AAT that had been purified from the blood of healthy donors was administered to patients with COVID-19-associated ARDS, with the aim of reducing inflammation.

The results indicated that treatment with AAT led to decreased inflammation after one week. The study also found that the treatment was safe and well tolerated, and did not interfere with patients’ ability to generate their own protective response to COVID-19.

This discovery suggests a potentially important role for AAT in the treatment of ARDS and other inflammatory diseases associated with COVID-19.

The study’s co-lead author, Dr Oliver McElvaney from the RCSI Department of Medicine and Beaumont Hospital, com-

mented on these novel findings: “We know that patients who are critically ill with COVID-19 are more prone to developing severe inflammation throughout the body, with a disproportionately high rate of progression to ARDS and other serious respiratory issues. We think AAT might be able to provide some protection against the more harmful types of inflammation that arise in severe COVID-19 and other conditions with a similar inflammatory profile.”

Professor Gerry McElvaney, RCSI Department of Medicine and Beaumont Hospital, and senior author on the paper, commented: “These early results are encouraging, and will we hope form the basis for a larger trial to see how much of an effect reducing inflammation using AAT has on clinical outcomes such as mortality.”

- doi: <https://bit.ly/3u0jAAa> 



## Obesity alters molecular architecture of liver cells; repairing structure reverses metabolic disease

Cells use their molecular architecture to regulate their metabolic functions, and repairing diseased cells' architecture to a healthier state can also repair metabolism, according to a study led by Harvard T.H. Chan School of Public Health researchers.

“Chronic metabolic disease, which includes obesity, diabetes, and cardiovascular and liver diseases, is the biggest global public health problem,” said Gökhan Hotami İlgil, James Stevens Simmons Professor of Genetics and Metabolism at Harvard Chan School and the director of the Sabri Ülker Center for Nutrient, Genetic, and Metabolic Research. “The fundamental regulatory mechanism that we discovered can be used to evaluate the susceptibility – or resistance – of individuals to a disease state like obesity, and determine what steps, such as diet, nutrients, or fasting, will reduce, eliminate, or exacerbate these states. We can imagine a whole new array of therapeutic strategies targeting molecular architecture, similar to the restoration of an ailing building or preventing its deterioration.”

The study was published online on March 9, 2022, in *Nature*<sup>[1]</sup>.

Led by researchers Güne Parlakgöl and Ana Paula Arruda at the Sabri Ülker Center, the study compared liver samples from healthy, lean mice with samples from obese mice with fatty liver disease. Using multiple computational platforms – artificial intelligence, machine learning, deep learning, and neural networks – and high-resolution imaging using enhanced focused ion beam scanning electron microscopy, Parlakgöl, Arruda, and colleagues from the Howard Hughes Medical Institute generated three-dimensional reconstructions of specialized structures, called organelles, inside cells and made a comparative analysis of organelle architecture and organization of liver cells

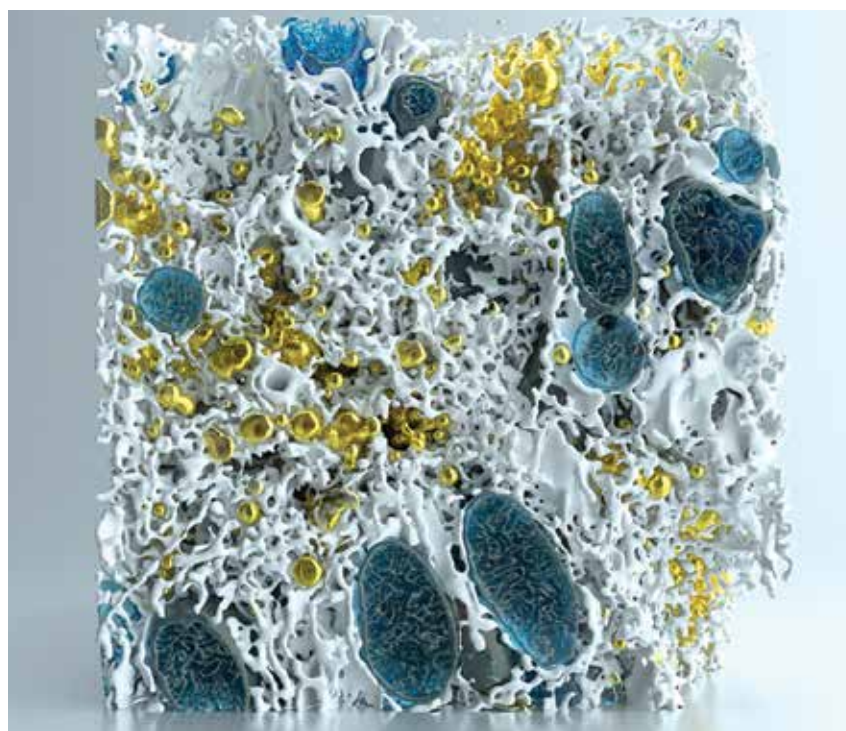


Image: Gökhan Hotami İlgil/Sabri Ülker Center for Nutrient, Genetic, and Metabolic Research and Refik Anadol, Refik Anadol Studios, LA

The endoplasmic reticulum (ER) is white and lipid droplets appear yellow in this three-dimensional image of the interior of a diseased mouse liver cell created by researchers at the Sabri Ülker Center for Nutrient, Genetic, and Metabolic Research.

from lean and obese samples. Through these analyses, the team determined that obesity leads to dramatic alterations in subcellular molecular architecture, particularly in the endoplasmic reticulum (ER), an organelle involved in the creation and shaping of proteins and lipids.

The team then partially restored the ER's structure using technologies that can repair molecules and proteins that can reshape cellular membranes – which also repaired the cells' metabolism. The restored cells looked normal, controlled lipid and glucose metabolism much better, and remained stress free and more responsive to stimuli.

“The outcome was really striking – when structure is repaired, so is the cell's metabolism,” said Arruda. “What we are describing here is a whole new way of

controlling metabolism by regulating molecular architecture, which is critical for health and disease.”

The images produced from this research are also the most detailed visualization to date of subcellular structures while the cells are still intact in their tissue environment. Other researchers have created similar imaging before, but mostly in single cells or in culture.

“High-resolution imaging and deep-learning-based analysis helped us to see that structural regulation of intracellular environment and organelle architecture is a key component of metabolic adaptation. Targeting this regulation may hold therapeutic opportunities to treat metabolic diseases such as diabetes and fatty liver disease,” said Parlakgöl. MBH

### Reference:

1. G. Parlakgöl, A. Paula Arruda, S. Pang, et. al. Regulation of liver subcellular architecture controls metabolic homeostasis. *Nature*, March 9, 2022. doi: <https://doi.org/10.1038/s41586-022-04488-5>



## New therapeutic prospect for preeclampsia

Preeclampsia is a condition that affects the placenta during pregnancy and is dangerous for both the foetus and the mother. Scientists from the Institut Pasteur, Inserm and the CNRS have proposed a new therapy, tested in two rodent models, that corrects the defects identified in placental cells, and restores placental and foetal weight. The treatment successfully lowers blood pressure in the mother and resolves the characteristic preeclampsia symptoms of excess protein in urine and cardiovascular abnormalities. The research was published July 30 in the journal *Redox Biology*<sup>[1]</sup>.

Preeclampsia is a placental dysfunction that affects approximately 2 to 8% of pregnant women worldwide. It can have fatal complications, with more than 50,000 maternal deaths each year and indirectly more than a million foetal or perinatal deaths worldwide. The primary symptoms of preeclampsia are arterial hypertension, proteinuria (increased levels of protein in the urine), abnormal coagulation in the placenta, cardiovascular abnormalities in the mother and foetal growth restriction. Preeclampsia can also have long-term effects on the cardiovascular system, brain, liver and kidneys of the mother several years after pregnancy. The current first-line treatment for preeclampsia is limited and involves the preventive use of aspirin for at-risk patients. This treatment reduces the procoagulant state in the placenta and partly relieves pressure on the vascular network.

Preeclampsia is characterized by a defective placenta caused by trophoblast dysfunction. Trophoblasts are specific cells in the placenta that help organize and manage the vascular network, allow-


ing the provision of oxygen, nutrients and other elements that are essential for foetal growth. At the molecular level, preeclampsia is characterized by an uncontrolled increase in oxidative stress, with excessive production of various reactive species including reactive oxygen and nitrogen species. There is a genetic component: the first gene to be identified as being implicated in the genetic forms of preeclampsia was the STOX1 transcription factor, which controls the expression of thousands of genes, especially those involved in the production of nitric oxide (NO).

In a transgenic mouse model, high accumulation of STOX1 in the placenta induced a preeclampsia-like syndrome. In preeclampsia, nitric oxide, a powerful vasodilator that dilates blood vessels to promote blood flow to the placenta, is mobilized to produce potentially toxic molecules (nitrosative stress) and its levels become insufficient in the placental vascular network, affecting trophoblast function and the vascular network and destabilizing other reactive species. This creates a vicious circle and causes uncontrollable oxidative/nitrosative stress with multiple complications, also affecting maternal blood vessel cells, with potentially fatal consequences.

NO is produced by a family of enzymes known as nitric oxide synthases (NOSs). Finding a way of restoring NO production in the placenta via NOSs could represent an effective new therapy to treat preeclampsia. A years-long collaboration between the team led by Dr Daniel Vaiman (Institut Cochin, Inserm/CNRS/Université Paris Cité) and the team led by Dr Miria Ricchetti (Department of Developmental & Stem Cell Biology, Institut Pasteur/CNRS) with Dr Laurent Chatre, and more recently an American team from Mississippi, gave rise to a potential solution.

The scientists' research was based on trophoblasts overexpressing STOX1 and on two rodent models of preeclampsia, one mimicking early-onset forms via placental overexpression of STOX1 and the other mimicking late-onset forms by partial occlusion of the lower abdominal aorta. The research revealed a cascade of events that ultimately led the scientists to propose a new therapy.

Treating trophoblasts with BH4 (or tetrahydrobiopterin, a cofactor that stabilizes the NOS enzyme producing NO) corrected the defects identified in these cells, restoring production of NO rather than potentially toxic molecules. More importantly, administering BH4 to the two pre-clinical rodent models restored placental and fetal weight. Finally, in the early-onset STOX1 preclinical model with significant arterial hypertension and proteinuria, the BH4 treatment corrected blood pressure, excess protein in urine, and cardiovascular abnormalities in the mother. The results even suggest that the treatment may be effective in addressing the long-term effects of preeclampsia on mothers (vascular abnormalities in the brain, kidneys, heart and liver).

This research is the first step towards the development of a therapy for preeclampsia. The scientists also performed genetic (transcriptomic) analyses of placentas treated with BH4 and showed that it corrects the expression of several genes disrupted by excess STOX1 in a different way from the deregulation induced by aspirin in the placenta. In conclusion, the scientists propose that a treatment combining BH4 and aspirin could be the ultimate therapeutic solution for many cases of preeclampsia. This hypothesis needs to be validated in clinical trials. 

### Reference:

1. L. Chatre, A. Ducat, F. T. Spradley, et. al. Increased NOS coupling by the metabolite tetrahydrobiopterin (BH4) reduces preeclampsia/IUGR consequences. *Redox Biology*, Vol 55, 2022. doi: <https://doi.org/10.1016/j.redox.2022.102406>



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Siemens Healthineers partnered with Integrated Global Healthcare Service, the management company for Oman International Hospital, to establish a leading private healthcare facility in Muscat.

# Access to Care sits at the core of Siemens Healthineers' commitment

It took a global pandemic for health systems to pivot and adapt, making at least 10 years of progress in the span of months and putting healthcare at the heart of the global agenda.

The speed with which healthcare has transformed in the past years is truly incredible, with the industry becoming more interconnected than ever before. From patient twinning and precision therapy to the adoption of data and AI, patient-centered breakthroughs have opened up new

pathways in clinical decision-making and treatment. Healthcare has also been the central focus of the global economy, driving significant change based on the pillars of security and social justice.

Despite these rapid changes, however, every two seconds, someone aged between 30 and 70 dies prematurely from heart diseases, respiratory failure, diabetes, or cancer. And billions of people live in fragile settings that present a significant chal-

lenge to health due to severely limited access to basic health services. Whether it's the lack of adequate clinics, appointment availability, or deeper infrastructural malaise, patient care access faces a whole gamut of challenges today.

## **Most critical task in healthcare**

With at least 50 percent of the world's population having no access to affordable, and timely healthcare services, forging a

Siemens Healthineers has been at the forefront of deploying inclusive and sustainable breakthroughs to improve access to healthcare – with solutions helping physicians and healthcare providers increase access for patients and address challenges linked to affordability, availability, and acceptability.

world where people are able to receive the right care in the right setting at the right time, is one of the most critical tasks facing the international community today.

In some cases, this has led to major policy changes and new international frameworks – for example, the EU Charter of Fundamental Rights now includes the right to “timely access to affordable, preventive and curative healthcare of good quality”. But overall, the gaps between when and where healthcare can be accessed is rapidly widening.

In addition, a surging global population has mounted unprecedented pressure on healthcare systems. The World Economic Forum estimates that 800 million people spend at least 10 percent of their household budgets on health expenses, sending 100 million of those people into extreme poverty. This can create a dangerous and costly healthcare cycle where late diagnosis and therapy lead to ineffective outcomes and amplifies the economic and social fallout.

Improving access to healthcare is also one of the pillars of UN Sustainable Development Goals (SDGs), namely SDG 3 on good health and well-being, and SDG 17 on partnerships for common sustainability goals, and acts as the gateway to economic and social opportunities in underserved societies.

The urgent need, therefore, is to forge a collaborative approach, and MedTech pioneers must play a leading role here. That’s the reason Siemens Healthineers has been at the forefront of deploying inclusive and sustainable breakthroughs to improve access to healthcare – with solutions helping physicians and healthcare providers increase access for patients and address challenges linked to affordability, availability, and acceptability.

### Successful case studies in Middle East and Africa

In the Middle East and Africa, this is demonstrated by a multitude of strategic partnerships. In Riyadh, Siemens Healthineers set up a partnership in 2021 with the Prince Sultan Cardiac Center that provides comprehensive cardiovascular healthcare services to Saudi armed forces personnel, for remote care. Facing a lack of patient engagement, the Cardiac Center teamed up with Siemens Healthineers to set up a telehealth service that resulted in better connectivity for patients. In Oman, the company helped set up the Oman International Hospital in partnership with Idealmed Global Healthcare Service to improve patient access through hi-tech laboratory solutions.

Breakthroughs in precision medicine have also brought in new opportunities. Personalized medicine and treatment start with a highly specific diagnosis – and Siemens Healthineers has been able to achieve this by improving diagnostic accuracy, reducing unwarranted variations, and advancing therapy outcomes.

The results of such efforts are visible in continents like Africa, where cancer mortality rates are higher than the global average due to a lack of radiotherapy access and skilled professionals. The Access to Care Cape Town radiotherapy training program facilitated by Siemens Healthineers, was set up to address this growing need and host participants in 14 African countries. In Ethiopia, Siemens Healthineers collaborated with the German government to support the Ministry of Health in its screening of COVID-19 patients.


Through Varian, a Siemens Healthineers company, which is a founding partner of the Global Access to Cancer Care Foundation (GACCF), Siemens Health-



Ole Per Maloy, CEO, Siemens Healthineers, Middle East and Southern and Eastern Africa.

ineers also partners with clinicians and universities to provide critical technology and training in countries that are struggling with 80 percent of the world’s cancer burden and only 5 percent of the resources needed to control it. GACCF is currently training more than 280 people on the ground and over 600 digitally in countries such as Ethiopia, Kenya, Tanzania, and Ghana.

For Siemens Healthineers, such projects are part of the company’s strategic plan to increase patient touchpoints in underserved countries by more than 75 percent to 260 million in 2030. In addition, training local talent may be one of the most powerful tools to improve access to care. It allows an immediate improvement to the quality of care provided to patients and in the mid to long term, it increases local knowledge base and reduces the need for treatment abroad.

Hand in hand, we can dramatically improve global access to healthcare for all and translate the UN SDGs into meaningful reality. It’s a win-win scenario for the communities that we serve, but this journey will succeed only if all stakeholders work together with the commitment and urgency that it deserves. 

# Advancing healthcare for the Arab world

Qatar continues to make major strides in healthcare research and practice, with beneficial implications not only for the country but also the wider Arab world. *Middle East Health* looks at some of the latest developments.



HMC's Al Maha Pediatric Specialized Care Centre was recently opened in Qatar

## Prime Minister opens HMC's Al Maha Pediatric Specialized Care Center

His Excellency Sheikh Khalid bin Khalifa bin Abdulaziz Al Thani, Prime Minister and Minister of Interior, officially opened Hamad Medical Corporation's new Al Maha Pediatric Specialized Care Centre in May this year. Present at the opening ceremony were Her Excellency Dr Hanan Mohamed Al Kuwari, Minister of Public Health, and a number of senior health officials.

Dr Al Kuwari noted that the development of the new purpose-built medical and rehabilitation facility was driven by

Qatar's commitment to improving the care of its paediatric long-term patients.

The beautifully designed facility, which includes gardens, recreational facilities and family areas, was the recipient of a European Healthcare Design Award and the winner of a World Architecture Award.

The Al Maha Center is located within the Al Wakra Hospital campus, thereby enabling fast access to this major general hospital if required. The Al Maha Center is spread generously over 20,000m<sup>2</sup> of floor area, which includes a range of inpatient

and outpatient areas. There are six inpatient units with 105 beds, of which 69 are private rooms, as well as 13 outpatient clinic rooms.

The patients' medical needs can be provided in one location, including medical, diagnostic and therapy services – such as physiotherapy, occupational therapy, speech therapy, assistive technology, audiology services, seating and positioning and feeding and swallowing as well as psychological support and intervention. The Al Maha Center also provides innovative





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## HMC Heart Hospital marks 40 years of cardiac catheterization

In July, Hamad Medical Corporation's (HMC) Heart Hospital recently organized the first 'Cardiac Catheterization Day' to mark the 40th anniversary of the introduction of cardiac catheterization at HMC. The event was aimed at acknowledging the work and achievements of medical teams at the facility, as well as highlighting the world-class services provided at the hospital.

Dr Nidal Asaad, Medical Director of the Heart Hospital and Senior Consultant of Cardiac Catheterization and Electrophysiology, said that the number of cardiac catheterization procedures performed at the Heart Hospital has increased by 50 percent over the last five years.

"The Heart Hospital performs more than 4,500 therapeutic and diagnostic catheterization procedures annually, including 1,100 emergency cardiac catheterization procedures for critical and urgent cases that require rapid intervention from our highly experienced and well-equipped team," Dr Asaad said. "These cases are brought to the Heart Hospital's Emergency Department by the Ambulance Service and the necessary interventions are performed rapidly for these cases within 45 minutes, which is much less than the internationally approved standard of 90 minutes," Dr Asaad said.

"Thanks to our highly-qualified medical teams and the continued development and improvement of equipment

and technologies at the Heart Hospital, the mortality rate from acute myocardial infarction decreased by two percent during 2021. This is comparable to the same rates at the best hospitals in the world," he added.

### Extracorporeal Membrane Oxygenation

Dr Asaad said the Cardiac Catheterization Department had overseen the introduction of state-of-the-art technology and treatments including Extracorporeal Membrane Oxygenation (ECMO) technology and the treatment of mitral valve leakage through catheterization, which was previously done through surgical intervention.

Dr Abdulrahman Arabi, Deputy Chair of Cardiology for Clinical Affairs and Director of the Cardiac Catheterization Laboratory at Heart Hospital, said the facility applies the highest international standards despite the large number of cases it receives compared to other cardiology hospitals.

"Our high-quality care is achieved not only because we have a state-of-the-art facility but more importantly because we have highly trained and experienced staff," said Dr Arabi. "Due to the concerted efforts and collaboration between Heart Hospital departments and the rest of HMC facilities and services, the waiting time for cardiac catheterization for non-urgent cases has decreased from eight months to four weeks over the last four years." MEH

services such as aquatic therapy offered in a state-of-the-art multi-level hydrotherapy pool, music and art therapy, virtual reality treatment, in addition to other related services designed to provide the best opportunities adapted to the specific needs of each child. Treatments and diagnosis are provided in 26 individual therapy rooms and four group therapy rooms, as well as three gymnasiums.

In addition to patient and family areas, the centre includes a cafeteria and mosque as well as training and conference facilities for staff professional development and family consultation purposes.

"The Al Maha Pediatric Specialized Care Center offers expert long-term and acute care for children with special needs. This unique centre, the first of its kind in the region, is an ideal facility designed to create a home-like environment aimed at promoting a better quality of life for children with long-term care needs. The centre reflects the achievement of one of Qatar's National Health Strategy's key

goals, which is to provide high-quality care based on international best practice standards," said Dr Al Kuwari.

Ali Al Janahi, HMC's Acting Assistant Managing Director and Chief of Tertiary Hospitals Group, explained: "Children have unique developmental and emotional needs and their environment, in this case a hospital, can play a significant role in responding to these needs. Our aim was to achieve a family-focused hospital design that addressed the multiple and often complex needs of these children and their families.

"The centre offers a paediatric healthcare environment that includes not only high-quality treatment rooms for children but also family spaces and fun areas to stimulate the children and encourage better family engagement. In addition, the centre provides family and attendant education facilities.

"We strive to make our paediatric patients feel safer in what may otherwise have been a more intimidating clinical environment. The Al Maha Center will

help its patients and their families on their healing journey," said Al Janahi.

"The successful transfer of our long-term paediatric patients, many of whom are children with chronic respiratory failure requiring long-term ventilation, was due to the combined efforts of the multidisciplinary teams involved and their meticulous planning and attention to detail. Equally important was ensuring that the parents were kept informed every step of the way," said Dr Abdulaziz Al Darwish, Acting Chief Executive Officer of Rumailah Hospital and Deputy Chief Medical Officer of HMC.

"These incredible teams of physicians, nurses, allied health professionals and support staff were dedicated to ensuring the safe and comfortable transfer of the children to their new environment. Where possible, the same professional teams transferred over with their patients as this contributed to the overall confidence and comfort of the children and their parents," said Dr Al Darwish. MEH

## The View Hospital putting patient experience first

Elegancia Healthcare, a subsidiary of Estithmar Holding, is set to provide integrated high-quality healthcare services with the upcoming inauguration of The View Hospital, a unique state-of-the-art healthcare facility in Qatar, located in the prestigious Al Qutaifiya area, in the vicinity of The Pearl.

The View Hospital will offer comprehensive programs and services that meet healthcare needs and help maintain healthy lifestyles for the community. Committed to delivering high-value care for patients and offering a wide range of medical and surgical specialties, the hospital consists of 240 beds, 62 VIP suites and 3 Royal suites and offers several specialties and centers of excellence in medical departments.

Elegancia Healthcare is working together with Cedars-Sinai — a California-based health system that was recently voted the #2 hospital in the United States by *U.S. News & World Report* — to create a facility that meets the highest international quality standards. Since its founding in 1902, Cedars-Sinai has evolved to meet the healthcare needs of one of the most diverse regions, continually setting new standards in quality and innovation in patient care, research, teaching and community service.

The hospital aims to offer patient-privileged access to ground-breaking treatments in a premium environment where safety, comfort, convenience, compassion and medical ethics come together to go beyond traditional healthcare. The View Hospital is set to raise the standards of patient experience in Qatar.

Henrik Christiansen, CEO of Estithmar Holding, said: “We are committed to keeping pace with the increasing demand for healthcare services in Qatar as it focuses on a transformation from heavy dependency of the public sector to an engaged private sector involvement. The demand for private healthcare facilities is expected to increase following the recently issued mandatory health insurance law in Qatar. Our aim is to advance integrated and team-delivered care at The View Hospital to patients in Qatar and the region.”

To cater to the major services patients



usually seek abroad, The View Hospital will offer complex care specialty services and international expertise, bringing top tier medical professionals and advanced technology to deliver a unique and positive patient experience in Qatar.


Bassam Sayad, CEO of Elegancia Healthcare, said: “The View Hospital will provide comprehensive inpatient and outpatient programs, with specialized clinical centers equipped with the latest technology. We are committed to expanding access to high-quality healthcare locally so as many people as possible can receive the best care close to home and family. Our affiliation with world-renowned Cedars-Sinai gives us an advantage to serve the interests of patients to meet their needs throughout the country without the need to travel and get treatment abroad.”

The iconic 15-floor hospital will offer a wide range of medical services utilising multidisciplinary approach with an effective system of service delivery, integration and coordination of care and adopting the highest standards and best practices in patient care. Signature services will be focused on women’s health, heart health, diabetes care, executive health, wellness and family health.

Aided with advanced equipment, the hospital will provide medical services in pain management, cardiology, dentistry, dermatology, diabetes care, diagnostic imaging, endocrinology, ENT,



gastroenterology, general surgery, maternity (Obstetrics & Gynaecology), neonatology and NICU, nephrology, neurology, ophthalmology, orthopaedics, paediatrics, physiotherapy & rehabilitation, plastic surgery, primary care, pulmonology and rheumatology services.

The View Hospital will provide a comprehensive, new level of expert, personally attentive healthcare all at one premium location, providing patients and their families with an exceptional experience and peace of mind. 

## Dr Hanadi Al Hamad receives WHO Prize for Research in Healthcare and Health Promotion for the Elderly

Dr Hanadi Al-Hamad, National Lead for Healthy Ageing for the Qatar Ministry of Public Health and Medical Director of Rumailah Hospital and the Qatar Rehabilitation Institute at Hamad Medical Corporation (HMC) received the prestigious “His Highness Sheikh Sabah Al-Ahmad Al-Jaber Al-Sabah Prize for Research in Health Care for the Elderly and in Health Promotion” from the World Health Organisation. She was one of seven awards recipients at the 75th World Health Assembly in Geneva on 27 May.

Dr Al-Hamad expressed her appreciation for the award: “I gladly accept this award not only for myself but also

on behalf of my whole team, who have been the cornerstone of all that we have achieved and all that we still plan to do in the future in developing best practice care for our older population in Qatar and the region.

“In my capacity as Qatar’s National Health Strategy lead for healthy ageing, I have been committed to enhancing high quality healthcare services for older adults, long-term care patients and people living with dementia. Alongside these efforts to develop better clinical services, we have also focused on illness prevention strategies designed to promote healthy ageing awareness and practices in our population. The recognition is due to



Dr Hanadi Al-Hamad, National Lead for Healthy Ageing for the Qatar Ministry of Public Health

our efforts to achieve the goals of our National Health Strategy 2018-2022 which focuses on care of our elder population and our Qatar National Vision 2030.” M54

## HMC’s Mental Health Service wins top award from Oracle Cerner

In July, Hamad Medical Corporation’s (HMC) Mental Health Service was announced as a joint winner of the Oracle Cerner ‘Achievement in User Experience’ award during an awards ceremony at the Oracle Cerner Middle East and Africa Collaboration Forum in Dubai. The award was for their project ‘behavioural health implementation with the first Middle East Behavioural Health Essential Clinical Dataset’ which was recognized for focusing on specialized documentation for mental health patients, with a key focus on patient confidentiality.

The award was collected by Dr Raed Amro, Assistant Executive Director of the Mental Health Service at the MHS on behalf of HMC: “Mental health records fall within general protected health information, therefore, we were keen to enhance the process of recording patient data in the system that is both efficient and safe.

“We collaborated with the Oracle Cerner team and our in-house Health Information and Communications Technology Department in the creation of an essential data set. This was a game-changer especially for nurses to help decrease the amount of time they spend on documentation leading to more time spent with the patient. Interdisciplinary collaboration is key to developing practical solutions for typical challenges, and I am pleased with how well the Oracle Cerner team worked with our teams at HMC to develop this solution,” said Dr Amro. M54



Dr Raed Amro, Assistant Executive Director of the Mental Health Service receives the Oracle Cerners ‘Achievement in User Experience’ award on behalf of HMC.

# Sidra Medicine study reveals genetic map of Arab and Middle Eastern populations

Research has important implications for genomic medicine in the Arab world



Dr Khalid Fakhro, Chief Research Officer at Sidra Medicine

Researchers in Qatar have unveiled a high-resolution map of the genetic structure of Arab and Middle Eastern populations, providing new insights into human history in the region and ancestral patterns that may help to explain local human traits and disease risks.

Crucially, the study – published in *Nature Communications* – reveals that ancient populations in the Arabian Peninsula played a far more central role in the story of early human migration out of Africa than was previously understood.

## Genetic ancestry

Developed by an international team led by Dr Younes Mokrab and Dr Khalid Fakhro from Sidra Medicine in Qatar, in collaboration with Qatar Genome Programme, it is the first large-scale analysis of the genetics of Arab and Middle Eastern populations. DNA from more than 6,000 people living in Qatar were examined, with their genomes compared to those from other populations living around the world today, as well as ancient DNA.

Understanding the genetics of these under-characterized populations breaks down a barrier to precision medicine tailored to address disease risks unique to people with Middle Eastern ancestry.

The study revealed key novel historical and social insights into Arab populations:

- A population split from early Afri-

cans occurred around 90,000 years ago, followed by a further split between 30-42,000 years ago that gave rise to the ancestors of modern-day Arab, European, and South Asian populations. This is supported by the observation that Neanderthal DNA is far rarer in Arab populations than in populations that later mixed with ancient hominins.

- Arab ancestral populations have undergone multiple splitting events 12-20,000 years ago, giving rise to various settling and Bedouin communities concurrent with the aridification of Arabia.

- By comparing modern genomes to various ancient human DNA dating back to Paleolithic and Neolithic periods. Peninsular Arabs were found to be the closest relatives to so-called ‘Basal Eurasian’ Neolithic farmers and hunter-gatherers who occupied the ancient Middle East.

- The study found very high rates of homozygosity, which is likely to be a result of the tribal nature of Arab cultures, suggesting the suitability of this population in discovering novel disease risk genes.

## Largest Arab genomic dataset

Dr Mokrab, head of the Medical and Population Genomics lab at Sidra Medicine – which is a member of Qatar Foundation – and Assistant Professor of Genomic Medicine at Weill Cornell Medicine Qatar, said: “Our in-depth genetic analyses of 6,218 Qatari genomes leverages the biggest dataset of this kind from the Middle East to date.

“Despite the relatively small size of the Qatari population, we discovered diverse ancestries relating to Europe, Asia, Africa and even South America. Notably we found a unique group of Peninsular Arabs as the most ancient of all modern Middle Eastern populations. This provides a fantastic addition to our knowledge of human genetic diversity.”

Professor Asma Al Thani of Qatar Genome Programme said: “As producers of the largest genomic dataset in the region, we hold a responsibility as Qatar

We are discovering every day that modern day Qatar is an excellent proxy for the diverse Arab world, and future discoveries from this population will have tremendous implications for precision medicine for millions of Arabs everywhere.

Genome Programme to represent our part of the world and fill many of the existing knowledge gaps on genomics of the Middle Eastern populations. This paper is a great example of the role that we play.”

Dr Khalid Fakhro, Chief Research Officer at Sidra Medicine, added: “This work builds on the terrific momentum in human genome research taking place in Qatar, allowing us to appreciate, at unprecedented scale, the fascinating trajectory of different tribal ancestries across Arabia over the past millennia. We are discovering every day that modern day Qatar is an excellent proxy for the diverse Arab world, and future discoveries from this population will have tremendous implications for precision medicine for millions of Arabs everywhere.”

The results of the study are designed to be a benchmark for providing genomic medicine to the people of the Middle East and the Arab world. The researchers have used the data to build a reference panel to impute genetic variation, the first ever dedicated for Arab populations.

## Reference:

Razali, R.M., Rodriguez-Flores, J., Ghorbani, M. *et al.* Thousands of Qatari genomes inform human migration history and improve imputation of Arab haplotypes. *Nature Communications* 12, 5929 (2021).

<https://doi.org/10.1038/s41467-021-25287-y>

# WCM-Q research reveals metabolic processes underpinning type 2 diabetes, retinopathy, obesity and dyslipidaemia

Researchers at Weill Cornell Medicine-Qatar (WCM-Q) have identified metabolites that are associated with type 2 diabetes and its complications, mainly obesity, retinopathy and dyslipidaemia.

The study, published in *Diabetes*, was led by Dr Noha Yousri, Assistant Professor of Research in Genetic Medicine at WCM-Q. Dr Yousri analysed 1,300 metabolites in samples from 996 Qatari adults (57% of whom had type 2 diabetes) and 1,159 metabolites from an independent cohort of 2,618 individuals from the Qatar BioBank (11% of whom had type 2 diabetes). It identified 373 metabolites associated with type 2 diabetes, obesity, retinopathy, dyslipidaemia (measured through lipoprotein levels). A total of 161 of these metabolites were novel, meaning their association with the conditions has never previously been identified. The identified metabolites highlight perturbations in several biological pathways including oxidative stress, lipotoxicity and glucotoxicity, all of which cause dysfunction and damage at cellular level.

## Metabo-clinical signatures

More interestingly, the researchers identified 15 patterns of what they termed “metabo-clinical signatures” based upon clusters of patients with type 2 diabetes who had similar metabolite levels and also shared two or more clinical characteristics, such as obesity, triglyceride, unhealthy HDL/LDL levels, or retinopathy.

Dr Yousri explained: “The study of complex diseases as diabetes benefits from profiling metabolites from various metabolic pathways. Being affected by both genetics and the environment, metabolites are useful in deciphering the disease mechanisms. This study gives us new insights into shared metabolic pathways between diabetes and its complications. In addition, the large sample size allowed us to identify disease clusters of individuals with similar complications that are associated with

broadly similar metabolic profiles. Identifying such metabo-clinical patterns, and future integration with other omics profiles will enhance personalized medicine approaches for type 2 diabetes, a prevalent disease that affects many people in our region and around the world.”

## Complexities of type 2 diabetes

Type 2 diabetes is a complex disease with many different causes and a wide variety of clinical complications, which makes understanding the disease, and how to treat or prevent it, extremely challenging. To meet this challenge of complexity, WCM-Q uses a highly advanced precision testing platform and powerful computing technology. This allows researchers at WCM-Q to analyze vast quantities of complex data generated from biological samples drawn from very large numbers of individuals. Using this data to build up a ‘disease atlas’ of type 2 diabetes and its complications in this way could potentially provide targets for the development of new drugs and more effective precision medicine approaches.

## Collaboration

Dr Khalid Fakhro, Chief Research Officer and Director of the Precision Medicine Program at Sidra Medicine, and a senior author of the paper, added: “This study is yet another terrific demonstration of the close collaboration between Sidra Medicine and WCM-Q to characterize the Qatari population on a molecular level. Establishing multi-omic reference databases based on metabolomics, transcriptomics, genomics and so on, of thousands of Qataris will be key to mapping markers for health and disease in the local population, and of great importance to the Arab world at large.”

The paper, entitled ‘Metabolic and Metabo-Clinical Signatures of Type 2 Diabetes, Obesity, Retinopathy, and Dyslipidemia,’ has been published in *Diabetes*. Other researchers who contributed to the paper include Dr



Dr Noha Yousri, Assistant Professor of Research in Genetic Medicine at WCM-Q

Ronald Crystal of Weill Cornell Medicine in New York, and Dr Steven Hunt and Dr Karsten Suhre, both of WCM-Q.

Dr Khaled Machaca, Senior Associate Dean for Research, Innovations, and Commercialization at WCM-Q, said: “This important study takes a deep dive into the metabolomics of type 2 diabetes and its associated complications, which can be debilitating and distressing for patients and their families. At WCM-Q we are dedicated to using our advanced scientific capabilities to improve our understanding of diseases of importance to the Qatari and local populations in an effort to pave the way for advanced treatments.”

The study was supported by Qatar National Research Fund (a member of the Qatar Foundation) and by Qatar Biobank. The work was also supported by the Bioinformatics Core and Biomedical Research Program in Weill Cornell Medicine-Qatar, funded by the Qatar Foundation.

## Reference:

Noha A. Yousri, Karsten Suhre, Esraa Yassin, et. al.; Metabolic and Metabo-Clinical Signatures of Type 2 Diabetes, Obesity, Retinopathy, and Dyslipidemia. *Diabetes* 1 February 2022; 71 (2): 184–205. <https://doi.org/10.2337/db21-0490>



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# WCM-Q research tackles the most pressing local and global health issues

One of the key pillars of WCM-Q's overall mission is to boost the efficiency of health-care by conducting cutting-edge research across a wide range of biomedical areas of interest, with a particular focus on disease factors specific to the local population, such as obesity, metabolic syndrome and diabetes.

With many important discoveries into some of the most pressing health issues facing Qatar and the wider region, WCM-Q has managed to achieve highly relevant and globally impactful epidemiological findings in relation to the COVID-19 pandemic, in addition to new discoveries about the fundamental processes that drive the basic functions of the human body.

## WCM-Q's Infectious Disease Epidemiology Group

Since the onset of the COVID-19 epidemic in Qatar in February 2020, WCM-Q's Infectious Disease Epidemiology Group (IDEG) has been leading epidemiological analyses and mathematical modeling as part of the Qatar COVID-19 national response, and gained official designation as a World Health Organization (WHO) Collaborating Centre for combating infectious diseases in the region. IDEG has also supported the infrastructure for research and data generation as part of this response, while the WCM-Q Genomics Core provided support through viral genome sequencing and wastewater deep sequencing.

WCM-Q's contributions were published in some of the world's leading scientific journals, such as the *New England Journal of Medicine*, and have been instrumental in providing a principal source of data and analyses for characterizing the pandemic in support of the national and global response and to inform policy, strategy planning, public health programming, and resource allocation.

## Qatar Genome Research Consortium

With countries in the Middle East experiencing an alarming increase in cancer patients, researchers operating as part of a WCM-Q and Qatar Genome Research Consortium reported the first landscape of cancer germline variation – known as inherited cancer – in the Middle East. The study provides in-depth screening of both common and rare cancer genetic markers in Qatari nationals.

Researchers at WCM-Q also gained new insight into the molecular mechanisms by which obesity leads to premature ageing of fat cells, causing chronic inflammation, insulin resistance, and eventually type 2 diabetes. New discoveries were also made into the essential role played by the Sirtuin 1 protein in the metabolism of fat, and how depletion of this protein is related to obesity and type 2 diabetes.

In partnership with WHO, WCM-Q researchers produced a comprehensive report on the hepatitis C virus epidemic in the Eastern Mediterranean region, offering guidance on how to eliminate the disease by the WHO's 2030 target date.

## Screening tool for genetic diseases

As part of a major landmark study, researchers from WCM-Q, Qatar Foundation (QF), and Weill Cornell Medicine in New York (WCM NY) assembled a large genomic database on the Qatari people and used it to develop an advanced but low-cost screening tool for genetic diseases. The tool,



QChip1, is a microarray capable of detecting, from a blood sample, more than 80,000 different DNA variations in genes linked to hereditary disorders.

With numerous other important studies concluded or in process, WCM-Q's functional and productive research model is based on a collaborative effort with national stakeholders to advance Qatar's healthcare, research and economic agendas. With that principle in mind, 25 active state-of-the-art WCM-Q laboratories have been functioning as national hubs available to multiple national stakeholders.

In support of the Qatar National Vision 2030 and that of QF to translate research products into applied commercially viable solutions for the benefit of the local population, WCM-Q faculty have been involved in three startups and have executed six industry-sponsored research agreements, including one with Moderna, the renowned producer of the Covid-19 RNA vaccine. To date, WCM-Q faculty members have generated just under 40 invention disclosures. [MS4](#)



# 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 pharmacodynamic (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 Remifentanyl is generally achieved with 3-6 ng/ml. A Remifentanyl 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 compart-

ment 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 Remifentanyl 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 de-

creasing 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 Remifentanyl, and the Kim-Obara-Egan Remifentanyl 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. ■ MHE

# The rising tide of orthopaedic surgery across the Middle East



By Bernard Ross

The demand for orthopaedic surgery is increasing around the world. As the global population continues to age, more people require surgical intervention to alleviate chronic pain, especially those with hip or knee joint conditions.

In 1950, the global average life expectancy was 47 years; now it is more than 73 years. The total population of people aged 65 or over across the Middle East has almost doubled in the last two decades, rising from 13.7 million in 2000 to more than 25.2 million in 2022.

During this time hip replacement rates increased by 30 percent between 2007 and 2017 across OECD countries, and this trend is beginning to be reflected across the Middle East. In Turkey, there were 60 total hip replacement (THR) surgeries for every 100,000 people in 2019 – more than double the figure from 2010. While in Saudi Arabia, where THR surgeries are less common, the rate of total knee arthroplasty (TKA) surgeries has increased annually.

## A balancing act

Balancing increasing surgical demand and rising healthcare costs with a growing

ageing population is putting healthcare systems under immense pressure – especially as many institutions are still recovering from difficulties arising from the Covid-19 pandemic. During the last two years, stopping the spread of coronavirus was prioritised over routine surgeries, causing the postponement of non-urgent operations with the aim of increasing bed capacity and protecting clinicians, patients, and nursing staff. Surgical demands are now higher post-pandemic due to the significant disruption in healthcare delivery.

As surgical demand increases the cost per procedure is likely to also increase, particularly post-pandemic. Healthcare systems across the region are now in a position where demand outweighs supply, driving costs up. Orthopaedic surgery is already costly – in 2019 hip replacements typically cost US\$36,000 in Israel, while in 2017 in the United Arab Emirates, hospital admission costs for hip replacements were \$22,500.

## Surgical interventions

Surgery is usually the last resort for patients with joint conditions. Healthcare professionals (HCPs) first recommend other solutions, such as physiotherapy and steroid injections. However, for older patients with already limited mobility physiotherapy is not always a viable option.

THR surgery is recommended to patients with long term forms of arthritis, including osteoarthritis, rheumatoid arthritis, and septic arthritis. Patients with hip fractures are also recommended THR surgery. For those in need of surgery, delayed surgical intervention can cause a deterioration in physical and mental health. Patients awaiting orthopaedic surgery are

required to live with worn or damaged joints, reduced mobility, and ongoing pain – even while resting.

## Faster recovery

Hip replacement surgeries are typically a speedy medical procedure, taking between one and two hours, however recovery can take up to five days. Despite advancements in surgery thus far, post-operative complications and re-admission rates have remained level, and some issues still exist for patients' post-surgery. Pain, dizziness, and weakness have been reported to delay discharge following THR, as well as post-operative oedema which can be a cause of pain and loss of muscle function. Oedema has also been reported to be the main cause of hospital readmissions in the 90-day period post-surgery.

Traditional methods for treating oedema following total hip replacement surgery typically include the use of compression stockings to reduce swelling and prevent deep vein thrombosis (DVT). However, compression stockings have been linked to discomfort and are difficult to apply. HCPs across the region are now turning to innovation for new solutions to enhance recovery and reduce post-operative complications.

## Breeding innovation

Implementing innovative solutions in healthcare is challenging. Healthcare systems need to ensure they can introduce new ideas that can help improve care, without negatively impacting the systems that are already in place.

It is important that new treatment plans can balance making healthcare more efficient and cost-effective, while maintaining and improving patient outcomes. Wearable devices that can aid

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recovery offer a unique solution that can address these issues and reduce recovery times.

Reducing post-operative oedema, for example, can enhance patient outcomes following THR surgery. Neuromuscular electrical stimulation devices can gently stimulate the common peroneal nerve activating the calf and foot muscle pumps, resulting in increased blood flow in the deep veins of the calf equal to 60 percent of walking without a patient having to move. This enhanced blood flow reduces oedema and has been clinically proven to reduce the build-up of swelling following hip replacement surgery. Wearable devices are also typically non-invasive and easier to administer than compression stockings, and reported as well tolerated.

Innovations in wearable devices have the potential to transform recovery post-surgery, both immediately after and in long term recovery. If healthcare systems can cut down inpatient care and reduce the number of readmissions post orthopaedic surgery, more resources and time will be available to spend elsewhere.


### A brighter future

Healthcare institutions across the Middle East that invest in innovation will have a bright future, despite the burden placed on them by Covid-19. Medical innovations that would have otherwise taken years to implement into care pathways are now proven to enhance healthcare delivery and are regularly being adopted into treatment plans – sup-



porting HCPs and patients across the region by improving outcomes following surgery.

But the speed of innovation adoption must not slow. The momentum developed

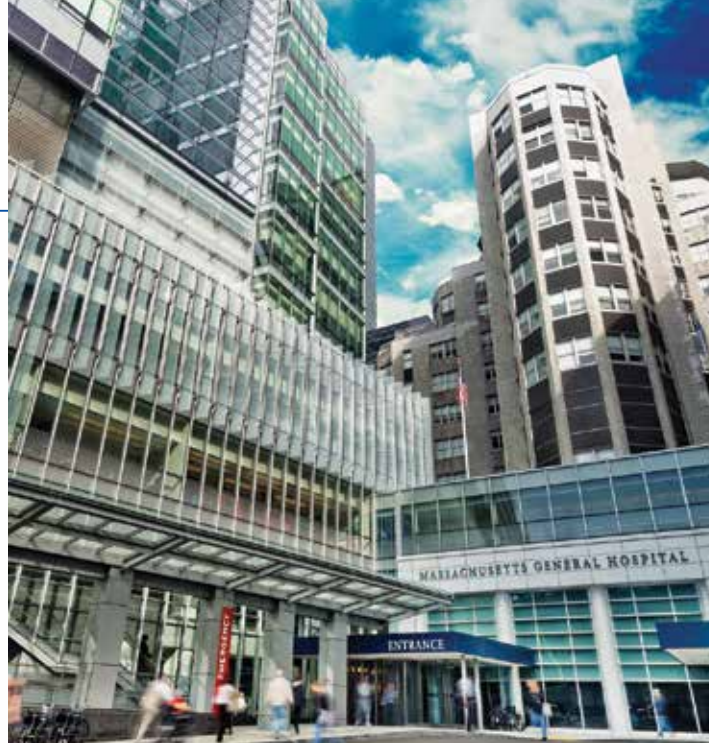
in the last two years can be a springboard to greater investment and innovation in healthcare and, ultimately, a brighter future for people across the region. 

### About the author

Bernard Ross is CEO and founder of Sky Medical Technology (Sky). Sky creates world-leading medical devices that saves lives while saving healthcare systems money. Sky's biomedical devices use its proprietary bio-electronic nerve stimulation technology – OnPulse™ – clinically proven to increase blood circulation in the deep veins of the calf. The result is the company's multi-award-winning device, the geko™ – a wristwatch-sized wearable applied to the knee delivering painless electrical impulses to stimulate blood flow, without the patient having to move. It has been globally adopted into healthcare systems to treat a range of medical conditions including the prevention of venous thromboembolism and the treatment and prevention of oedema (swelling).

Ross is a serial entrepreneur with more than 20 years' senior experience at private and public board level across multiple industries including pharmaceutical, technology development and FMCG. He is a former Head of International Development at CMI plc, Senior Vice President, Cardiovascular of Bioaccelerate Inc. (BACL) and former CEO of Innacardio Inc.

# New 3D bioprinting technique makes functional articular cartilage



A clinician–researcher team at Massachusetts General Hospital has developed a novel approach to direct-volumetric drop-on-demand three-dimensional (3D) bioprinting. The team is using the new technology to grow articular cartilage that is much more functional than previously possible.

“The treatment options we have for full and partial-thickness cartilage loss are less than ideal,” says Brian E. Grottkau, MD, chief of the Pediatric Orthopaedic Service at Mass General. “We are using 3D printing to tackle this and other problems for which we don’t have good solutions.”

Dr Grottkau is collaborating on the tissue engineering advancement with Yonggang Pang, MD, PhD, an orthopaedic surgery researcher in Mass General’s Laboratory for Therapeutic 3D Bioprinting.

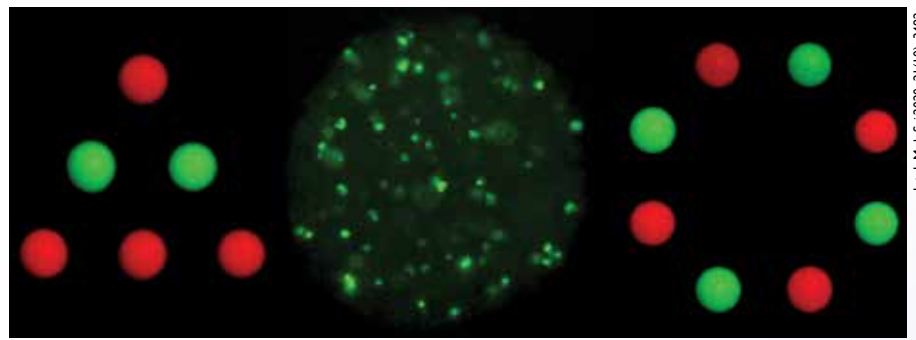
“Everyone else is focusing on the shape of the tissue,” Dr Pang says. “But we are focusing on the function, as well, by micro-controlling the cells during a bioprinting process and preserving their native functions afterward.”

## New 3D bioprinting directly controls volume of a bioink

3D printing can be roughly broken down into two categories, explains Dr Pang: contact versus non-contact with the surface.

Drop-on-demand 3D printing is a non-contact method, whereby the bioprinter dispenses tiny droplets of material and cells (together called a bioink) that fall into place on the object being printed. These smaller droplets allow for more control than is possible with 3D bioprinters that must touch the printed surface to dispense a bioink.

To improve accuracy and minimize the negative effect of bioink fluctuations during drop-on-demand printing, the Mass



Representative patterned droplets dispensed onto the surface of a Petri dish. Green and red droplets were dispensed from two discrete dispensing units.

General team has developed a new method to directly control the volume of droplets. They use a thin syringe and squeeze out a small droplet of bioink accurately, just outside the needle tip. A puff of air blows the droplet to the surface of the object being printed before the droplet falls due to gravity. This helps ensure accurate volume, even when the physical properties of the bioink fluctuates.

## Bioprinting a solution to articular cartilage damage

An upcoming publication will describe the team’s success in bioprinting microspheres of specifically micro-patterned chondrocytes in a matrix to grow into articular cartilage (the smooth, white tissue at the ends of bones that allows joints to move easily). This cartilage can be damaged by disease, injury or normal wear-and-tear, and current ways to treat cartilage loss are not ideal because of the use of scar tissue or autologous chondrocytes that don’t adhere well.

Drs Grottkau and Pang are combining their drop-on-demand 3D printing technology with a special bioink, made of chondrocytes and an extracellular ma-

trix, to tackle the tough clinical problem of damaged articular cartilage. Using the new printing method, they create micro-cartilage-tissues that they deliver into a cartilage defect with a needle. There, the micro-cartilage-tissues coalesce with existing cartilage “just like a jigsaw puzzle” and organically create macro-cartilage starting from 24 hours after delivery, Dr Grottkau says. “That cartilage winds up being indistinguishable from natural cartilage and integrates with the surrounding cartilage and underlying subchondral bone, which has not been done before.”

The team believes the approach has remarkable promise for healing articular cartilage and can also be used to create:

- Liver tissues that can vascularize
- Biological joint replacements for patients with arthritis
- High-throughput drug screening (for example, bioprinting breast cancer tissues and testing the effectiveness of a large number of drugs).

“We decided to prove our mettle in cartilage, which is vexing to solve, but there are also many other applications,” says Dr Grottkau. MGH

Int. J. Mol. Sci. 2020, 21(10), 3482

# Learning to walk again: Rehabilitation with HAL, a wearable cyborg

Exoskeletons fitted to the outside of the body to offer function and support have been around for a while, in science and science fiction alike. The Hybrid Assistive Limb or HAL, from renowned Japanese biomechanical innovator CYBERDYNE Inc., is somewhat different. Introduced to Saudi Arabia in 2017, by Abdul Latif Jameel Health and available at the Abdul Latif Jameel Rehabilitation Hospital in Jeddah – the first in the region and now a GCC regional training centre of excellence – the hospital offers this pioneering therapy to a range of patients.

The wearable cyborg HAL is the only approved system of its kind that uses non-invasive sensors to detect the weak bioelectrical signals that appear on the wearer's skin surface. This signal that travels from the brain, spinal cord to the muscle contains information about how the person wants to move. HAL reads this signal and transforms them into a motorized response. The motion is therefore a deliberate and controllable activity in response to the desire to move from the patients themselves.

Akram Bouchenaki, Chief Executive Officer, Abdul Latif Jameel Health, said: "Seeing this technology come to life and helping patients in Abdul Latif Jameel Hospital is not only incredibly rewarding, but motivating too. Our mission is to take innovations in health and apply them in a tangible way – accelerating the access of health care for those who need it most. Health-tech is still in its infancy, but the wearable cyborg HAL is an example of how today's technology can change a patient's future."



## Cybernetics treatment

During the cybernetics treatment, impulses from the body are fed back to the brain, creating a positive neuromuscular feedback loop, triggering the responsible area of the brain and inducing neuroplasticity – the ability for the brain's neural networks to change through growth and reorganization. Over the course of rehabilitative training using HAL, the musculature develops in response, and ultimately, the movement of the limbs can improve significantly. There are three different types of HAL that can be applied for a different part of the body. In the case of HAL Lower Limb Type that is installed at Abdul Latif Jameel Hospital, it will help the patient to walk with more stability and reduce the use of walking aids.

The technology of HAL Lower Limb Type compensates for the missing power of the lower limbs, and so can be used therapeutically for a broad range of walking disabilities in patients who still possess at least some residual function in their legs. Neural impulses on the skin surface must be detectable and intercepted to use the system. Rehabilitative therapy using this technology has the potential to address

conditions including spinal cord injury, stroke, traumatic brain injury, multiple sclerosis, neurodegenerative diseases, muscular dystrophy, and other neuromuscular diseases.

Spinal cord injury patients normally train for 12 weeks, five times per week. During this rehabilitation, key treatment goals may be achieved. Studies have shown positive results for increased walking speed, reduced need for walking aids, improved skin sensation, reduction of spasticity, reduction in neuropathic pain, muscular strengthening, and stimulation of affected brain regions.

The Abdul Latif Jameel Hospital works in partnership with CYBERDYNE in Japan and Germany. In a study to evaluate results in Saudi Arabia, an improvement in function of around 85% was achieved in most patients.

## Hybrid Assistive Limb video

Watch a video of CYBERDYNE HAL:  
<https://youtu.be/mFElev-ChJY>

- Abdul Latif Jameel Health will be showcasing the CYBERDYNE HAL at Arab Health 2023, stand S1.J10 in Sheikh Saeed Hall 1 – where you can experience the HAL first-hand.
- The Abdul Latif Jameel Hospital can be contacted at:  
+966 12 677 0001  
[info@aljhospital.com](mailto:info@aljhospital.com)  
[cyberdyne@aljhealth.com](mailto:cyberdyne@aljhealth.com)



# Introducing Cyberdyne Hybrid Assisted Limb® (HAL®) Our Unique Exoskeleton Therapeutic Device.

In 2017, Abdul Latif Jameel Health partnered with Japanese innovator, Cyberdyne Inc. to bring their breakthrough technology to Saudi Arabia, for the first time, at the Abdul Latif Jameel Hospital, Jeddah.

The Hybrid Assisted Limb®, or HAL®, is a unique exoskeleton therapeutic device used for treatment of patients with physical disabilities caused by spinal cord injuries, traumatic brain injuries, multiple sclerosis and other diseases of the central nervous and neuromuscular systems.

Cyberdyne HAL® is controlled by the wearer's intent to move. Its non-invasive sensors can detect the faint bioelectrical signals that reflect the wearer's intention to move through the surface of their skin, translating these to actual movement in the exoskeleton.

Even for patients who have difficulty moving, this unique system enables patients to perform their desired movements with their own, voluntary, commands.

Cyberdyne HAL® establishes a pathway for signals that reach the muscles to cause a meaningful response through movement. This movement can be felt by the wearer, closing a biological feedback loop with signals important in inducing neuroplasticity, necessary for healthy motor function.

In effect, the Cyberdyne rehabilitation therapy helps the patient's brain and nervous system relearn and recover lost functions.

Cyberdyne HAL® has been successfully used in studies across three Saudi Ministry of Health hospitals with positive results - and is now exclusively available from Abdul Latif Jameel Health.

**Contact us today and discover how Abdul Latif Jameel Health can help your patients' rehabilitation.**



# Technogym Biostrength: the revolution in strength training



The first strength training solution that adapts to you and guarantees 30% superior results in the same amount of time.

The effectiveness of strength training depends on many small, key elements: the correct load, the adequate number of repetitions, the recovery time, the speed of execution of the exercise, the posture, the range of motion. Optimising every single detail and preventing the most common errors is fundamental to making your training effective and achieving better results in less time.

Biostrength, the new Technogym line for strength training, adapts to you, thanks to a patented technology that uses artificial intelligence and scientific research, and ensures you get 30% better results in the same amount of time compared to classic training with equipment or free weights. Biostrength allows you to train with the right load, range of motion, correct posture, speed of execution and even indicates the number of sets, repetitions and optimal recovery times.

The patented Biodrive system, which uses aerospace technology, offers you 6 types of resistance, which can improve the effectiveness of your exercise depending on the goal you want to achieve. You are guided through every aspect of the workout to achieve maximum results in a safe and effective way: Biodrive recognises when you are too tired and the spotter function automatically reduces the load to allow you to complete the set, while, to keep you motivated and encourage you to improve, Biostrength gives you reward badges as you achieve new goals.

Biostrength is a digital and connected experience with an unprecedented variety of training programmes and content.

With a simple log-in to the Technogym Ecosystem, Biostrength equipment allows you to select the workout experience that best suits the results you want to achieve from goal-oriented programmes, to custom programmes or free training.

The 4 target programmes include:

- **HYPERTROPY:** to develop muscle mass. This programme increases the load in the eccentric phase of the movement, while the muscle fibres lengthen, in a way that is functional for developing mass.
- **POWER:** to train like an athlete. The use of a resistance without inertia allows you to train explosive strength and to express maximum force in complete safety.
- **STRONG:** to increase your strength. The viscous resistance that makes the exercise more intense as the speed of execution increases.
- **TONE:** get more muscle tone with less effort. Elastic resistance and a gradual increase in the workload allow you to im-

prove muscle tone constantly throughout the entire range of movement.

If you are a more advanced user and would like to optimise every single exercise in your training programme, the CUSTOM function will offer you various training techniques such as drop sets, pyramids and single set tone express.

If you already know what to do and want to set up your own programme, with the FREE TRAINING mode you can train quickly and easily, without logging in, simply by adjusting your session and selecting the workload and number of repetitions you want.

Biostrength represents a great opportunity for fitness clubs and personal trainers to increase the value of their membership by offering their clients innovative programmes that guarantee the desired results. Thanks to Mywellness, Technogym's professional software platform, they can assign each user a tailor-made programme optimised to individual goals; with a simple log-in the user will be fully guided by Biostrength in the optimal execution of the exercise. **MEH**

## Technogym

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# Interprofessional collaboration leads to significant and sustained reduction in hospital-onset *C. difficile* infections



Structure of *Clostridium difficile* glucosyl transferase Toxin B. *C. diff* toxin B is a cytotoxin produced by the bacteria *Clostridioides difficile*. It is one of two major kinds of toxins produced by *C. difficile*, the other being an related enterotoxin (Toxin A). Both are very potent and lethal.

A new study <<https://doi.org/10.1016/j.ajic.2022.02.017>> published May 12, 2022 in the *American Journal of Infection Control* (AJIC), suggests that healthcare facilities can significantly reduce the incidence of hospital-onset *Clostridioides difficile* infection (HO-CDI) by establishing interprofessional teams to implement selected, evidence-based infection-prevention interventions.

“Our project showed that interprofessional collaboration and continuous improvement can profoundly impact HO-CDI incidence, and sustain reductions over years,” said Cherith Walter, MSN, RN, Emory St. Joseph’s Hospital, and first author on the study. “We hope our findings will help other healthcare teams struggling with this incredibly challenging healthcare-associated infection to improve patient safety and reduce associated costs.”

According to the US Centers for Disease Control and Prevention, an estimated 500,000 cases of CDI occur in the United States annually, making it one of the most prevalent healthcare-associated infections (HAI) in the country. Due to the cost of caring for patients with HO-CDI, as well as financial penalties levied under the Centers for Medicare and Medicaid Services’ (CMS) hospital-acquired condition reduction programme, these infections have increased the financial burden on the healthcare system.

## Collaborative interventions

To address the HO-CDI incidence at their 410-bed community hospital, which was consistently above the national CMS benchmark, Walter and colleagues created an interprofessional team comprising a clinical nurse specialist, a physician

champion, a hospital epidemiologist, an infection preventionist, a clinical microbiologist, unit nurse champions, an antimicrobial stewardship pharmacist, and an environmental services representative. The team reviewed HO-CDI events at their facility between 2014 and 2016 to determine causative factors, and then identified appropriate, evidence-based infection prevention interventions. The selected interventions comprised diagnostic stewardship, including the development of a Diarrhoea Decision Tree (DDT) testing algorithm with a nurse-driven ordering protocol; enhanced environmental cleaning; antimicrobial stewardship, including a system-wide Electronic Medical Record intervention to reduce fluoroquinolone use; and education and accountability, the latter of which focused on encouraging compliance with the DDT algorithm.

After the first year, the project leads recorded a 63% decrease in HO-CDIs as compared to the two years prior (4.72 per 10,000 patient days vs. 12 per 10,000 patient days). This number improved further to 2.8 per 10,000 days three years after implementation of the selected interventions (a 77% decrease from baseline). The team also saw a decrease in their facility’s standardized HO-CDI infection ratio (the total number of infections divided by the National Health Safety Network’s risk-adjusted predicted number of infections), from 1.11 in 2015 to 0.43 in 2020 – significantly lower than the national benchmark.

Interventions also improved CDI testing practices, increasing testing for appropriate patients within the first three days of hospital admission from 54% in 2014 to 81.1% in

These study findings are exciting, because they suggest that professional collaboration to consistently apply known, evidence-based practices can significantly reduce the incidence of HO-CDI, an intractable and costly HAI

late 2019, to support prompt treatment of infected patients. This practice also helped identify and differentiate cases of community-acquired CDI (CA-CDI) from HO-CDI, reducing the financial impact of HO-CDIs on the facility after 2016. Finally, by empowering nurses to hold providers accountable for judicious test ordering and creating a system of ‘accountability notices’ alerting nurses and providers to DDT algorithm deviations, the team successfully increased compliance with the algorithm, from 50% in mid-2018 to 80% in mid-2020.

“These study findings are exciting, because they suggest that professional collaboration to consistently apply known, evidence-based practices can significantly reduce the incidence of HO-CDI, an intractable and costly HAI,” said Linda Dickey, RN, MPH, CIC, FAPIC, and 2022 APIC president. “They are also the first findings demonstrating the impact of education and accountability interventions in reducing HO-CDI incidence and improving compliance with standards of practice.”



# WHO launches first global report on infection prevention and control

The COVID-19 pandemic and other recent large disease outbreaks have highlighted the extent to which health care settings can contribute to the spread of infections, harming patients, health workers and visitors, if insufficient attention is paid to infection prevention and control (IPC). But a new report from the World Health Organization (WHO) shows that where good hand hygiene and other cost-effective practices are followed, 70% of those infections can be prevented.

Today, out of every 100 patients in acute-care hospitals, seven patients in high-income countries and 15 patients in low- and middle-income countries will acquire at least one healthcare-associated infection (HAI) during their hospital stay. On average, 1 in every 10 affected patients will die from their HAI.

People in intensive care and newborns are particularly at risk. And the report reveals that approximately one in four hospital-treated sepsis cases and almost half of all cases of sepsis with organ dysfunction treated in adult intensive-care units are health care-associated.

WHO's first ever Global Report on Infection Prevention and Control brings together evidence from scientific literature and various reports, and new data from WHO studies.

"The COVID-19 pandemic has exposed many challenges and gaps in IPC in all regions and countries, including those which had the most advanced IPC programmes," said Dr Tedros Adhanom Ghebreyesus, WHO Director General. "It has also provided an unprecedented opportunity to take stock of the situation and rapidly scale up outbreak readiness and response through IPC practices, as well as strengthening IPC programmes across the health

system. Our challenge now is to ensure that all countries are able to allocate the human resources, supplies and infrastructures this requires."

## Infection prevention and control programmes

The new WHO report provides the first-ever global situation analysis of how IPC programmes are being implemented in countries around the world, including regional and country focuses. While highlighting the harm to patients and healthcare workers caused by HAIs and antimicrobial resistance, the report also addresses the impact and cost-effectiveness of infection prevention and control programmes and the strategies and resources available to countries to improve them.


The impact of healthcare associated infections and antimicrobial resistance on people's lives is incalculable. Over 24% of patients affected by healthcare-associated sepsis and 52.3% of those patients treated in an intensive care unit die each year. Deaths are increased two to threefold when infections are resistant to antimicrobials.

In the last five years, WHO has conducted global surveys and country joint evaluations to assess the implementation status of national IPC programmes. Comparing data from the 2017–18 and the 2021–22 surveys, the percentage of countries having a national IPC programme did not improve; furthermore in 2021–22 only four out of 106 assessed countries (3.8%) had all minimum requirements for IPC in place at the national level. This is reflected in inadequate implementation of IPC practices at the point of care, with only 15.2% of health care facilities meeting all of the IPC minimum requirements, according to a WHO survey in 2019.

However, encouraging progress has been made in some areas, with a significant increase being seen in the percentage of countries having an appointed IPC focal point, a dedicated budget for IPC and curriculum for front-line health care workers' training; developing national IPC guidelines and a national programme or plan for HAI surveillance; using multimodal strategies for IPC interventions; and establishing hand hygiene compliance as a key national indicator.

Many countries are demonstrating strong engagement and progress in scaling-up actions to put in place minimum requirements and core components of IPC programmes. Progress is being strongly supported by WHO and other key players. Sustaining and further expanding this progress in the long-term is a critical need that requires urgent attention and investments.

The report reveals that high-income countries are more likely to be progressing their IPC work, and are eight times more likely to have a more advanced IPC implementation status than low-income countries. Indeed, little improvement was seen between 2018 and 2021 in the implementation of IPC national programmes in low-income countries, despite increased attention being paid generally to IPC due to the COVID-19 pandemic. WHO will continue to support countries to ensure IPC programmes can be improved in every region.

WHO is calling on all countries around the globe to increase their investment in IPC programmes to ensure quality of care and patient and health workers' safety. This will not only protect their populations, increased investment in IPC has also demonstrated to improve health outcomes and reduce health-care costs and out-of-pocket expenses. 



Download the WHO global report on infection prevention and control  
<https://bit.ly/3Qikfa8>

## New study finds aerosolized hydrogen peroxide can significantly reduce *C. difficile* infections in hospital settings

New data published online in the *American Journal of Infection Control* (AJIC) on March 17, 2022 < <https://doi.org/10.1016/j.ajic.2021.11.021> > suggest that adding aerosolized hydrogen peroxide (aHP) to hospital infection prevention protocols can effectively reduce *Clostridioides difficile* infections (CDI), one of the most common healthcare-associated infections (HAIs), among patients in large, acute-care facilities. The findings offer the first, long-term evaluation of an aHP disinfection system for reducing CDI in a clinical setting.

“Our study showed that persistence in utilizing an aerosolized hydrogen peroxide system had a significant impact on reducing *C. difficile* infections hospital-wide,” said Christopher L. Truitt, Ph.D., Wayland Baptist University, and the paper’s lead author.

*C. diff* spores can be transmitted by environmental surfaces in hospital rooms, including bed handrails, equipment controls, and doorknobs, and are resistant to hand sanitizers and most disinfectants. Enhanced protocols for hand hygiene and environmental cleaning, along with improved antibiotic prescribing, are required to prevent

*C. diff* spread and infection, but even with consistent implementation of these measures, the microbe is difficult to eradicate from hospital surfaces.


aHP disinfection systems offer a touchless, whole-room approach to enhance standard environmental cleaning protocols. Once placed in a room, the systems generate an aerosolized dry-mist fog that contains a specified percentage of hydrogen peroxide. The fog covers all exposed surfaces to kill any *C. diff* spores that remain after physical cleaning. To date, there is no long-term data evaluating the use of these systems.

Dr Truitt and his colleagues retrospectively analyzed CDI rates at a large, acute-care facility in Philadelphia, Pennsylvania, over a 10-year period, to evaluate the effectiveness of an aHP disinfection system for reducing CDI. The researchers compared the incidence of healthcare-associated CDI (HA-CDI) at the facility prior to and following implementation of the system as an addition to standard CDI patient room-cleaning procedures following the discharge or transfer of patients with CDI.

### Consistent use of an aHP disinfection system

Findings suggest that consistent use of an aHP disinfection system contributed to a significant and sustained reduction in HA-CDI rates. Over a 27-month period prior to implementation of the system, the facility recorded 120 HA-CDI. Following implementation, 72 cases were observed over a 33-month interval. This reflects a sig-

nificant, 41% decrease in the facility’s HA-CDI rate – from 4.6 per 10,000 patient days to 2.7 per 10,000 patient days ( $p < 0.001$ ).

Over an additional five-year period during which the aHP system was consistently utilized along with an environmental cleaning programme and other measures including antibiotic stewardship, researchers observed a 74% reduction in hospital-onset CDI. 

### New copper coating formulation could be next superbug fighter

A new copper coating that kills bacteria quicker and in greater amounts than current formulations could soon be available for hospitals and other high-traffic facilities.

Although current formulations made of pure copper are antibacterial and self-sanitizing, they kill certain types of bacteria with a thicker cell wall (Gram-positive bacteria) more slowly than bacteria with a thinner cell wall (Gram-negative).

A team of UBC researchers led by Dr Amanda Clifford, an assistant professor in the department of materials engineering, have designed a nano-copper coating that includes bacteria-killing nanoscale features and zinc. The nanoscale features are tiny bumps that can kill bacteria by rupturing their cell wall. Zinc, which is also antibacterial, selectively oxidizes in the presence of copper and helps kill bacteria more quickly compared to pure copper alone.

“Use of our coating could significantly reduce the incidence of contracting bacterial infections from high-touch surfaces in healthcare facilities, such as doorknobs and elevator buttons, since it kills bacteria using multiple approaches,” says Dr Clifford. “As it contains less copper than other existing coatings or whole copper parts, it would also be cheaper to make.”

The team found that the material took



just one hour to kill 99.7 per cent of *Staphylococcus aureus* – a Gram-positive pathogen commonly responsible for hospital-acquired infections – compared with two hours for pure copper.

“Not only does this coating kill pathogens faster than pure copper, it helps ensure antibiotics remain effective,” says Dr Clifford. “By using this new formulation, we’re killing pathogens before patients become infected and need to use antibiotics against them, slowing the rise of antibiotic resistance.”

The researchers have filed a provisional patent for the coating and fabrication process, which is described in a new paper in *Advanced Materials Interfaces* < <https://doi.org/10.1002/admi.202201009> >.

“This is currently targeted for hospitals and healthcare settings because these locations are where the antibiotic-resistant pathogens, such as methicillin-resistant *Staphylococcus aureus* (MRSA), are an issue. We also don’t want to be at a place where we can’t use antibiotics,” says Dr Clifford.

The team plans to further evaluate the material against other pathogens, such as viruses, with hopes to eventually commercialize their work.

# Infection control – helping to reduce the risk of cross contamination

Intersurgical offer a range of respiratory products that may be used to help reduce the risk of cross contamination between patients and health care workers in the clinical environment.

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- Visit [www.intersurgical.com/info/InfectionControl](http://www.intersurgical.com/info/InfectionControl) for further information.

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# Scientists show they can detect Alzheimer's 17 years ahead of symptoms

The dementia disorder Alzheimer's disease has a symptom-free course of 15 to 20 years before the first clinical symptoms emerge. Using an immuno-infrared sensor developed in Bochum, a research team is able to identify signs of Alzheimer's disease in the blood up to 17 years before the first clinical symptoms appear. The sensor detects the misfolding of the protein biomarker amyloid-beta. As the disease progresses, this misfolding causes characteristic deposits in the brain, so-called plaques.

"Our goal is to determine the risk of developing Alzheimer's dementia at a later stage with a simple blood test even before the toxic plaques can form in the brain, in order to ensure that a therapy can be initiated in time," says Professor Klaus Gerwert, founding director of the Centre for Protein Diagnostics (PRODI) at Ruhr-Universität Bochum. His team cooperated for the study with a group at the German Cancer Research Centre in Heidelberg (DKFZ) headed by Professor Hermann Brenner.

The team published the results obtained with the immuno-infrared sensor in the journal *Alzheimer's & Dementia*, the journal of the Alzheimer's Association on 19 July 2022<sup>[1]</sup>. This study is supported by a comparative study published in the same journal on 2 March 2022, in which the researchers used complementary single-molecule array (SIMOA) technology.

## Early detection of symptom-free people with a high risk of Alzheimer's disease

The researchers analysed blood plasma from participants in the ESTHER study conducted in Saarland for potential Alzheimer's biomarkers. The blood samples had been taken between 2000 and 2002 and then frozen. At that time, the test participants were between 50 and 75 years old and hadn't yet been diagnosed with Alzheimer's disease. For the current study, 68 participants were selected who had been diagnosed with Alzheimer's disease during the 17-year follow-up and compared

with 240 control subjects without such a diagnosis. The team headed by Prof. Gerwert and Prof. Brenner aimed to find out whether signs of Alzheimer's disease could already be found in the blood samples at the beginning of the study.

The immuno-infrared sensor was able to identify the 68 test subjects who later developed Alzheimer's disease with a high degree of test accuracy. For comparison, the researchers examined other biomarkers with the complementary, highly sensitive SIMOA technology – specifically the P-tau181 biomarker, which is currently being proposed as a promising biomarker

candidate in various studies.

"Unlike in the clinical phase, however, this marker is not suitable for the early symptom-free phase of Alzheimer's disease," as Prof. Gerwert summarises the results of the comparative study. "Surprisingly, we found that the concentration of glial fibre protein (GFAP) can indicate the disease up to 17 years before the clinical phase, even though it does so much less precisely than the immuno-infrared sensor."

Still, by combining amyloid-beta misfolding and GFAP concentration, the researchers were able to further increase the accuracy of the test in the symptom-free stage.



Photo by Rad Cynua/Unsplash

## Start-up aims to bring immuno-infrared sensor to market

The Bochum researchers hope that an early diagnosis based on the amyloid-beta misfolding could help to apply Alzheimer's drugs at such an early stage that they have a significantly better effect – for example, the drug Aduhelm, which was recently approved in the USA.

“We plan to use the misfolding test to establish a screening method for older people and determine their risk of developing Alzheimer's dementia,” says Prof. Gerwert. “The vision of our newly founded start-up betaSENSE is that the disease can be stopped in a symptom-free stage before irreversible damage occurs.”

Even though the sensor is still in the development phase, the invention has already been patented worldwide. Beta-SENSE aims to bring the immuno-infrared sensor to market and have it approved as a diagnostic device so that it can be used in clinical labs.

## Clinical trials with Alzheimer's drugs often fail

Approved by the US FDA in spring 2021, the drug Aduhelm has been shown to clear amyloid-beta plaques from the brain. However,

previous studies showed it had only a minor effect on clinical symptoms such as memory loss and disorientation. Consequently, the European Medicines Agency decided in winter 2021 not to approve the drug in Europe.

“Up to now, clinical trials for Alzheimer's drugs have been failing by the dozen, apparently because the established plaque tests used in the trials don't flag up the disease in time,” says Prof. Gerwert. “It seems that once plaques are deposited, they induce irreversible damage in the brain.”

In the tests used to date, the plaques are either detected directly in the brain with the complex and expensive PET scan technology or indirectly determined in a less complex way using protein biomarker concentrations in invasively obtained cerebrospinal fluid with ELISA or mass spectrometry technology. In contrast to established plaque diagnostics, the immuno-infrared sensor indicates the earlier misfolding of amyloid-beta, which causes the later plaque deposition.


“However, it is still controversially discussed whether this misfolding is the cause of Alzheimer's disease or if it's just an accompanying factor,” points out Prof. Gerwert. “For the therapeutic approach, this question is crucial, but it is irrelevant for

the diagnosis. The misfolding indicates the onset of Alzheimer's disease.”

“The exact timing of therapeutic intervention will become even more important in the future,” predicts Léon Beyer, first author and PhD student in Prof. Gerwert's team. “The success of future drug trials will depend on the study participants being correctly characterised and not yet showing irreversible damage at study entry.”

## Biomarkers for Parkinson's and ALS

Misfolded proteins play a central role in many neurodegenerative diseases, such as Parkinson's disease, Huntington's disease and amyotrophic lateral sclerosis (ALS). As the researchers have showed, the immuno-infrared sensor can in principle also be used to detect other misfolded proteins, such as TDP-43, which is characteristic of ALS. They don't measure the concentration of a specific protein, but detect its misfolding using disease-specific antibodies.

“Most importantly, this platform technology enables us to make a differential, precise biomarker-based diagnosis in the early stages of neurodegenerative diseases, in which the currently applied symptom-based diagnosis is very difficult and prone to errors,” says Prof. Gerwert. 

## Reference:

1. Beyer L. et al. Amyloid-beta misfolding and GFAP predict risk of clinical Alzheimer's disease diagnosis within 17 years. *Alzheimers & Dementia*. 19 July 2022. doi: <https://doi.org/10.1002/alz.12745>

# Stress transmitter wakes your brain more than 100 times a night

You wake up. The alarm clock says 02:56.

“Oh no, it is not time to wake up yet,” you think, fearing that you will need lots of coffee to stay awake the following day.

Most people believe that a good night's sleep should be uninterrupted. That is why it can be extremely annoying to wake up in the middle of the night when all you want to do is sleep.

New research <sup>[1]</sup> from the University of Copenhagen shows that the stress transmitter noradrenaline causes you to wake up many times a night. But do not worry. It is all part of a normal, good night's

sleep and can even mean that you have slept well.

## Noradrenaline

Noradrenaline is a stress hormone and transmitter substance, which inter alia is associated with the body's fight or flight response. It is related to adrenaline, and levels may increase during stress, but it also helps people stay focussed.

“You may think that sleep is a constant state that you are in, and then you wake

up. But there is a lot more to sleep than meets the eye. We have learned that noradrenaline causes you to wake up more than 100 times a night. And that is during perfectly normal sleep,” says Assistant Professor Celia Kjærby from the Center for Translational Neuromedicine, who is one of the first authors of the study.

Even though noradrenaline technically causes the brain to wake up more than 100 times a night, we do not think of it as waking up.

“Neurologically, you do wake up, because your brain activity during these very brief moments is the same as when you are

awake. But the moment is so brief that the sleeper will not notice,” explains PhD Student Mie Andersen, who is the second first author of the study.

Even though the researchers have studied mice, their findings can in all probability be translated to humans, because they have focussed on basic biological mechanisms – that is, mechanisms shared by all mammals.

### Noradrenaline affects sleep waves

Professor Maiken Nedergaard, who has led the study, sees the new finding as an important piece of the puzzle to understand what happens in the brain when we sleep.

“We have found the essence for the part of sleep that makes us wake up rested and which enables us to remember what we learned the day before. We have found that the refreshing part of sleep is driven by waves of noradrenaline. The very short awakenings are created by waves of norepinephrine, which are also so important for memory,” says Maiken Nedergaard and adds:

“You could say that the short awakenings reset the brain so that it is ready to store memory when you dive back into sleep.”

We will return to the subject of memory shortly.

#### What the researchers did

Microscopic optical fibres made of glass and genetically manipulated ‘light receptors’ were inserted into the brains of the test mice. The optical fibres were attached to cables, including an LED light source.

Subsequently, the researchers measured the here and now levels of noradrenaline while the animals slept and compared it to the electrical activity in their brains. This was where they spotted the high levels of noradrenaline.

The researchers then conducted memory tests by using the implanted equipment to increase the amplitude of the noradrenaline waves, improving the animals’ memory.

Previous research has suggested that noradrenaline, which is associated with stress, is inactive during sleep. Therefore, the researchers were surprised to see how



active noradrenaline really is during sleep.

The new study shows that when we sleep the level of noradrenaline in the body is constantly increasing and decreasing in a wavelike pattern. High levels of noradrenaline mean that the brain is briefly awake, while low levels of noradrenaline mean that you are asleep. That is, your noradrenaline levels and degree of ‘awakeness’ are connected and constantly changing.

“Approximately 30 seconds pass from one ‘top’ to the next, which means that your noradrenaline levels are constantly changing. At the same time, we could tell that the deeper the ‘valley’, i.e. the better the sleep, the higher the subsequent top, and the higher degree of awakening,” says Mie Andersen.

“This shows that perhaps you do not need worry if you wake up at night. Of course, it is not good to be sleepless for extended periods, but our study suggests that short-term awakenings are a natural part of sleep phases related to memory. It may even mean that you have slept really well,” Celia Kjørby adds.

### The mice developed ‘super memory’

It is a well-known fact that sleep is good for us – in a number of ways. It removes waste products, prevents Alzheimer’s and improves our memory.

The latter was also a focus in this study, and the findings suggest that the mice with the highest number of deep noradrenaline valleys were also the ones with the best memory.

“The mice developed ‘super memory’. They had less trouble remembering things they had learned the previous day. Of course, this suggests that the noradrenaline dynamic strengthens the sleep processes which affect our memory,” says Celia Kjørby.

First, the mice were allowed to sniff at two identical objects. They were then put to sleep, and once awake they were returned to the objects. However, one of the two objects had now been replaced by a new one. The mice who had seen the highest number of noradrenaline valleys were more inclined to study the new object, which suggests that they remembered having seen a different object last time.

### New perspectives on the use of noradrenaline in antidepressants

Besides increasing our knowledge of the engine room of sleep, the new study provides food for thought when it comes to antidepressants.

“Some forms of antidepressants increase the level of noradrenaline in the body, which increases the risk that you will see fewer deep sleep valleys. Our study shows that this is likely to affect your memory,” Celia Kjørby says and adds:

“That is why we need to focus attention on how different types of medication regulating the level of noradrenaline in the body affect our sleep. In the future, we should seek to develop drugs that do not affect the noradrenaline waves during sleep.”

#### Reference

1. Kjaerby, C., Andersen, M., Hauglund, N. et al. Memory-enhancing properties of sleep depend on the oscillatory amplitude of norepinephrine. *Nature Neuroscience* (2022). <https://doi.org/10.1038/s41593-022-01102-9>



# المستشفى رقم 1 في الولايات المتحدة.

احتلت مايو كلينك المرتبة الأولى بين مستشفيات الولايات المتحدة للسنة السابعة على التوالي حسب تصنيف "أفضل المستشفيات" الصادر عن U.S. News & World Report للدورة 2022-2023. يتظافر خبراؤنا الدوليون من جميع التخصصات الطبية لتقديم أفضل مستويات الرعاية لجميع المرضى، وبما يلبي جميع احتياجاتهم الصحية. مايو كلينك هي الوجهة الدولية الأولى للحالات الخطيرة والمعقدة وللمرضى الباحثين عن الإجابات الشافية والأمل والخيارات العلاجية المتعددة.

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# American University of Beirut Medical Center uses UpToDate to enhance patient care during the pandemic and disasters

American University of Beirut Medical Center (AUBMC) began 145 years ago in a small, rented building in Beirut. Over the years, milestones include the founding of the School of Nursing, the first of its kind in the Middle East, and the addition of a state-of-the-art medical centre with five Centres of Excellence, an elaborate outpatient facility, an emergency department, research laboratories, classrooms, and offices for academic staff.

Frontline caregivers across the world were challenged by the unprecedented demands of COVID-19. On top of those stresses, clinicians at AUBMC faced additional catastrophic events – a devastating explosion and a severe economic downturn — while still managing the unrelenting tide of the pandemic.

When it came to the COVID-19 pandemic, the major issue was needing to be updated about the latest evidence or the latest news.

“Even attending physicians and the biggest experts in such diseases needed to update data on a daily basis, because it is a dynamic field and things were changing quickly with no clear-cut answers,” explains Dr Firas Kreidieh, a Clinical Fellow in Hematology and Oncology, Department of Internal Medicine at AUBMC. The ‘UpToDate’ evidence-based clinical decision support solution from Wolters Kluwer played a large role in providing the latest evidence and answers to their questions.

With UpToDate, his team was able to practice evidence-based medicine efficiently and deliver the best patient care under normal and crisis situations. Care teams at AUBMC rose to the challenge,

effectively caring for a massive influx of patients during the pandemic, local disaster, and an economic crisis.

## Evidence impacting education

Dr Kreidieh’s history with UpToDate dates back to his third year in medical school when he began clinical experience.

“At that time, my major use of UpToDate was for disease background and medication information,” he recalls. “It’s on the wards when you start getting these clinical questions and when you really appreciate the importance of UpToDate to find the answers.”

Dr Kreidieh has served as Medical Chief Resident at the Internal Medicine Department at AUBMC, which started using UpToDate at the medical centre in 2007.

“UpToDate helps our residents and interns by synthesizing the evidence and providing them with what they need to know about a certain topic, enhancing clinical and research skills and increasing efficiency that’s reflected back positively in quality patient care,” he explains.

## Speed to answers in a crisis

Dr Kreidieh, along with Dr Ali Taher, AUBMC Vice Dean and a Professor of

Medicine at the Division of Hematology & Oncology – who also serves as Vice-Chair for Research at the Department of Internal Medicine and the Director of the Naef K. Basile Cancer Institute – couldn’t have anticipated how the AUBMC team would be tested in the year 2020.

UpToDate proved a worthy partner during the COVID-19 pandemic, Dr Kreidieh says. “Given that it is continually updated and available in one reference, UpToDate is and was extremely helpful,” he explains. “For example, a resident or intern who was on night duty and had lots of critical patients on the COVID unit to take care of, they could access UpToDate to get a fast, current, concise answer to a question. I strongly believe that UpToDate has enhanced our efficiency on the wards. Efficiency is an asset to promoting quality patient care, particularly in situations where time saves lives.”

Dr Taher adds: “UpToDate has revolutionized our workflow on the wards and enhanced our ability to further promote patient quality care, particularly during the COVID pandemic.”

While in the midst of the pandemic, the AUBMC team suddenly experienced a massive influx of trauma patients when the



Beirut port exploded on August 4, 2020, injuring more than 6,000 people.

“I was in the infusion unit and felt the ground move, so I thought it was an earthquake,” Dr Kreidieh recalls. “Then there was a second very loud sound and so much smoke that I thought something happened within the AUBMC campus.”

The medical centre activated Code D, the disaster code, which Dr Kreidieh explains is seldom activated at the hospital unless a major catastrophe occurs. “A message is sent to all house staff that we really need help, and everybody, even those at home came into the hospital,” Dr Kreidieh says.

Dr Kreidieh was impressed and inspired to see his hospital pull together. “It was really an inspirational scene seeing all the medical teams, including surgery, oncology, internal medicine — all departments were really one hand. And I will never forget that night.”

#### Direct access to evidence at critical moments

UpToDate can be integrated with a health system’s electronic medical record (EMR) for direct access to clinical decision support without interrupting workflow. AUBMC has UpToDate links conveniently in its

Epic EMR system, Dr Kreidieh explains, “so you can simply click on the link for UpToDate and access any data you would like right from the EMR.”

“The major use of UpToDate on the night of the explosion was searching drugs, antibiotics, and botulinum toxin,” says Dr Kreidieh. “The injuries were major, particularly in terms of blast injuries, so there were several antimicrobials that we needed to start patients on.”


Patients who were injured by flying glass from the explosion often required a botulinum injection. But, Dr Kreidieh explains, if the patient had already received a prior injection and/or had an infection, there are specific guidelines to be followed.

“UpToDate directly provides the guidelines, the table, and the algorithm for that. Not having to search the literature for those answers really saved time and helped us increase our efficiency when dealing with lots of patients and a shortage of house staff,” Dr Kreidieh says.

Dr Taher says: “UpToDate provides concise summary of topics relevant to us in medicine and can guide us to look at the references. It saves a lot of time. AUBMC has recently provided access to UpToDate even when outside the AUB campus.”

UpToDate has revolutionized our workflow on the wards and enhanced our ability to further promote patient quality care, particularly during the COVID pandemic.

Dr Kreidieh adds: “Thanks to UpToDate, our efficiency on the wards has increased markedly. When you actually have no time to search for answers to a certain question is when UpToDate really proves its value.”

Dr Taher concludes: “UpToDate has revolutionized our workflow on the wards and enhanced our ability to further promote patient quality care, particularly during the COVID pandemic and the blast crisis.” 

# A framework for achieving your smart, connected hospital vision



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

Hospital IT leaders have made massive investments over the last 20 years on digital technologies. They've built an electronic health record infrastructure. They've deployed digital technologies like wireless nurse call, digital radiology, and more.

And yet, too often, they've received too little value in return when these digital technologies are not connected and integrated within the clinical ecosystem.

To realize optimal value from digital data sources, a hospital needs to be "smart". In other words, digital technologies need to be integrated within the clinical ecosystem through an intelligent clinical communication and collaboration (CC&C) platform.

A smart hospital is one that leverages data from connected systems in near-real time. This is what enables nurses and physicians to rapidly derive insight and value from data sources so they can recognize and respond optimally to patient issues and provide better care.

In contrast, siloed technologies create workflow complexity for frontline care teams,

who must focus more on dealing with the tools than on the work of patient care. Fragmented clinical communication and workflows have become untenable in the face of staffing shortages. And if the problem remains unchecked, complications will negatively affect patient safety and outcomes.

## Smart, connected hospital framework

We developed a smart, connected hospital framework to help IT leaders visualize how to make the most of investments in their EHR infrastructure and clinical and operational systems – while improving the care team experience, patient safety and other outcomes. The framework illustrates how different types of interoperability work together in the clinical ecosystem starting with interconnected data sources and feeding upward into the end-user experience.

By connecting digital technologies within the clinical ecosystem and enabling deep interoperability, IT leaders can:

- Unify healthcare teams and the entire enterprise, tying together the clinical and administrative IT systems that are sources of data, information and knowledge.
- Align IT initiatives with a predetermined, well-constructed plan rather than managing clinical communication systems that grow organically without strategic governance or direction.
- Create a better work environment and experience for nurses, doctors and the extended care team – enabling a better experience for patients and families.

## Deep interoperability and continuous process improvement

The smart, connected hospital frame-

work consists of four layers which enable deep interoperability and continuous process improvement:

1. Input layer features data interoperability between clinical and operational systems such as the electronic health record, patient monitoring equipment, connected beds and medical devices. Data interoperability creates the foundation for connectedness.

2. Aggregation and intelligent processing layer includes intelligent middleware that enables routing, escalation and prioritization of clinical communications and alarm notifications at scale, delivered with associated context about the patient, event and care team.

3. Experience layer, where workflow interoperability enables people to receive information from multiple systems that has been aggregated and intelligently processed. End-user clinical communication devices reside at this layer and have bearing on how smart a hospital can be.

4. Analytics layer, where IT leaders measure clinical and economic outcomes and gauge the value they're receiving from digital technology investments. For example, measure the average time to acceptance for bed exit alarms and set goals to drive down average response time. Continuous process improvement is a cornerstone in the development of a smart institution. **MEH**

## Whitepaper: Smart, connected hospital framework

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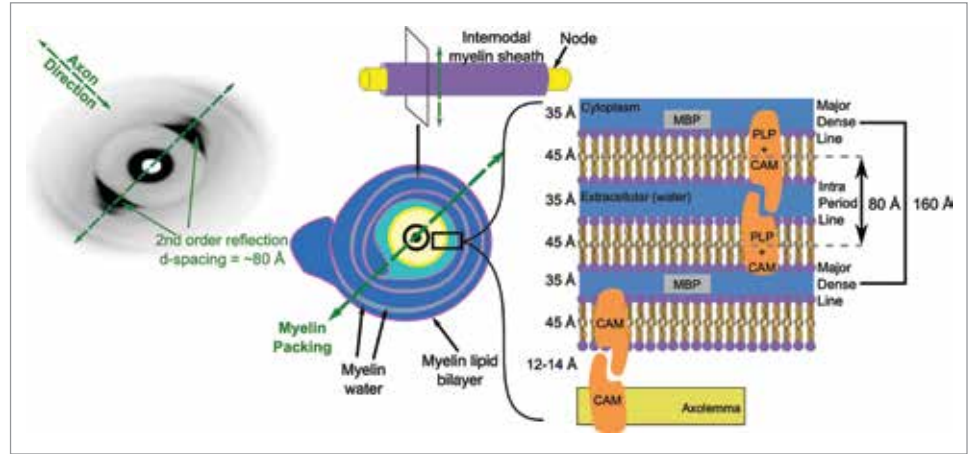


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The myelin sheath (middle) wraps around nerves, protecting them and enabling signals to travel through the brain. A cross section of these layers is shown on the right. With traumatic brain injuries, myelin sheath collapses, which can be tracked with synchrotron X-ray diffraction (left).

## Synchrotron X-ray diffraction captures ‘invisible’ traumatic brain injuries

Traumatic brain injuries (TBIs) are usually diagnosed with MRI and computed tomography scans, but these techniques often miss more mild damage. Such “invisible” TBIs can result in severe loss of function and diminished quality of life, motivating researchers to find new techniques to identify the subtle trauma.

Rama Madhurapantula, of the Illinois Institute of Technology, described how synchrotron X-ray diffraction can aid in diagnosing invisible TBIs in their presentation, “X-ray fibre diffraction to elucidate tissue transition and changes to molecular packing in relation damage,” at the American Crystallographic Association’s 72nd annual meeting in July.

Myelin sheath is a protective insulation around nerves that enables the transmission of signals in the brain. TBIs can cre-

ate irreversible damage to the structure and packing of myelin because of stretching, compression, or, in the case of concussions, vigorous shaking.

Characterizing the changes to myelin at a molecular level is essential for understanding the fundamentals of TBIs and looking at such small scales will also catch mild to moderate cases. While traditional imaging methods work on the micron scale, Madhurapantula’s team showed synchrotron X-ray diffraction can capture much smaller changes on the nanometre to angstrom scale in situ.

“Simply put, visible or invisible TBIs are determined by the ability of an instrument to visualize the damage,” said Madhurapantula. “It takes significantly lower force levels than we previously assumed to cause permanent damage to myelin. These changes are on the order of 5-50 nanometres and are undetected by medical imaging techniques.”

The X-rays used are about 70,000 times more intense than those used for a chest X-ray and are focused into a very small area to generate a high intensity beam. As the beam hits a sample, the position and intensity of the diffracted rays are captured as a pattern on a photographic plate. This information helps determine material and mechanical characteristics of neurological tissues.

The synchrotron X-ray diffraction methodology described in the talk requires minimal sample preparation and can scan large sections of material. The method could be extended to work on other tissues or tissue transitions, where one type of tissue meets and blends with another.

“We can track changes over these transition regions, which are often diffuse and can span a few millimetres,” said Madhurapantula. “For instance, we were able to develop a high-resolution model of the muscle to tendon transition in skeletal muscles and heart valve assemblies.”

## Spinal fractures in the elderly are preventable with simple X-rays

Among older people, vertebral compression fractures are very common, and those with such fractures are at high risk of incurring new ones. Findings in a new thesis from the University of Gothenburg indicate that a simple X-ray method could be introduced as a routine procedure. More elderly patients can then be diagnosed and given the most efficacious drugs. *Middle East Health* reports.

Vertebral compression means that the spine is compressed, causing a fracture in one of the vertebrae. Vertebral compression fractures (VCFs) occur easily in people with osteoporosis, and affect older women in particular.

The thesis confirms previous research showing that 25% of older women between 75 and 80 have VCFs. However, the majority are unaware that these are causing their back pain – only one in three is diagnosed. Based on population statistics



Photo: Peter Johansson

Lisa Johansson, doctoral student at Sahlgrenska Academy, University of Gothenburg.

from Statistics Sweden (SCB), there are at least 40,000 older women in Sweden who do not know they have VCFs.

Although this research is based on the

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Swedish population, the findings and recommendations are applicable to other countries and healthcare systems.

### Diagnostic imaging required

Vertebral compressions do not necessarily result in distinct symptoms. Imaging is needed to detect these spinal fractures. If more people were diagnosed, many fractures, much suffering and heavy costs could be avoided.

“People who have had a vertebral compression fracture have more than twice the risk of getting a new one, which means they belong in the high-risk group. So they should be considered for the most efficacious drugs that not only stop bones from collapsing, but also build them up,” says Lisa Johansson, doctoral student at Sahlgrenska Academy, University of Gothen-

burg, who authored the thesis.

When elderly patients have suffered fractures, their hip and lumbar spine bone density is examined with the dual-energy X-ray absorptiometry (DXA) method, to find out if they need treatment for osteoporosis. DXA can then also be used to get a side view of the chest and lumbar spine, with a method called vertebral fracture assessment (VFA), in which the height of the vertebrae is analyzed.

### Routine procedure

The thesis shows that VFA is of great clinical benefit, and the results suggest that the method should be introduced as a routine procedure in health care.

“The VFA method provides a very low radiation dose, and it’s fast, cheap, simple,

and effective in finding vertebral compressions. It’s a valuable method for diagnosing relevant compressions, and significantly improves fracture risk assessment in older women,” Johansson says.

The thesis is based on the SUPERB (Sahlgrenska University Hospital Prospective Evaluation of Risk of Bone Fractures) population study, which included 3,028 women in Gothenburg, between 75 and 80 years old. The study shows that the women with VCFs had lower hip bone density to a greater extent, and their physical functional capacity and health was poorer. The women who had an identifiable vertebral compression, even if it was classed as mild, had a markedly increased fracture risk entirely independent from other risk factors and bone density. **MSH**

## Siemens Healthineers launches new mobile X-ray system Mobilett Impact

Siemens Healthineers has launched Mobilett Impact, its newest mobile X-ray system, at this year’s European Congress of Radiology (ECR) in Vienna. The system combines all the benefits of a mobile X-ray system for imaging at the patient’s bedside with full digital integration and an economical price: With Mobilett Impact, not just the imaging itself but the entire imaging workflow can be performed right at the patient’s bedside.

“Mobile x-ray is key for when the patient is not able to leave the bed, or to be transported to the radiology department. The most prevalent use case is lung assessment in the ICU, where the physician needs to constantly monitor the condition of the patient to make relevant decisions for the patient’s therapy,” says Verena Schön, Head of X-ray Products at Siemens Healthineers.

Mobilett Impact is fully integrated in the hospital system and all imaging data is transmitted wirelessly. This results in an uninterrupted workflow ex-



perience with optimized dose application for high quality images, supported by an intuitive user interface that reduces the required training for technicians to a minimum. Proven imaging presets and quick image flavour adjustments further support consistent results.

“We design all of our mobile systems for optimal radiation dose and to tackle today’s biggest challenges in the healthcare environment, such as growing workloads, rapid staff turnover and cost pressures,” says Schön. “Mobilett Impact is the next logical step in this journey.” **MSH**



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