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July - August 2023

Paediatrics

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- Brain tumour data platform advances research
- Researchers build newborn seizure prediction model

Crisis in Lebanon

Hospitals collaborate to provide care in face of severe economic adversity

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- Royal College of Physicians of Ireland opens examination centre in Bahrain
- WHO launches global network to detect and prevent infectious disease threats

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Developments in cerebral palsy

In our focus on Paediatrics in this issue of *Middle East Health*, we look at some of the latest developments in cerebral palsy as featured in a special issue of the *Journal of Pediatric Rehabilitation Medicine* which aims to deepen the conversation around one of the most common developmental movement disorders in children.

Cerebral palsy, the most common childhood-onset disability, affects individuals worldwide, and yet, evidence-based clinical practice guidelines for managing this condition have been limited. One of the key challenges in managing CP is the variability in care due to the absence of standardized clinical pathways. Authors of the special issue explore the complexities of managing spasticity and highlight the need for individualized approaches that consider spasticity severity, patient goals, and medication side effects. One article examines the use of baclofen and other medications as treatment options for spasticity management in children, shedding light on alternative approaches and considerations. Another addresses spasticity-related pain (SRP). The authors present a pooled analysis of the efficacy of incobotulinumtoxinA injections in reducing SRP in children and adolescents with CP. Their findings highlight the potential benefits of botulinum neurotoxinA (BoNT-A) for managing SRP, while emphasizing the need for further research in this area.

The authors also explore innovative technologies such as the Quantitative Timed Up and Go wearable sensor, which shows promise in assessing motor performance and functional mobility in children with CP. Additionally, the efficacy of neurodevelopmental therapy in maximizing motor functions and preventing musculoskeletal complications is examined, with a focus on the Cognitive Orientation to daily Occupational Performance approach.

Also in this issue we look at the economic crisis in Lebanon and its effect on the delivery of healthcare with a contributed article from The LAU Medical Centre-Rizk Hospital and an interview with Nassib Nasr, Director General of Hôtel-Dieu de France. The economic and healthcare situation in Lebanon is dire. However, in the face of such adversity hospitals are establishing networks to enhance collaboration in effort to save the Lebanese hospital sector. As the Advisor to the Minister of Health, Dr Pierre Anhoury, puts it: "The difficult situation we are going through is a source of initiatives that would never have seen the light of day just a few years ago."

As in each issue we also report on a range of recent healthcare research breakthroughs which we believe you will find of interest.

Callan Emery
Editor
editor@MiddleEastHealth.com

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Publisher
Michael Hurst
Michael@MiddleEastHealth.com

Editor
Callan Emery
editor@MiddleEastHealth.com

Editorial Consultants
Dr Gamal Hammad, Dr Peter Moore, Harry Brewer

Middle East Editorial Office
PO Box 72280, Dubai, UAE
Telephone: (+9714) 391 4775
editor@MiddleEastHealth.com

Marketing Manager
Foehn Sarkar
Telephone: (+9714) 391 4775 ▮ Fax: (+9714) 391 4888
marketing@MiddleEastHealth.com

Subscription & Admin Manager
Savita Kapoor
Telephone: (+9714) 391 4775 ▮ Fax: (+9714) 391 4888
Savita@MiddleEastHealth.com

Advertising Sales
PO Box 72280, Dubai, UAE
marketing@MiddleEastHealth.com

Americas, France
Joy Sarkar
P O Box 72280, Building No.2
2nd Floor, Dubai Media City
Dubai, United Arab Emirates
Tel: +971 4 391 4775 Fax: +971 4 391 4888
Joy@MiddleEastHealth.com

Japan
Mr Katsuhiro Ishii
Ace Media Service Inc
12-6, 4-chome, Adachi-ku, Tokyo 121-0824, Japan
Tel: +81-3-5691-3335 ▮ Fax:+81-3-5691-3336
Email: *amskatsu@dream.com*

China
Miss Li Ying
Medic Time Development Ltd,
Flat 1907, Tower A, Haisong Building, Tairan 9th Road,
Futian District, Shenzhen, China 518048
Tel: +86-755-239 812 21 ▮ Fax: +86-755-239 812 33
Email: *medic8@medictime.com*

Taiwan
Larry Wang
Olympia Global Co Ltd
7F, No.35, Sec 3, Shenyang Rd, Taichung
Taiwan 40651 ▮ P O Box: 46-283 Taichung Taiwan 40799
Tel: +886- (4)-22429845 ▮ Fax:+886- (4)-23587689
Email: *media.news@msa.hinet.net*

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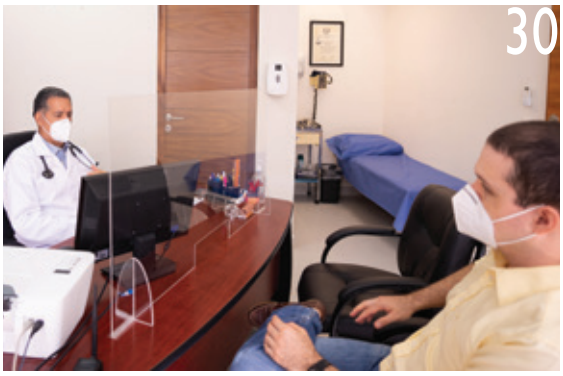

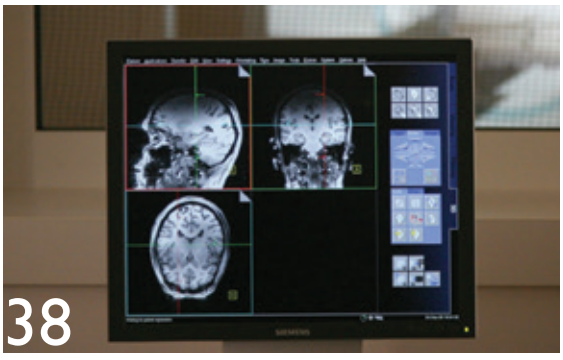

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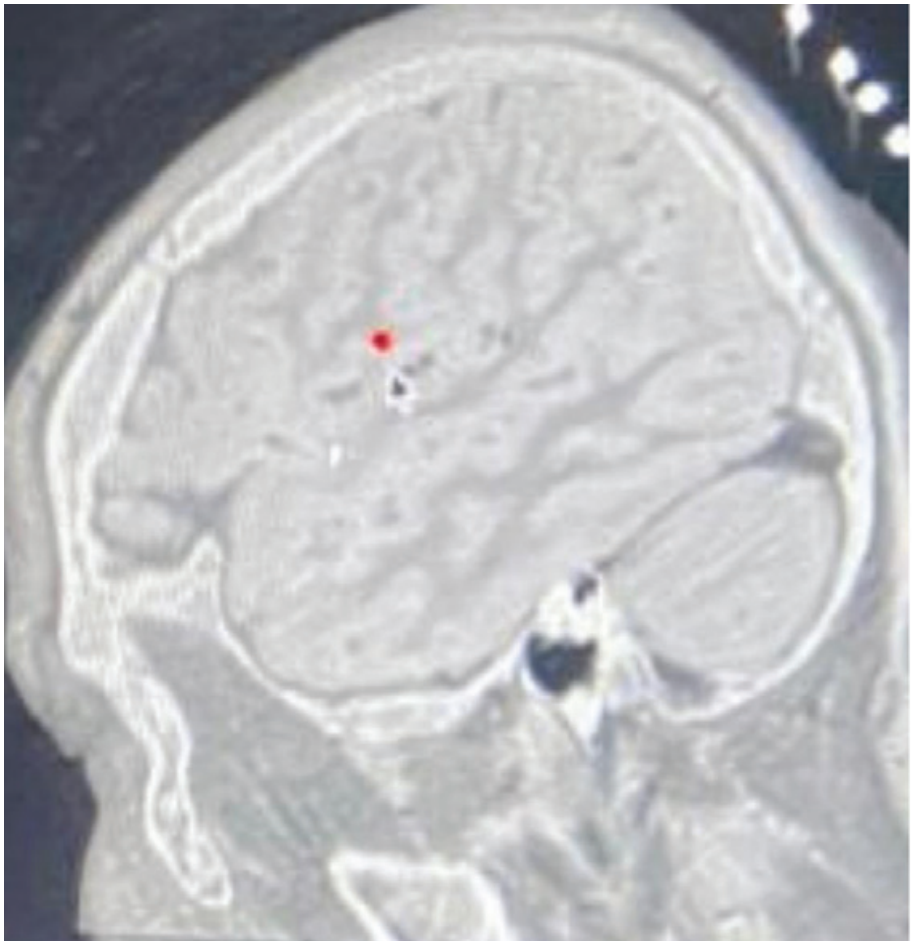
Update from around the region

In Middle East first: KFSH&RC implants brain electrodes in child to detect epileptic foci without surgery



The Neuroscience Center of King Faisal Specialist Hospital and Research Center (KFSH&RC) in Riyadh has implanted, for the first time in the Middle East, brain electrodes in an 11-year-old child without the need for surgery. This groundbreaking non-invasive procedure, utilizing the cutting-edge stereo-electroencephalography (SEEG) technique, was performed on a boy with drug-resistant epilepsy (intractable epilepsy). The goal was locating the epileptic foci in the brain, paving the way for their future removal.

The advanced technique of stereoelectroencephalography utilizes minimally invasive procedures and involves creating tiny 2mm holes in the skull to implant electrical monitoring electrodes directly into the brain. These electrodes enable precise measurement and mapping of electrical activity, allowing specialists to identify the specific regions where epileptic seizures originate.

Dr Ibrahim Althubaiti, a consultant at the Epilepsy Integrated Practice Unit at KFSH&RC, highlighted the distinct challenges of carrying out such a medical procedure on children instead of adults. Unlike adults who can easily comply with instructions, children's movement, Althubaiti explained, can be challenging to control for prolonged periods, posing a greater difficulty in executing the medical procedure. "Nevertheless, the successful implementation of the SEEG technique allowed us to overcome this challenge," he said.

After placing the electrodes, the patient is closely monitored for several days to meticulously identify the origin of the seizure and determine the specific tissues that need to be removed or excised to eliminate epilepsy seizures effectively. This approach ultimately improves a patients' quality of life and that of their families.

Moreover, the technique stands out for its efficiency, cost-effectiveness, and accelerated recovery. The medical procedure takes just 45 minutes, with no more than 48 hours of recovery. Notably, the cost is reduced by 60% compared to the previous procedures, which involved temporarily removing a substantial part of the skull to access the brain for electrode placement. This prior surgical procedure lasted for nine hours and carried the risks of pain, infections, and potential complications from anaesthesia.

The KFSH&RC Neuroscience Center offers top-quality care for adult and paediatric patients suffering from complex and febrile epilepsy. The centre boasts a team of highly skilled doctors and surgeons specializing in epilepsy care, utilizing state-of-the-art diagnostic techniques and surgical interventions. The centre has made a remarkable global achievement by successfully conducting a hemispherectomy on the world's youngest infant, only 14 days old, to treat severe and intractable epilepsy. Before the surgery, the child had experienced complete anaesthesia and unconsciousness. However, thanks to the groundbreaking procedure, the child has fully recovered.

This accomplishment is a testament to KFSH&RC's ongoing commitment to harnessing all available resources and incorporating pioneering technologies to enhance patient outcomes, optimize operational efficiency, and establish itself as the preferred option for specialized healthcare services.

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Dubai's Mediclinic City Hospital one of region's leading organ transplant centres

Dubai's Mediclinic City Hospital's transplant centre, established in 2018, has grown to become one of the leading centres for organ transplants in the region.

Led by Dr Waldo Concepcion, Dr Ramzi Abou Ayache and a team of specialists, the centre has been a pioneer in the field of transplant surgery and has transformed the UAE organ transplant landscape. To date, 37 solid organ transplants, the highest number in Dubai, have been carried out on adults with a 100% graft and patient survival rate.

Dr Concepcion said: "Our vision is for Mediclinic City Hospital to be a beacon of hope for transplant surgeries, not only in Dubai but internationally."

The transplant centre offers patients suffering from end-stage renal disease an alternative to dialysis, which in turn provides them a better quality of life. Both deceased donor and live donor transplants are performed at the transplant centre, offering families the opportunity to explore the option of being a live kidney donor.

Mediclinic City Hospital is focused on patient-centred care. Fatima Rashid Schmit who underwent a kidney transplant at Mediclinic City Hospital in January 2023, felt very assured throughout the process. She said: "The team explained to me the clinical aspect of the surgery, the post op and the recovery. The staff was friendly and compassionate and attentive to my needs."

The transplant centre's multidisciplinary team of experts includes a cardiologist, psychologist and gynaecologist who collaborate with the transplant team to give patients the best quality care available. After the transplant procedure, it continues to support patients with an extensive follow-up and post-transplant care programme.


Dr Waldo Concepcion


Dr Ramzi Abou Ayache

- For more information, visit: *https://www.mediclinic.ae/en/city-hospital/specialized-units/Transplant-Centre.html*

Fakeeh Care Group integrates Wolters Kluwer's UpToDate in YASASII EMR clinical workflow

Wolters Kluwer Health, a global provider of clinical technology and information, software, and services for healthcare professionals, has integrated its UpToDate clinical decision support (CDS) in Fakeeh Technologies' YASASII electronic medical record (EMR) system. Fakeeh Care Group, a leading healthcare network in the Middle East, has now integrated the CDS at three hospitals in Saudi Arabia and the United Arab Emirates.

Dr Ziyad Alharbi, Group Executive Director, Academic and Training Affairs at the Fakeeh Care Group said: "Having easy access to all patient information and medication details through the UpToDate Infobutton with just one click definitely increases efficiency."

Garry Edwards, Clinical Effectiveness Vice President for EMEA at Wolters Kluwer Health, added: "The integration of UpToDate into YASASII will help align medical practice with the best evidence, while improving the clinical workflow and quality of patient care."

Founded in 1978, the Fakeeh Care Group provides comprehensive secondary and tertiary services in Saudi Arabia and the UAE, with an emphasis on preventative healthcare. The integration of UpToDate into the hospitals' EMR supports the Fakeeh Care Group's goal of providing world-class healthcare to its patients. The integration is now in place at three hospitals: the Dr. Soliman Fakeeh Hospitals in Jeddah and Riyadh, and Fakeeh University Hospital in Dubai.

Dr Mazen Fakeeh, President and Chairman of the Board of the Fakeeh Care Group, commented: "The Fakeeh Care Group is more than just a hospital group; it also acts as an academic hospital with undergraduate and postgraduate programmes. The reason we chose UpToDate is to ensure that we have the latest updated clinical information available to our clinicians and students, especially as it is crucial for the quality of education and patient care we provide. As a nationally and internationally accredited organization, we also need to have access to the most current and reliable information to maintain our high standards of care."

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Royal College of Physicians of Ireland opens examination centre in Bahrain

The Royal College of Physicians of Ireland (RCPI) has opened a new clinical examination centre in the Crown Prince Centre for Training and Medical Research, Bahrain. This state-of-the-art facility provides RCPI with an ideal location to conduct its exams and strengthens the partnerships between the Crown Prince Centre for Training and Medical Research, Bahrain and RCPI.

As the RCPI grows its presence in the Middle East, this strategic expansion marks a significant milestone for RCPI as it responds to the ever-increasing demand for highly skilled and trained medical personnel across the Gulf being driven by factors such as ageing populations and the rising prevalence of chronic diseases. Healthcare spending in the GCC is expected to reach $135.5 billion in 2027, increasing by 5.4% per year from 2022, with Bahrain expected to see a CAGR of 6.1%, according to recent research from Alpen Capital.

The newly established examination centre in Bahrain showcases RCPI's commitment to advancing medical education and providing exceptional postgraduate training opportunities for doctors looking to upskill. This aligns with RCPI's strategic objective to be globally active, increasing its presence across the world and growing international membership, collaborating and sharing knowledge and expertise across borders.

Prof. Mary Horgan, President of RCPI, said: "There is an enduring and strengthening bond between Ireland and Bahrain which is reflected in the opening of our new centre. It is a true honour for us to have Bahrainis who have graduated from our esteemed training programmes serve as convenors for these examinations. As an Infectious Diseases Consultant, the pandemic underscored the significance of collaboration among medical professionals and the advantages of tapping into an international network.

"Becoming a member of RCPI offers doctors unparalleled professional development opportunities throughout their medical careers. In addition, RCPI actively collaborates with doctors and healthcare leaders worldwide to enhance the quality and safety of healthcare in ever-evolving healthcare environments."

From left to right: Dr Abdulrahman Almadani, Consultant Pulmonologist, MRCPI Exam Convenor in Bahrain, Prof Mary Horgan, President, Royal College of Physicians of Ireland, Dr Nahed Seddiq, Infectious Diseases Consultant, Member of MRCPI Exam Team in Bahrain, Dr Manal Abduljalil, Consultant Haematologist, MRCPI Exam Convenor in Bahrain.

Brig. (Prof.) Fahad bin Khalifa Al-Khalifa, Commander of the Royal Medical Service of the Bahrain Defence Force said: "We are so excited to host and be the exclusive hub for the MRCPI exam in the Kingdom of Bahrain like we are for the court of examiners of the MRCSI intercollegiate exam. This will elevate our young colleagues practice both locally and regionally and hopefully open up new horizons for more collaboration with the Royal College of Physicians in Ireland."

RCPI's expansion in Bahrain marks a significant milestone in the college's ongoing commitment to enhancing medical education and delivering excellence in healthcare. The examination centre will serve as a hub for aspiring doctors, enabling them to gain valuable skills, knowledge, and recognition within the global medical community.

Doctors who pass the rigorous examinations will be conferred as Members of the Royal College of Physicians of Ireland, joining an esteemed global network of 13,000 RCPI member doctors, gaining recognition for their expertise and improving their employability across the globe.

RCPI started holding examinations in the Gulf Region in 2004 and already has examination centres in Dubai in the UAE, Muscat in Oman and Riyadh in Saudi Arabia.

RCPI has a tremendous presence in the Gulf region, with over 1,200 doctors currently holding membership. Additionally, it has proudly produced 180 graduates from its training programmes in the Gulf region. MEH

The Valens Clinic: Comprehensive mental health and wellness care in Dubai

Situated in Dubai's Business Bay, The Valens Clinic is a distinguished mental health facility committed to providing comprehensive and individualized care. Upholding our core values of Health, Hope, and Harmony, we specialize in various areas including psychiatry, psychology, child and adolescent mental health, metabolic consultation, and dietetics.

Our Core Values: Health, Hope, and Harmony

1. **Health**: At The Valens Clinic, we view health holistically, addressing not only symptoms but the underlying causes of mental health disorders. Our team of specialists works tirelessly to help each patient achieve and maintain optimal mental and physical health.
2. **Hope**: We aim to cultivate hope, supporting our patients throughout their journey to recovery. Our dedicated professionals empower patients by offering them the tools and support needed to manage their mental health effectively.
3. **Harmony:** We strive to create a balanced connection between mind and body. Our multidisciplinary team combines advanced scientific techniques with traditional therapeutic methods, providing balanced and effective treatment strategies.

Our Services

The Valens Clinic offers an array of mental health services, including specialized treatments for ADHD, anxiety, depression, and couples counselling.

We achieve results using evidence based interventions approved in international guidelines. This approach applies to our use of medication when appropriate and psychological therapies such as psychodynamic therapy, CBT, ACT and interpersonal therapies. We also collaborate with other specialist centers in the UAE and abroad to ensure access to the widest range of treatments for our clients.

Our couples counselling services aim to address relationship difficulties, enhance communication, and nurture stronger bonds between partners. Our therapists create a safe space for open dialogue, promoting understanding and mutual growth.

We also provide metabolic consultations and dietetic services, recognizing the critical role of nutrition in mental health. Our experts offer advice on dietary habits and lifestyle modifications to help manage various conditions and enhance overall wellbeing.

Child and Adolescent Mental Health Services

At The Valens Clinic, we understand the importance of early intervention in mental health. Our Child and Adolescent Mental Health department provides specialized services, with experts adept at identifying and managing mental health disorders in younger patients.

Our Medical Director

At the forefront of The Valens Clinic's operations is our esteemed Medical Director, CEO and Co-Founder, Dr. Joseph El Khoury. A highly regarded figure in mental health care, Dr. El Khoury has enriched the clinic with his exceptional expertise and patient-centric vision.

Dr. El Khoury firmly believes in the importance of individualized, evidence-based treatment. He encourages a therapeutic alliance and advocates for the integration of innovative mental health techniques, fostering an environment of continuous learning within the clinic. His commitment to patient care echoes the clinic's core values, positioning The Valens Clinic as a beacon of hope and health for those seeking mental health services. MEH

Dr Joseph El Khoury, Medical Director, CEO and Co-Founder, The Valens Clinic

Contact
The Valens Clinic: 800 Valens (825367)
Email: *Info@thevalensclinic.ae*
Website: *www.thevalensclinic.ae*
Location: One by Omniyat. Suite 3004. Business Bay, Dubai, UAE

worldwide monitor

Update from around the globe

World's first birth after uterus transplantation with robot-assisted surgery

For the first time worldwide, in yet another breakthrough by the world-leading research team at the University of Gothenburg, a child has been born following a uterus transplantation achieved solely by robot-assisted surgery on both donor and recipient.

The baby, a boy measuring 49 cm and weighing 3100 grams, was delivered by planned caesarean section on May 25. The mother is 35 years old, and the donor is a relative.

What distinguishes this case is the surgical method used in the transplantation itself. This time, the donor and recipient alike were operated on entirely by means of robot-assisted laparoscopic surgery with no open-surgery stage.

Robotic surgery is considerably less invasive than traditional open surgery, enabling patients to recover faster.

In the present case, the transplantation was carried out at Sahlgrenska University Hospital in October 2021. In the donor, the uterus was freed one step at a time, supported by robot surgery. The last step involved detaching the uterus from its blood vessels and removing it vaginally in a laparoscopic pouch.

In the recipient, it was then possible to insert the uterus into the woman's pelvis through a small incision; first suture it with the blood vessels; and then suture it to the vagina and supportive tissue. All these steps were assisted by robot surgery.

Ten months later, an embryo created by in vitro fertilization before the transplantation was inserted in the transplanted uterus, and a few weeks later pregnancy was verified. The mother-to-be felt well throughout her pregnancy, which has now concluded with a planned C-section in the 38th week.

Photo: Johan Wingborg

Pernilla Dahm-Kähler, Department of Obstetrics and Gynecology, Institute of Clinical Sciences, Sahlgrenska Academy at the University of Gothenburg.

Pernilla Dahm-Kähler, adjunct professor of obstetrics and gynaecology at Sahlgrenska Academy, University of Gothenburg, is also a gynaecologist and senior consultant doctor at Sahlgrenska University Hospital. As the principal surgeon in the intricate operation on the recipient, she describes the technique: "With robot-assisted keyhole surgery, we can carry out ultra-fine precision surgery. The technique gives very good access to operate deep down into the pelvis. This is the surgery of the future, and we're proud and glad to have been able to develop uterine transplantations to this minimally invasive technical level."

Photo: Johan Wingborg

Niclas Kvarnström, Department of Surgery, Institute of Clinical Sciences, Sahlgrenska Academy at the University of Gothenburg.

Niclas Kvarnström was the transplant surgeon in charge on the research project, and the one who performed the complicated blood-vessel suturing in the recipient.

"With the robot assisted technique, procedures can be done that were previously considered impossible to perform with standard keyhole surgery. It is a privilege to be part of the evolution in this field with the overall goal to minimize the trauma to the patient caused by the surgery," he said.

The transplantation represents a further development of the uterus transplantation surgery that began with open-surgery technique in Sweden in 2012. The work is headed by Mats Brännström, professor of obstetrics and gynaecology at Sahlgrenska Academy, University of Gothenburg, and gynaecologist and senior consultant doctor at the University Hospital. MEH

WHO launches global network to detect and prevent infectious disease threats

WHO and partners are launching a global network to help protect people from infectious disease threats through the power of pathogen genomics. The International Pathogen Surveillance Network (IPSN) will provide a platform to connect countries and regions, improving systems for collecting and analyzing samples, using these data to drive public health decision-making, and sharing that information more broadly.

Pathogen genomics analyzes the genetic code of viruses, bacteria and other disease-causing organisms to understand how infectious they are, how deadly they are, and how they spread. With this information, scientists and public health officials can identify and track diseases to prevent and respond to outbreaks as part of a broader disease surveillance system, and to develop treatments and vaccines.

The IPSN, with a Secretariat hosted by the WHO Hub for Pandemic and Epidemic Intelligence, brings together experts worldwide at the cutting-edge of genomics and data analytics, from governments, philanthropic foundations, multilateral organizations, civil society, academia and the private sector. All share a common goal: to detect and respond to disease threats before they become epidemics and pandemics, and to optimize routine disease surveillance.

Mount Sinai Researchers use new Deep Learning approach to enable analysis of ECG as language

Mount Sinai researchers have developed an innovative artificial intelligence (AI) model for electrocardiogram (ECG) analysis that allows for the interpretation of ECGs as language. This approach can enhance the accuracy and effectiveness of ECG-related diagnoses, especially for cardiac conditions where limited data is available on which to train.

In a study published in the June 6 online issue of *npj Digital Medicine* [1], the team reported that its new deep learning model, known as HeartBEiT, forms a foundation upon which specialized diagnostic models can be created. The team noted that in comparison tests, models created using HeartBEiT surpassed established methods for ECG analysis.

"Our model consistently outperformed convolutional neural networks [CNNs], which are commonly used machine learning algorithms for computer vision tasks. Such CNNs are often pretrained on publicly available images of real-world objects," explained first author Akhil Vaid, MD, Instructor of Data-Driven and Digital Medicine (D3M) at the Icahn School of Medicine at Mount Sinai. "Because *HeartBEiT* is specialized to ECGs, it can perform as well as, if not better than, these methods using a tenth of the data. This makes ECG-based diagnosis considerably more viable, especially for rare conditions which affect fewer patients and therefore have limited data available."

Thanks to their low cost, non-invasiveness, and wide applicability to cardiac disease, more than 100 million electrocardiograms are performed each year in the United States alone. Nonetheless, the ECG's usefulness is limited in scope since physicians cannot consistently identify, with the naked eye, patterns representative of disease, particularly for conditions which do not have established diagnostic criteria or where such patterns may be too subtle or chaotic for human interpretation. Artificial intelligence is now revolutionizing the science, however, with most of the work to date centred on CNNs.

Mount Sinai is taking the field in a bold new direction by building on the intense interest in so-called generative AI systems such as ChatGPT, which are built on transformers – deep learning models that are trained on massive datasets of text to generate human-like responses to prompts from users on almost any topic. Researchers are using a related image-generating model to create discrete representations of small parts of the ECG, enabling analysis of the ECG as language.

"These representations may be considered individual words, and the whole ECG a single document," explained Dr Vaid. "*HeartBEiT* understands the relationships between these representations and uses this understanding to perform downstream diagnostic tasks more effectively. The three tasks we tested the model on were learning if a patient is having a heart attack, if they have a genetic disorder called hypertrophic cardiomyopathy, and how effectively their heart is functioning. In each case, our model performed better than all other tested baselines."

Researchers pretrained *HeartBEiT* on 8.5 million ECGs from 2.1 million patients collected over four decades from four hospitals within the Mount Sinai Health System. Then they tested its performance against standard CNN architectures in the three cardiac diagnostic areas. The study found that *HeartBEiT* had significantly higher performance at lower sample sizes, along with better "explainability".

Senior author Girish Nadkarni, MD, MPH, Irene and Dr Arthur M. Fishberg Professor of Medicine at Icahn Mount Sinai, Director of The Charles Bronfman Institute of Personalized Medicine, and System Chief, Division of Data-Driven and Digital Medicine, Department of Medicine, elaborated: "Neural networks are considered black boxes, but our model was much more specific in highlighting the region of the ECG responsible for a diagnosis, such as a heart attack, which helps clinicians to better understand the underlying pathology. By comparison, the CNN explanations were vague even when they correctly identified a diagnosis."

Indeed, through its sophisticated new modelling architecture, the Mount Sinai team has greatly enhanced the manner and opportunities by which physicians can interact with the ECG. "We want to be clear that artificial intelligence is by no means replacing diagnosis by professionals from ECGs," explained Dr Nadkarni, "but rather augmenting the ability of that medium in an exciting and compelling new way to detect heart problems and monitor the heart's health." MEH

Reference:

1. Vaid, A., Jiang, J., Sawant, A. et al. A foundational vision transformer improves diagnostic performance for electrocardiograms. *npj Digit.* Med. 6, 108 (2023). https://doi.org/10.1038/s41746-023-00840-9

The goal of this new network is ambitious, but it can also play a vital role in health security: to give every country access to pathogen genomic sequencing and analytics as part of its public health system," said Dr Tedros Adhanom Ghebreyesus, WHO Director-General. "As was so clearly demonstrated to us during the COVID-19 pandemic, the world is stronger when it stands together to fight shared health threats."

COVID-19 highlighted the critical role pathogen genomics plays in responding to pandemic threats. Without the rapid sequencing of the SARS-COV-2 genome, vaccines would not have been as effective, or have been made available so quickly. New, more transmissible variants of the virus would not have been as quickly identified. Genomics lies at the heart of effective epidemic and pandemic preparedness and response, as well as part of the ongoing surveillance of a vast range of diseases, from foodborne diseases and influenza to tuberculosis and HIV. Its use in monitoring the spread of HIV drug resistance, for example, has led to antiretroviral regimes that have saved countless lives.

"Global collaboration in pathogen genomic surveillance has been critical as the world fights COVID-19 together," said Dr Rajiv J. Shah, President of The Rockefeller Foundation. "IPSN builds upon this experience by creating a strong platform for partners across sectors and borders to share knowledge, tools, and practices to ensure that pandemic prevention and response is innovative and robust in the future." MEH

the laboratory

Medical research news from around the world

Diminished and irreversible brain response to nutrients observed in people with obesity

After a person eats, the gut dispatches a series of signals to the brain conveying the presence of nutrients, a phenomenon that scientists believe may help regulate eating behaviour. However, in a new study led by Yale's Mireille Serlie, researchers found that while the detection of nutrients in the stomach does induce brain activity changes in lean people, such brain responses are largely diminished in people with obesity.

These differences in brain activity, the researchers say, could help explain why it's difficult for some to lose weight and maintain weight loss.

The findings were published June 12 in *Nature Metabolism* <*https://doi.org/10.1038/s42255-023-00816-9*>.

"We need to find where that point is when the brain starts to lose its capacity to regulate food intake and what determines that switch," said Serlie.

Over 4 million people die each year around the world as a result of being overweight, according to the World Health Organization, and understanding the biological factors that contribute to obesity will be essential for addressing its devastating, global impact, say researchers. And while the ways that the body responds to nutrient intake may be a key factor in eating behaviour, the role of nutrient signalling in humans is not well understood.

For the new study, researchers infused glucose or fat directly into the stomach of 28 people identified as "lean" – those with a body mass index (BMI) of 25 or less – and 30 people with obesity (BMI of 30 or higher). They then assessed brain activity though functional magnetic resonance imaging (fMRI).

Among lean participants, the researchers saw evidence of reduced activity across various regions of the brain following the infusion of both glucose and fat. Conversely, they observed no changes in activity in participants with obesity.

"This was surprising," said Serlie, a professor of medicine (endocrinology) at Yale School of Medicine and senior author of the study. "We thought there would be different responses between lean people and people with obesity, but we didn't expect this lack of changes in brain activity in people with obesity."

Serlie and her colleagues then took a closer look at a brain region called the striatum, which previous research has shown mediates the rewarding and motivational aspects of food intake and plays a key role in regulating eating behaviour. The striatum does this in part through the neurotransmitter dopamine.

Using fMRI, they found that in lean people, both glucose and fat led to decreased activity in two parts of the striatum. However, only glucose led to changes in brain activity in participants with obesity, and only in one area of the striatum. Fat did not change brain activity in this region. When researchers evaluated dopamine release in the striatum following nutrient infusion, they found that glucose induced dopamine release in both groups of participants while fat only caused dopamine release in lean participants.

These findings, the researchers said, are compatible with reduced nutrient sensing in people with obesity.

For the study, participants with obesity then underwent a 12-week dietary weight-loss programme; those who lost at least 10% of their body weight were then re-imaged.

For these individuals, the researchers found, weight loss did nothing to change the brain's response to nutrient infusion. "None of the diminished responses were recovered," said Serlie.

Prior analyses have found that most people who lose weight regain it within a few years of dieting. These new findings, the researchers say, may help explain why that's so often the case.

"In my clinic, when I see people with obesity, they often tell me, 'I ate dinner. I know I did. But it doesn't feel like it,'" said Serlie. "And I think that's part of this defective nutrient sensing. This may be why people overeat despite the fact that they've consumed enough calories. And, importantly, it might explain why it's so hard to keep weight off."

We need to find where that point is when the brain starts to lose its capacity to regulate food intake and what determines that switch. Because if you know when and how it happens, you might be able to prevent it.

Understanding the biology of eating behaviour in humans is still in its early stages, says Serlie, and more research will be needed to uncover why diminished nutrient sensing occurs in some people, what biological pathways are involved, and when these changes begin to take hold.

"Everyone overeats at times. But it's unclear why some people continue to overeat and others don't," she said. "We need to find where that point is when the brain starts to lose its capacity to regulate food intake and what determines that switch. Because if you know when and how it happens, you might be able to prevent it."

Similarly, knowing when changes to nutrient-sensing become irreversible would help physicians determine treatment paths for patients. And one goal for the future, Serlie said, would be to find a way to restore nutrient sensing, if possible.

Regardless, she said, the findings drive home the human brain's key role in obesity.

"People still think obesity is caused by a lack of willpower," said Serlie. "But we've shown that there is a real difference in the brain when it comes to nutrient sensing." MEH

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BMI alone not a sufficient indicator of metabolic health

Body mass index (BMI) is not a complete measure of metabolic health, and a high proportion of U.S. adults with normal BMI still have obesity, according to research being presented at ENDO 2023, the Endocrine Society's annual meeting in Chicago.

The latest research highlights the importance of including what percentage of the body is fat, muscle, bone, and water, and how much fat is in the abdomen vs. the thighs to fully understand drivers for cardio-metabolic disease.

"We show that there are racial/ethnic differences in body fat, BMI, and body fat distribution which may provide evidence for future studies to further determine if these differences are possible drivers of the racial disparities seen in cardio-metabolic diseases," said Aayush Visaria, M.D., M.P.H., an internal medicine resident at the Rutgers Robert Wood Johnson Medical School in New Brunswick, N.J.

Visaria and colleagues identified non-pregnant U.S. adults aged 20-59 years from the 2011-2018 National Health and Nutrition Examination Survey (NHANES) with whole body DEXA scan data. Their BMI was categorized by ethnicity (non-Asian: underweight<18.5, normal=18.5-24.9, overweight=25-29.9, obese≥30 kg/m2, Asian: <18.5, 18.5-22.9, 23-27.4, 27.5+).

The researchers estimated odds of obesity among adults as normal/overweight based on BMI or total body fat percentage (BF%) as ≥25% in male and ≥32% in female, by race (non-Hispanic White [NHW], non-Hispanic Black [NHB], Asian, Hispanic, and other). They also estimated mean DEXA adiposity measures by race.

They found that nearly 36% had BMI≥30 (the traditional definition of obesity) but 74% had obesity per BF%. Among normal BMI adults, 44% of non-Hispanic Whites, 27% of NHB, 49% of Hispanic, and 49% of Asians had obesity as per BF%. Among normal BMI adults, the mean android-to-gynoid fat ratio was 0.84 for NHW, 0.85 for NHB, 0.89 for Hispanics, and 0.91 for Asians.

Nearly 3 in 4 young-to-middle-aged U.S. adults were considered to have obesity according to BF% from DEXA scans. Asian Americans and Hispanics with seemingly normal BMI were more likely to have obesity, and more likely to have a greater proportion of abdominal fat than non-Hispanic Whites. Non-Hispanic Blacks had significantly lower chances of obesity at normal/overweight BMI ranges, and a lower proportion of abdominal fat.

"We hope this research will add to the idea of weight-inclusive care and allow clinicians to 1) routinely use supplementary measures of body fat such as waist circumference or bioimpedance-based body fat measurements (e.g. smart scales) in addition to BMI, 2) engage in practices to prevent unconscious biases that may occur when caring for a patient with obese BMI, and 3) engage in clinical decision-making that is not solely dependent on a BMI calculation but rather an overall idea of body composition and body fat distribution," Visaria said. MEH

Novel gene therapy shows promise as cure for sickle cell disease

Researchers involved in the multicentre Ruby Trial presented an update on the safety and effectiveness of a single dose of EDIT-301, an experimental one-time gene editing cell therapy that modifies a patient's own blood-forming stem cells to correct the mutation responsible for sickle cell disease. Results were presented at the European Hematology Association Hybrid Congress in Frankfurt, Germany.

The first four patients, two of whom were treated at Cleveland Clinic Children's, had their stem cells collected for gene editing. The patients then underwent chemotherapy treatment to destroy their remaining bone marrow, making room for the repaired cells that were later infused back into their body.

This is the first time a novel type of CRISPR gene-editing technology – known as CRISPR/CA12 – is being used in a human study to alter the defective gene. This technology is a highly precise tool to modify blood stem cells genomes to enable robust, healthy blood cell production.

The data showed new white blood cells in all four patients at about four weeks with no severe adverse effects. Patients also achieved a normal level of haemoglobin. The patients also have been free of sickle cell disease's associated pain attacks for a period of 11 months and seven months following therapy.

"New treatments like this are critical for people who have sickle cell disease," said principal investigator Rabi Hanna, M.D., director of the paediatric blood and bone marrow transplant programme at Cleveland Clinic Children's and principal investigator. "These initial results provide hope that this new technology will continue to show progress as we work toward creating a possible functional cure for this devastating and life-threatening disease."

Sickle cell disease is an inherited blood disorder that leads to the production of abnormal haemoglobin. Normal red blood cells are round and can move through small blood vessels to deliver oxygen. However, in people with sickle cell disease, the genetic change in DNA causes a chemical alteration in haemoglobin and alters the shape of red blood cells into a sickle, blocking them from passing through narrow blood vessels. They can clog or break apart which also leads to decreased red blood cell life, and increased iron storage in the liver and heart. This can cause conditions such as liver fibrosis, liver failure, stroke, cardiomyopathy and heart failure along with severe pain.

For most people with the condition, medications can modify disease severity and treat symptoms. However, despite current therapies, the average life of a sickle cell patient, is in the mid 40s. A blood or marrow transplant can cure sickle cell disease, but the transplant often requires a sibling donor and has the potential for severe graft-versus-host disease. MEH

New molecule offers major breakthrough in curing glioblastoma

Researchers at the University of Gothenburg, working with French colleagues, have successfully developed a method able to kill the aggressive brain tumour glioblastoma. By blocking certain functions in the cell with a docked molecule, the researchers cause the cancer to die of stress. Their findings are published in the 24 April 2023 issue of *iScience* <doi: *https://doi.org/10.1016/j.isci.2023.106687*>

Cancer cells, especially those that form aggressive tumours, are in one way or another out of control and live a very stressful existence. To manage this stress, the cancer cells hijack mechanisms that the healthy cells use to regulate protein production and process the surplus proteins that they create. Without these hijacked mechanisms, the cancer cell would die.

"We have now succeeded in stopping this hijacking by inserting a specially developed molecule in the cells that inhibits one of these hijacked adaptive mechanisms in the cancer cells. This causes the cancer to self-destruct," says Leif Eriksson, professor of physical chemistry at the University of Gothenburg.

Eriksson's group has worked with a research group at INSERM in Rennes, France. Using super computers and advanced simulations, the researchers developed a version of the molecule that can also pass through the blood-brain barrier that protects brain tissue.

The breakthrough applies to glioblastoma brain tumours. These make up about 45 per cent of all brain tumours. In the EU there are 19,000 cases of glioblastoma annually. Currently, the prognosis for malignant glioblastomas is very bad. Only a few per cent survive five years after diagnosis and treatment.

"Today, cancer treatment consists of surgery, radiation and chemotherapy. Unfortunately, all cancer cells are not killed and the tumour returns. Once the cancer relapses, the tumour cells have often spread and developed resistance," Eriksson.

Can it be used with other cancers?

Studies with the new method have shown very promising results. The researchers saw that a combination treatment with the new substance and chemotherapy was enough to completely kill the tumours while also preventing relapse. Since the tumours were stressed to death, all cancer cells disappeared, and in animal experiments with mice there was no cancer relapse after 200 days. In comparative experiments with just chemotherapy, the brain tumours relapsed after 100 days and grew rapidly.

"These are the first clear results with brain tumours that can lead to a treatment which completely avoids surgery and radiation. We have also begun studying the use of our substance on other aggressive tumour forms like pancreatic cancer, triple-negative breast cancer and certain lever cancers," says Eriksson.

There are other types of brain tumours that develop differently than glioblastomas. This new method does not work with these forms of cancer.

No side effects with new treatment

Current treatments for brain tumours often have severe side effects. With this new treatment, the researchers have not yet seen any side effects with the substance. The treated animals maintained weight, had no apparent changes in behaviour and there was no sign of impact on the liver. While more in-depth studies are needed, extensive cell tests have shown that the substance is non-toxic for healthy cells even at very high doses.

Research on this molecule will now continue. There is still much to do, such as optimising the treatment procedure and additional animal experiments. But Eriksson believes that it should go relatively quickly to get the pharmaceutical into clinical treatment.

"It largely depends on whether funding comes in that allows taking the different steps as smoothly as possible. If I'm optimistic, perhaps it might take five years. That's a short timeframe, but at the same time glioblastomas are nearly 100 per cent fatal, so any improvement in medical care is major progress," says Eriksson. MEH

When it comes to immunity, you are what you eat

Mouse study shows how diet altered by gut microbes spurs development of immune cells

The notion that diet and health are inextricably linked is hardly novel. For millennia, people have known that poor nutrition is responsible for many health problems. But the precise mechanisms that explain just how diet alters the function of our cells, tissues, and organs have remained poorly understood.

Now, a study led by Harvard Medical School researchers sheds light on this process, pinpointing a critical intermediary between food and health — the gut bacteria that make up our microbiome, or the collection of microorganisms that live in symbiosis with humans.

The work, which was conducted in mice and published June 28 in *Nature* [1], shows that gut microbes feast on common fatty acids such as linoleic acid and convert them to conjugated linoleic acid (CLA). This byproduct then serves as a signal for a biological cascade that ultimately spurs a specific type of immune system to develop and reside in the small intestine.

In the study, the researchers observed that mice in whom this cascade was interrupted more readily succumbed to a common foodborne pathogen.

Interplay between gut microbes, food, and immunity

The findings, the team said, detail an intricate interplay between gut microbes, food, and immunity. They also underscore the importance of understanding

how individual microbial species in the gut could alter specific organ functions and exercise important effects on health.

"The triad of diet-microbes-immune system has attracted considerable attention, with a paucity of detail to demonstrate how these three components work together," said study senior author Dennis Kasper, the William Ellery Channing Professor of Medicine at Brigham and Women's Hospital and professor of immunology in the Blavatnik Institute at Harvard Medical School. "We have found one of the clearest demonstrations here of a mechanism underlying how diet and the microbiome build the immune system."

In the new study, Kasper worked in collaboration with Xinyang Song, a former postdoctoral researcher in the Kasper lab, now a principal investigator at the University of Chinese Academy of Sciences, and colleagues from HMS, Massachusetts General Hospital, Tufts University, and the UMass Chan Medical School.

The team initially noticed that germ-free mice – a common lab model that is not naturally colonized by microorganisms, and thus has no microbiome – were missing a subset of immune cells known as CD4+CD8aa+ intraepithelial lymphocytes (IELs), which normally reside in a specific part of the small intestine.

Interestingly, mice that were not germ-free but ate a minimal diet composed of just the essential nutrients to keep them alive were also deficient in these cells. However, CD4+CD8aa+ IELs were present in non-germ-free mice fed a typical rich commercial diet composed of many different nutrients.

Suspicious that an interplay between diet and the microbiome might be responsible for the presence or absence of CD4+CD8aa+ IELs, the researchers examined which nutrients were lacking from the minimal diet, eventually homing in on various fatty acids. After feeding individual fatty acids to mice on minimal diets with typical microbiomes, they discovered that animals that ate a long-chain fatty acid known as linoleic acid began growing CD4+CD8aa+ IELs in their small intestines.

Kasper explained that many bacteria that reside in the gut produce an enzyme called linoleic acid isomerase (LAI) that converts linoleic acid into a conjugated form, with some linoleic acid double- and single-chemical bonds rearranged. Further investigation showed that CLA – the conjugated form of linoleic acid – was abnormally low both in mice with a typical microbiome fed a minimal diet or in germ-free mice fed a rich diet, suggesting that bacteria were necessary to convert linoleic acid into CLA.

When the researchers colonized germ-free mice with bacteria that produced LAI and fed them a rich diet, these animals developed CD4+CD8aa+ IELs in their small intestines. Conversely, when the researchers colonized them with bacteria that had been genetically modified to not produce LAI, they did not develop these immune cells, showing that CLA produced by this bacterial enzyme was essential for these immune cells to grow.

Further investigation revealed a more complete mechanism behind why CLA spurred CD4+CD8aa+ IEL development: The researchers found that some immune cells in the small intestine produced a protein called hepatocyte nuclear factor 4g (HNF4g) on their surfaces, which serves as a receptor for CLA. When CLA attached to these receptors, the cells produced a different protein called interleukin 18R (IL-18R), which in turn lowered the production of a third protein called ThPOK. The less ThPOK produced, the more CD4+CD8aa+ IELs developed.

This complex pathway has clear implications for immunity to infection, Kasper said. Indeed, when the researchers tampered with any part of the cascade – for example, preventing production of IL-18R or HNF4g – mice in whom the cascade was turned off didn't produce CD4+CD8aa+ IELs and were unable to fight off infection with Salmonella typhimurium, a bacterial species commonly responsible for cases of food poisoning.

> "We have found one of the clearest demonstrations here of a mechanism underlying how diet and the microbiome build the immune system."

"One of the reasons that more examples of the diet-microbes-immune system triad have not yet come to light is that these pathways are so complicated," Kasper said. "By investigating these intricate pathways, we will have a better understanding of how our microbiomes keep us healthy and how to intervene when they don't." MEH

Reference:

1. Song, X., Zhang, H., Zhang, Y. et al. Gut microbial fatty acid isomerization modulates intraepithelial T cells. *Nature* (2023). https://doi.org/10.1038/s41586-023-06265-4

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Experts assess current state of treatment and management of cerebral palsy

A special issue of the *Journal of Pediatric Rehabilitation Medicine* aims to deepen the conversation around one of the most common developmental movement disorders in children

Although cerebral palsy (CP) is the most common childhood-onset disability, there are very few evidence-based clinical practice guidelines or recommendations on how to treat and manage this condition. A special issue [1] of the *Journal of Pediatric Rehabilitation Medicine*, guest-edited by Rachel Byrne, Deborah Gaebler-Spira, Michael Green, and Heakyung Kim, in partnership with the Cerebral Palsy Foundation, assesses the state of the art of the treatment of CP.

Co-guest editor Michael Green, DO, Clinical Pediatric Rehabilitation Medicine Attending at Primary Children's Hospital, University of Utah Health, explains: "The goal of this special issue is to deepen the conversation around CP and to improve research and its translation into evidence-based practice in order to improve the care and quality of life for people living with CP."

CP is defined as a disorder of movement and posture due to a non-progressive lesion to an immature brain. As such, children with CP may deal with movement problems that are commonly related to spasticity. Because a standardized clinical pathway for managing spasticity does not exist to guide care providers toward optimal care for people with CP, there is significant variability in the care provided to these individuals.

"There is no single medication, intervention, or surgery that manages spasticity perfectly throughout the lifespan," explains co-guest editor Deborah Gaebler-Spira, MD, Feinberg Northwestern University School of Medicine and Shirley Ryan Ability Lab/Lurie Children's Hospital, Chicago. "Also, existing surgical and pharmacological treatments come with their own side effects and adverse events, which can sometimes compromise function. These challenges can be exacerbated in child-onset conditions, making spasticity management particularly difficult in individuals with CP."

Co-guest editor Heakyung Kim, MD, Department of Physical Medicine & Rehabilitation, UT Southwestern, Dallas, notes: "Given the lack of systematically collected data, it is extremely important for clinicians to consider experts' experiences and rationales regarding enteral baclofen use when selecting their interventions. For this special issue, we invited three experts on spasticity management to share their experiences and rationales and present a balanced view: one to discuss the mechanisms and methods of baclofen as a treatment of spasticity, a second to discuss the cons of this medication, and a third to share the pros of using baclofen as a treatment for spasticity."

Featured articles

Treatment with baclofen

In "Is baclofen the least worst option for spasticity management in children?" <*https://doi.org/10.3233/PRM-230001*> Joline Brandenburg, MD, Department of Physical Medicine and Rehabilitation & Department of Pediatric and Adolescent Medicine, Mayo Clinic College of Medicine, assesses the use of baclofen for spasticity management in children and discusses approaches to using other medications as first-line treatment options.

"In my practice, other medications for spasticity management are often used prior to initiating baclofen. In this article, I discuss the approaches I take in medication selection that incorporate spasticity sever-

ity, patient goals, and medication side effect profiles," Dr Brandenburg explains.

Spasticity-related pain

The article "Spasticity-related pain in children/adolescents with cerebral palsy. Part 2: IncobotulinumtoxinA efficacy results from a pooled analysis," <*https://doi.org/10.3233/PRM-220020*> indicates that injections with incobotulinumtoxinA could bring considerable benefit to children/adolescents with spasticity by reducing spasticity-related pain (SRP).

According to lead investigator Florian Heinen, MD, Division of Paediatric Neurology and Developmental Medicine and LMU Center for Children with Medical Complexity, Dr von Hauner Children's Hospital, Ludwig Maximilian University of Munich: "Botulinum neurotoxinA (BoNT-A) is recommended and its use established to relieve CP-related spasticity in children, and it has demonstrated efficacy for improving muscle tone and helping patients achieve individualized goals of motor function. There is less evidence available regarding the use of BoNT-A formulations for the control of SRP, especially in children/adolescents. While the results of our analysis are promising for treatment of SRP, further research is warranted."

Quantitative Timed Up and Go

In "Reliability and discriminant validity of the quantitative timed up and go in typically developing children and children with cerebral palsy GMFCS levels I-II," <*https://doi.org/10.3233/PRM-210034*> researchers examine the reliability and discriminant validity of the Quantitative Timed Up and Go (QTUG) wearable sensor technology in typically developing children and children with CP.

Lead investigator Andrea Fergus, PhD, DPT/TDPT, Shenandoah University Division of Physical Therapy, points out that "the deficits in motor performance and functional mobility observed in children with CP, gait disorders specifically, are associated with activity restrictions and lower levels of participation across multiple life domains. The results of our study show that the QTUG is a clinically feasible, reliable tool. We provide preliminary evidence that the QTUG can discriminate between children on several of the gait parameters within the TUG."

Neurodevelopmental therapy

In children with CP, neurodevelopmental therapy (NDT) is the most widely used treatment approach aimed at maximizing the child's potential to improve motor functions while preventing musculoskeletal complications. "Effect of the Cognitive Orientation to daily Occupational Performance (CO-OP) approach for children with cerebral palsy: A randomized controlled trial" <*https://doi.org/10.3233/PRM-210085*> details two specific treatment approaches. Gamze Ekici, PhD and Zeynep Kolit, MSc, Department of Occupational Therapy, Faculty of Health Sciences, Hacettepe University, Ankara, set up a randomized trial to investigate the efficacy of NDT with and without the Cognitive Orientation to daily Occupational Performance (CO-OP) approach.

"This study clearly shows that the gains after the treatment increased with the addition of the CO-OP approach in children who take the NDT approach. Thus, the CO-OP approach supports skill acquisition by improving children's performance levels, which are necessary to perform their daily occupations," the authors report.

Other articles in this special CP issue cover the following topics:

- The challenge point framework
- Bimanual task practice
- Use of the Computer-Based instrument for Low motor Language Testing in Canada
- Factors associated with intrathecal baclofen pump explants
- Effectiveness of intrathecal morphine following selective dorsal rhizotomy
- Treatment with trihexyphenidyl
- Outpatient hospital utilization after single event multi-level surgery
- Effects of a balance board on the balance parameters in children with spastic CP
- Use of shear wave elastography to analyze the muscle structure
- Vitamin D levels
- Hematological and biochemical parameters
- Use of music
- Obesity
- Burnout among informal caregivers
- Gross Motor Function Classification System levels in a low-resource setting
- Racial disparities
- Classification systems in Japan

JPRM Editor-in-Chief Elaine Pico, MD, UCSF Benioff Children's Hospital Oakland writes: "We established the annual JPRM CP special issue in 2019, and it has become an important resource nationally and internationally for all team members who participate in the care of those with this condition. Our managing editor Sara Tinsley and I work year-round with our special guest editors, and I am particularly proud of each and every issue. We have treatments for CP but no cures; therefore, all the research we have is focused on better outcomes for individuals with spasticity-related challenges. This special issue contains a large collection of rigorously evaluated research in the field of CP that is a must read for anyone who treats this condition." MEH

References:

1. *https://content.iospress.com/journals/journal-of-pediatric-rehabilitation-medicine/16/1*

Great Ormond Street Hospital for Children: the child first and always

Great Ormond Street Hospital (GOSH) is a globally renowned children's hospital, championing innovation across 63 clinical specialties and providing ground-breaking treatments for the rarest and most complex conditions. Located in the heart of London, GOSH is a British institution with 170 years of history.

In 2023 Newsweek's World's Best Specialised Hospitals ranking, GOSH ranked among the top three paediatric hospitals in the world. It also ranked highly in cardiac surgery, neurosurgery, oncology, as well as being recognised as one the world's best smart hospitals.

What are the secrets of such success?

As a pioneer of cutting-edge and innovative medical technology, GOSH works at the forefront of the field to continuously deliver the medicine of the future. As well as world-class clinical treatment and care, we also have a commitment to delivering a nurturing and family-centred experience. "The child first and always" has been the hospital's motto for over 100 years, and it remains as true today as it has ever been.

360-degree, multi-specialty care

GOSH has 18 highly specialised national services. Our expert teams of over 300 world-leading consultants deliver 360-degree, multi-specialty care with the child at the centre. As champions of the highest calibre of paediatric care, our teams are dedicated to quality, integrity, and safety.

We are part of Europe's largest academic centre for research and education in children's health and disease. We are committed to achieving the best possible results by consistently measuring outcomes and value against the highest international standards, and our collaborative approach to international partnerships means we are dedicated to sharing best practice in a transparent and empowering way.

Our world-leading expertise includes:

- One of the largest heart transplant centres for children in the world and the largest paediatric cardiac programme in the UK
- The leading centre in the world for gene therapy in children
- One of the three largest centres for children with cancer/leukaemia in the Western world and the largest in Europe
- One of the two largest centres in Europe for paediatric bone marrow transplantation (BMT)
- The largest epilepsy surgery centre in Europe and the largest centre for paediatric brain surgery in the UK
- The leading centre in Europe for the management of conjoined twins
- The largest paediatric centre for Interventional Radiology in Europe
- The largest paediatric centre in the UK for intensive care
- The largest paediatric centre in the UK for craniofacial reconstruction
- The largest paediatric centre in the UK for renal transplantation.

As the global pioneer in children's rare disease studies and treatments, GOSH has extensive experience and knowledge in the clinical treatments of rare diseases in children and developed a mature multidisciplinary diagnosis and treatment model. At GOSH, we treat over 28,000 children with rare & ultra-rare diseases and have more than 500 research projects looking into rare and complex diseases.

Established in 2019, Zayed Centre for Research into Rare Disease in Children is the world's first purpose-built centre dedicated to paediatric research into rare diseases. The Centre houses circa 500 researchers and clinicians. It brings together pioneering research and clinical care under one roof and drives forward new treatments and cures for seriously ill children from across the UK and internationally.

Gulf office ensures best patient experience

GOSH has a longstanding relationship with the Middle East providing high quality and safe care for patients in a family-centred environment. A dedicated Gulf office ensures that children and families being referred to the hospital receive the very best experience possible as well as providing a local point of contact. The unit is tailored to the referral and treatment of international patients with a dedicated, multi-lingual team ensuring a smooth and efficient patient experience.

Want to know more about Great Ormond Street Hospital (GOSH) in London?

We've been helping children overcome rare and complex conditions ever since we opened our doors in 1852. Stronger than ever, our team is made up of 300 exceptional and dedicated consultants across 63 specialties. We are a driving force in medical technology and research so we can provide much needed treatment for children across the world.

Our International and Private Care service supports over 5,000 children from over 90 countries every year. We have a compassionate and multi-lingual team to help our international patients and their families feel at home.

- You can contact us on: *GulfOffice@gosh.nhs.uk*
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Great Ormond Street Hospital for Children
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Great Ormond Street Hospital for Children

We've been helping children overcome **rare and complex conditions** ever since we opened our doors in 1852 in London. Our expert team cares for children across 63 different specialties and sub-specialties, the largest of any UK hospital.

Recently, GOSH was ranked among the **top three paediatric hospitals in the world** in Newsweek's World's Best Specialised Hospitals 2023 ranking.

As a pioneer of cutting-edge and innovative medical technology, GOSH works at the forefront of the field to continuously deliver the medicine of the future. As well as **world-class clinical treatment and care**, we also have a commitment to delivering **a nurturing and family-centered experience.**

Our expert teams of over 300 world-leading consultants deliver 360-degree, multi-specialty care with the child at the centre.

We provide specialised services all under one roof for our international patients. Our International and Private Care Service supports over 5,000 children from 80 different countries every year. We have a **compassionate and multi-lingual team** to help all our international patients and their families feel at home.

We are dedicated to helping children from around the world fulfil their potential through international collaboration, education, innovation and research.

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

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Boost for brain cancer diagnosis

First-of-its-kind open-analysis platform for paediatric brain tumours provides robust data resource for childhood cancer research

Researchers from Children's Hospital of Philadelphia (CHOP), the Alex's Lemonade Stand Foundation Childhood Cancer Data Lab, the Children's Brain Tumor Network (CBTN), the Pacific Pediatric Neuro-Oncology Consortium (PNOC), and more than 20 additional institutions have partnered to create a first-of-its-kind open-source, reproducible analysis platform for paediatric brain tumours. With the help of thousands of genomically sequenced samples, researchers have used this platform to identify initial findings about genetic variants associated with poorer outcomes that could help guide future diagnostic and therapeutic advances.

The details of the platform and those initial findings were published online by the *journal Cell Genomics* [1].

Paediatric brain tumours are collectively the leading cause of cancer-related death in children in the United States. However, the severity of paediatric brain tumours varies wildly, with some having an almost universally fatal prognosis while others have relatively strong long-term survival rates, though all brain tumours negatively impact these children and their families to at least some degree. Limited access to tissue samples and patient-derived cell lines has been a significant barrier to understanding the differences between paediatric brain tumours at a molecular level. That long sought-after data could lead to better diagnostic techniques and potential targeted therapies that could treat these deadly tumours.

Pediatric Brain Tumor Atlas

In 2011, CBTN and PNOC began extracting and preparing what has now become nearly 6,000 tumour samples with over 68,000 sub-samples. More than 1,000 of these tumours were sequenced to form the initial release of the Pediatric Brain Tumor Atlas (PTBA) in 2018, and data were made available without embargo so that researchers could study what variants might be driving certain types of brain tumours. With the help of the Alex's Lemonade Stand Foundation Childhood Cancer Data Lab, the team of researchers was able to build an open-source version of this atlas, the Open Pediatric Brain Tumor Atlas (OpenPBTA), to analyze these data.

Open Pediatric Brain Tumor Atlas

OpenPBTA is accessible to anyone conducting research who is looking for new therapeutic targets or finding new ways to translate research into clinical practice. At the time of this study, OpenPBTA contained genomic and clinical data from more than 1,000 paediatric brain tumours and 22 patient-derived cell lines from the CBTN and PNOC. The OpenPBTA provides an open, real-time framework to genomically characterize paediatric brain tumours. It is the first large-scale, collaborative, open analysis of genomic data and provides a cloud-based resource for researchers looking for more comprehensive data on paediatric brain tumours.

"While there have been many proponents of an open-source model for scientific research, nothing like this existed for paediatric cancer," said Jo Lynne Rokita, PhD, a Supervisory Bioinformatics Scientist leading OpenPBTA at the Center for Data-Driven Discovery (D3B) at CHOP and one of the study's corresponding authors. "We designed OpenPBTA so that anyone could access the data, contribute to its analysis, and/or use it in their own research."

"Collaboration is key to accelerating new cure discovery. OpenPBTA made it possible for experts across the globe to come together and gain a deeper understanding of the leading cause of cancer-related death in children and young adults," said Jay Scott, Co-Executive Director of Alex's Lemonade Stand Foundation.

Collaboration is key to accelerating new cure discovery. OpenPBTA made it possible for experts across the globe to come together and gain a deeper understanding of the leading cause of cancer-related death in children and young adults.

Jaclyn N. Taroni, PhD, another corresponding author on the study and Director of Alex's Lemonade Stand Foundation Childhood Cancer Data Lab, said: "With our successful launch of OpenPBTA, we're hoping the research community adapts this model to other paediatric cancers."

OpenPBTA is already providing researchers with more insight into potential drivers of paediatric brain tumours. In this study, researchers found that the loss of the tumour suppressor gene TP53 is a significant marker for poor overall survival in fast-growing brain and spinal cord tumours called ependymomas and certain diffuse midline gliomas, and dysregulation of the gene was also implicated in hypermutant high-grade gliomas.

"Solving paediatric brain tumours cannot be accomplished by any one institution. The OpenPBTA model of shared, real-time collaboration supported by PNOC and CBTN has not only empowered new discoveries, but also innovative ways of performing the required science on behalf of accelerated, collaborative innovation for children affected by brain tumours," said Sabine Mueller MD, PhD, MAS, Professor of Neurology, Neurosurgery and Pediatrics at the University of California, San Francisco, and the Lead of PNOC and executive co-chair of CBTN.

Reference

1. Shapiro et al, "OpenPBTA: An Open Pediatric Brain Tumor Atlas." Cell Genom. Online May 31, 2023. doi: https://doi.org/10.1101/2022.09.13.507832 .

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The **MUSC Shawn Jenkins Children's Hospital,** located in Charleston, South Carolina, USA, is one of the top-ranked children's hospitals in the Southeast United States. The new 11-floor hospital provides expert care in over 27 pediatric specialties including burn care, cancer, heart surgery, orthopaedics and neurosurgery. Our pediatric heart center is ranked #4 in the United States and achieves among the best outcomes in the nation. To learn more about MUSC pediatric experts, visit **musckids.org**

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muscShawn Jenkins Children's Hospital
Medical University of South Carolina

Researchers develop first-of-its-kind prediction model for newborn seizures

Model can be incorporated into routine care to help decide which babies will need electroencephalograms

Researchers from the Neuroscience Center at Children's Hospital of Philadelphia (CHOP) have developed a prediction model that determines which newborn babies are likely to experience seizures in the Neonatal Intensive Care Unit (NICU). This model could be incorporated into routine care to help the clinical team decide which babies will need electroencephalograms (EEGs) and which babies can be safely managed in the Neonatal Care Unit without monitoring through EEGs. This would allow families and providers to care for babies without intrusive and unnecessary procedures. The findings were published March 22, 2023 by *The Lancet Digital Health* [1].

Neonatal seizures are a common neurological issue in newborn babies. In particular, approximately 30% of newborn babies with temporary lack of oxygen to the brain (known as hypoxic-ischemic encephalopathy, or HIE) will have seizures. Most of these seizures can only be detected through EEG monitoring and not simply through clinical observation, an important lesson that has shaped the management of babies with seizures in the last two decades. Newborns with HIE are at an increased risk for neurobehavioral problems and epilepsy later in life, and detecting and treating seizures is important to reduce seizure-induced injury, thereby improving outcomes for newborns with early seizures.

Current guidelines suggest that newborns with HIE undergo four to five days of EEG monitoring to detect seizures. However, this approach is not always feasible, as many of these babies receive care in NICUs that do not have access to continuous EEG (CEEG). Even NICUs in large healthcare networks often only have limited EEG resources, especially as the interpretation of EEG readings is time intensive for the entire care team, including physicians and technologists.

Predicting newborn seizures

Predicting which newborns will experience seizures is complex, and prior attempts to predict future seizures using clinical and EEG data have not yielded highly accurate results. To help address these issues, researchers at CHOP used data from a recently developed EEG reporting form that is used for all EEGs to build prediction models using machine learning methods.

"In this study, we used data from the EEGs of more than 1,000 newborns to build models to predict neonatal seizures," first study author Jillian McKee, MD, PhD, a paediatric epilepsy fellow in the Division of Neurology and the Pediatric Epilepsy Program at CHOP. "This data helped us optimize which newborns should receive EEG monitoring in the NICU."

The researchers built their seizure prediction models based on standardized EEG features reported in the electronic medical records. The retrospective study found that these models could predict seizures, and particularly seizures in newborns with HIE, with more than 90% accuracy. The models could be tuned to not miss seizures, performing with sensitivity of up to 97% in the overall cohort and 100% among newborns with HIE while maintaining high precision.

Seizure prediction tool available online

The authors indicated that this is the first study reporting on a seizure prediction model based on clinically-derived standardized reports. The study team has made the model publicly available <*http://neopredict.helbiglab.io*> as an online tool.

"If we can further validate this model, it could enable a more targeted use of limited EEG resources by reducing EEG use in low-risk patients, which will make care of babies with neurological concerns in the NICU more personalized and focussed," said senior study author Ingo Helbig, MD, a paediatric neurologist in the Division of Neurology and co-director of ENGIN (Epilepsy NeuroGenetics Institute) at CHOP. "We believe incorporating this model into real-time clinical practice could greatly improve the quality and efficiency of the care we deliver in these critical early days of life."

Nicholas Abend, MD, a co-author and Senior Medical Director within the Neuroscience Center at CHOP, commented: "This project indicated we can efficiently acquire standardized data as part of clinical practice to drive research which enables us to provide better care. We are already using this same approach to collect data on all EEG reports, thousands of epilepsy visits over time, and numerous other domains within the Neuroscience Center, thus establishing a true learning healthcare system." MEH

Reference:

1. McKee et al, "Leveraging electronic medical record-embedded standardized electroencephalogram reporting to develop neonatal seizure prediction models: a retrospective cohort study." Lancet Digit Health. Online March 22, 2023. doi: *https://doi.org/10.1016/S2589-7500(23)00004-3*

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Digital diagnosis: Video technology transforms the healthcare landscape

By **Christina Molt Wengel**,
Chief Marketing Officer at Milestone Systems

The healthcare industry thrives on the dedication and commitment of its great workforce. However, the spectre of impending staff shortages looms ominously over the horizon, threatening uninterrupted, life-saving care. Urgent measures are imperative to address this challenge and ensure the well-being of those in need.

Deeply attuned to the transformative power of human connection, healthcare professionals understand how a simple touch can engender trust, alleviate anxiety, and foster open communication between patients and caregivers. As the World Health Organization (WHO) projects a staggering shortfall of 10 million healthcare workers worldwide by 2030, exploring innovative methods that empower these professionals in their daily interactions with patients while enhancing the quality of care is crucial.

A critical juncture in the UAE

Astoundingly, the World Health Organization (WHO) projects a staggering shortfall of 10 million healthcare workers worldwide by 2030, necessitating an urgent exploration of innovative methods to empower these professionals in their daily interactions with patients. Here, the intersection of technology and personal care assumes paramount importance.

In the fast-paced world of healthcare, where every second can mean the difference between life and death, the UAE finds itself at a critical juncture. As the demand for high-quality care soars, the nation's healthcare sector grapples with the alarming reality of increasing patient volumes and limited resources. Integrating video technology has emerged as an imperative solution to address this pressing challenge.

With its ability to enhance patient monitoring, optimise response times, and mitigate risks, the UAE must harness the power of transformative technology to safeguard lives and revolutionise healthcare delivery. The medical device market in the UAE is predicted to grow to $1.5bn by 2025 at a CAGR.

Enhancing safety, efficiency, and the patient experience:

The healthcare industry has traditionally relied on alarms, sensor systems, and call bells to ensure patient safety. However, integrating video analytics with these technologies represents an exciting frontier that can significantly enhance the patient experience. Streamlining monitoring processes and providing vigilant care without compromising privacy and tranquillity, video technology empowers caregivers to make informed judgments and prioritise their actions.

Consider the perils of falls, which extend beyond the elderly. Patients weakened by surgery, disoriented and panic-stricken, patients weakened by surgery may find themselves at risk of plummeting from their beds. Even individuals recovering from broken bones, strokes, or heart attacks teeter on the precipice of vulnerability. Video capabilities enable nurses to make proactive decisions, differentiating between requests for a glass of water and a dire state of distress, ultimately saving precious time and potentially lives.

Safeguarding privacy and dignity

While implementing video technology, it is essential to assuage concerns and honour patients' need for privacy. Privacy-enhancing features, such as automatic blurring functions, should be implemented. These features ensure vigilant monitoring while respecting patients' dignity and shielding them from prying eyes in nurse stations. With a solid regulatory framework and stringent privacy controls, the possibilities for hospital video technology expand.

To shed further light on the benefits and challenges of integrating video technology in healthcare, insights from healthcare practitioners and industry experts are invaluable. Driven by data and real-life examples, these perspectives provide a well-rounded view of the topic. They address concerns about privacy, potential ethical issues, and implementation challenges, enabling readers to form informed opinions.

Assuaging these concerns demands implementing privacy-enhancing features, such as automatic blurring functions. These features honour patients' need for privacy while enabling vigilant monitoring without compromising their dignity, shielding them from prying eyes in nurse stations.

As hospitals have always embraced innovation, the harmonious marriage of video technology and the healing touch of human hands emerges as the prescription for a new era of safety, efficiency, and compassionate healthcare. By leveraging video technology, the healthcare industry can ensure the well-being of patients, empower caregivers, and enhance the overall healthcare experience. Let us embark on this transformative journey, where digital advancements augment our noble healing mission and bring forth a future where every patient receives the care they truly deserve.

Milestone Systems

Founded in 1998, Milestone is a standalone company in the Canon Group.

Milestone Systems is a leading provider of open platform video management software; technology that helps the world see how to ensure safety, protect assets and increase business efficiency. Milestone enables an open platform community that drives collaboration and innovation in the development and use of network video technology, with reliable and scalable solutions that are proven in more than 500,000 installations worldwide.

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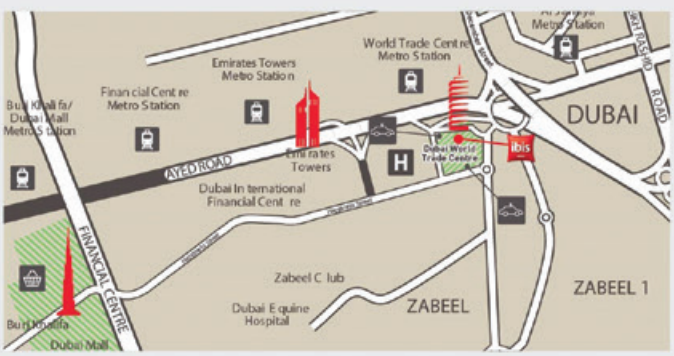

The importance of improving health literacy to advance cancer care

Pfizer, The Emirates Oncology Society, Friends of Cancer Patients and the Gulf Federation of Cancer Control held a joint event in Dubai earlier this year to provide support for the cancer care community. 'Uniting our Voices' brought together healthcare professionals, industry leaders, and patient association groups to discuss the importance of advancing health literacy. *Middle East Health* speaks to **Dr Nadine Tarcha**, Pfizer Gulf Medical Lead, about the importance of health literacy and cancer care in the UAE.

Middle East Health: Regarding health literacy, it is noted that 76% of UAE adults have limited health literacy. What do you regard as low heath literacy?

Nadine Tarcha: Low health literacy refers to a person's limited ability to understand, access, and use health-related information to make informed decisions about their own health and well-being. It can manifest in various ways, including difficulty understanding health information and health concepts, difficulty navigating the healthcare system and poor decision making.

For cancer patients, this can be a huge challenge as they may not be able to understand or communicate symptoms to their doctors, or even identify symptoms themselves. It can also affect safe and appropriate use of medicines, poor adherence to treatment plan which leads to poor health outcomes.

MEH: What practical measures do you suggest can be adopted to improve health literacy in the UAE and the region? How can these be implemented?

NT: The most important thing is to ensure clear communication. Health information should be presented in common terminology and language that is clear, and it should fall within appropriate reading levels. Avoiding complex medical terminology and using simple, easy-to-understand language helps individuals better understand health information.

This can be done using visual aids, such as infographics, diagrams, and illustrations. These can help convey complex health information in a more understandable manner. Visual aids can make information more accessible and help individuals comprehend health concepts more easily.

Likewise, we can also make sure that we tailor educational tools. Customizing materials to the specific needs and cultural backgrounds of the target audience can greatly improve health literacy. Considering factors such as language, literacy level, cultural beliefs, and health beliefs can help ensure that health information is relevant and resonates with the audience.

MEH: What can be done to improve early screening for cancer?

NT: Early screening for any cancer is critical for early detection and treatment, which can significantly improve patient outcomes, and the most important factor to improve early screening is increasing awareness. It's important for doctors to educate patients about screening options, but also for industry players to hold public education campaigns to raise awareness about the importance of cancer screening.

Similarly, engaging patients in the decision-making process and empowering them to take an active role in their health can improve early screening rates. Patient education, counselling, and shared decision-making conversations with healthcare providers can help patients under-

stand the importance of screening, address concerns, and make informed decisions about the most appropriate screening option for their individual needs.

Additionally, collaborating among different healthcare providers, including primary care physicians, oncologists, radiologists, and other specialists, can improve early screening rates for all types of cancer. This can involve coordinated efforts in identifying at-risk patients, ordering, and interpreting screening tests, providing appropriate referrals, and ensuring follow-up care.

MEH: It is also noted that cancer incidence is increasing across the region. Why is this the case?

NT: One reason could be the changing lifestyle factors. Rapid urbanization of lifestyle in the Gulf region have led to changes in dietary habits, decreased physical activity, increased tobacco use, and other lifestyle factors that are known risk factors for cancer, such as obesity and sedentary behaviour.

A potentially surprising reason is increased awareness and improved screening. There has been an increased emphasis on cancer awareness and early detection in the Gulf region in recent years, leading to improved cancer screening programmes and increased detection of cancer cases that may have previously gone undiagnosed. This combination can also result in higher cancer diagnosis rates, which also means that more people are getting treated for it.

MEH: People delay cancer check-ups largely out of a fear of cancer. This is a difficult to overcome as the fear of cancer is legitimate. What can frontline / primary care doctors do practically to help their patients overcome their fear and undergo cancer screening? What should they be telling their patients?

NT: To reduce the stigma of a cancer diagnosis, primary care doctors must provide evidence-based information. They can educate patients about the purpose, benefits, and importance of cancer screening using data-driven information about the screening tests available, their accuracy, and potential outcomes. When patients understand the impact of getting checked early with real-life evidence, they will be able to make more informed decisions and alleviate some of their fears.

Similarly, doctors can also personalize their messages to patients. They can tailor the message to each patient's individual risk factors, such as family history, lifestyle factors, and age, to emphasize the importance of cancer screening based on their specific situation. They must use language that is easily understandable and relatable to the patient, avoiding technical jargon that may further increase anxiety.

Lastly, they must emphasize shared decision-making. They can discuss the pros and cons of screening and empower patients to make their own decisions based on their values and preferences. Importantly, they must always involve patients in the decision-making process and emphasize that cancer screening is ultimately a personal choice.

Doctors can also personalize their messages to patients. They can tailor the message to each patient's individual risk factors, such as family history, lifestyle factors, and age, to emphasize the importance of cancer screening based on their specific situation.

Overall, it's critical for healthcare practitioners to make sure that their patients are heard and understood. By demonstrating that you understand the patient's needs, it helps them build confidence in the healthcare system and make more informed decisions by getting cancer screening early. MEH

With funding from Japan, UNOPS works to strengthen Lebanon's health services

Lebanon has faced multiple socio-economic crises in recent years. A protracted financial crisis, compounded by COVID-19, the explosion at the Port of Beirut in August 2020 and the recent energy crisis have led to a sharp increase in extreme poverty and food insecurity and put millions of people out of work. The crises have significantly impacted the provision of basic services for vulnerable communities and people, with hospitals across the country experiencing shortages in medical equipment, supplies and power.

To help combat the shortage of electricity, UNOPS worked with the government of Japan and Lebanon's Ministry of Public Health to provide a reliable energy supply to hospitals and improve energy efficiency.

"We are grateful for this support from Japan and for UNOPS efforts in making this project a reality," said Dr. Firas Abiad.

Three solar photovoltaic hybrid systems were installed in public hospitals in the North, Bekaa and Nabatieh governorates. Each of the solar systems has the capacity to generate more than 260 kilowatts of renewable energy – covering up to 30 per cent of the energy needs of the targeted hospitals. More than 13,000 light bulbs, fixtures and other accessories were also provided to the hospitals to improve energy efficiency.

As part of the project, a CT scanner and more than 540 medical items and equipment were also procured for the hospitals. To build local capacity and ensure the sustainability of the systems and equipment, training was also provided – including to hospital personnel – to operate and maintain the solar energy systems and medical equipment delivered.

Together, the solar energy systems and other delivered equipment will help to strengthen the provision of essential health services for some of Lebanon's most vulnerable communities, benefitting over half a million people each year.

"Governmental hospitals in Lebanon are the backbone and pillar of the country's healthcare sector [...] Japan hopes that this assistance will help secure sustainable access to health services for the most vulnerable communities during these difficult times," said H.E. Mr. Masayuki Magoshi, Ambassador of Japan to Lebanon.

The US$1.3 million project – funded by the Government of Japan and implemented by UNOPS in partnership with Lebanon's Ministry of Public Health – was formally completed at a ceremony held at the Minieh Governmental Hospital.

Speaking at the ceremony, Representative and Director of UNOPS Multi-Country Office in Amman, Muhammad Usman Akram, said that reliable energy and quality healthcare services are critical for the people of Lebanon amidst the multiple challenges the country is experiencing.

"I appreciate the continued partnership with the government of Japan in support of vulnerable populations and in collaboration with the Ministry of Public Health to enhance access to public health services in Lebanon," he said.

France to assist Lebanon to improve healthcare

Meanwhile, in June Lebanon's Caretaker Minister of Health, Firas Abiad, signed a cooperation and coordination agreement with his French counterpart, François Braun.

"This agreement organizes and activates cooperation to guarantee the implementation of useful projects," Abiad explained after inking the agreement with his counterpart in France.

Lebanon's Caretaker Minister of Health, Firas Abiad, signs cooperation and coordination agreement with French counterpart François Braun.

"The framework agreement includes various areas of joint cooperation, including areas of primary health care, ministry programs for mental and psychological health, organ donation, the preparation of medical and nursing cadres, and strengthening health systems," Abiad explained.

The Minister of Health also visited the Gustave Roussy Center, Europe's leading centre for cancer treatment.

During the visit, discussions focused on the National Cancer Control Plan, which the ministry said it would launch in July, and the means to strengthen cooperation between the Ministry of Public Health and the Center in terms of treatment, research, executive training, and development of advanced treatment protocols. MEH

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Providing healthcare in the face of economic collapse

The aftermath of the Beirut Port explosion in August 2020, coupled with the nation's ongoing financial crisis, has left Lebanon on the brink of collapse. Moreover, many sectors were impacted by this situation, especially Lebanon's health sector, which heavily depends on public financial support. In the hope of shedding additional light on this subject, we interviewed Nassib Nasr, Director General of Hôtel-Dieu de France, administered by Saint Joseph University of Beirut and considered one of the most prestigious hospitals in the country,

Nassib Nasr, Director General of Hôtel-Dieu de France

Q: What are the main concerns in regards to the healthcare sector in Lebanon today?

Nassib Nasr: One of the primary obstacles today is the lack of public health coverage in Lebanon, the country's current economic situation, as well as the scarcity of some drugs and other medical supplies.

Q: With the huge decline in access to healthcare services in Lebanon, what role does Hôtel-Dieu de France and the University of Saint Joseph (USJ)-HDF hospital network play in helping people get the services they need?

NN: One of our main roles is maintaining some of our previous, extremely high standards for healthcare, which is difficult. It is no simple task. However, I believe that the danger zone has been crossed. In order to get through this crucial period, we have worked hard to save three other medium-sized hospitals, which are now administered by Hôtel-Dieu. We have today the largest network of hospitals and hospital beds in Lebanon that meet quality standards, which is difficult given what is happening in Lebanon.

Q: What are the positive and negative sides of creating a hospital network in Lebanon?

NN: The positive side is that we are creating a synergy between hospitals, and in doing so, we can optimize a variety of things, including services, third-party payments, supplies, etc. The drawback is that we are in charge of three additional hospitals, all of which have a very poor financial history, and we must invest in them to help them get back to where they were before the crisis. We thus have a plan, and the first phase of it consists of helping them and investing in them. I believe we will see results in the next upcoming months.

> The positive side is that we are creating a synergy between hospitals, and in doing so, we can optimize a variety of things, including services, third-party payments, supplies, etc.

Q: What is your vision regarding Hôtel-Dieu de France and its hospital network?

NN: First and foremost, the hospital network, which is quite dynamic, will expand both this year and in the years to come. We are currently developing a number of projects, which include hospitals and many other ideas. Moreover, our country requires additional hospital beds with administration similar to that of Hôtel-Dieu because other hospitals are in

Mr Nasib Nasr, Director of the USJ-HDF Hospital Network, General Joseph Aoun, Commander-in-Chief of the Lebanese Armed forces and Pr Salim Daccache s.j., Rector of Saint-Joseph University of Beirut, mark the occasion of Saint-Charles Hospital joining the network.

Saint-Charles Hospital joins USJ-HDF

Saint-Charles Hospital has joined the Saint-Joseph University-Hôtel-Dieu de France (USJ-HDF) Hospital Network in Lebanon. A ceremony to mark the agreement was held on June 27, at Saint-Charles Hospital, Fiyadieh, Beirut under the patronage of His Excellency the Minister of Public Health of Lebanon, Dr Firass Abiad, in the presence of General Joseph Aoun, Commander-in-Chief of the Lebanese Army, as well as civilians, politicians, senior military officers and representatives from Saint-Joseph University, Hôtel-Dieu de France and Saint-Charles Hospital.

Speaking at the ceremony, Mr. Nassib Nasr, the Director General of Hôtel-Dieu de France, said: "This partnership marks a significant step forward in our shared commitment to the health and well-being of the Lebanese population.

"We have a responsibility to meet the medical needs of all those who pass through our doors, whatever their origin, socio-economic status or resources," he emphasized.

"Together, we continue to hold high the values of compassion, medical expertise and dedication to patients. May we find inspiration and strength in this alliance to build a better future for all."

Commenting on the collaboration that is part of the hospital network, the Rector of Saint-Joseph University of Beirut and Chairman of the Board of Directors of Hôtel-Dieu de France, Pr Salim Daccache s.j., stressed the importance of "working together to save the Lebanese hospital sector, but also and above all to save the quality and excellence of education, science and learning that have long distinguished Lebanon. A Lebanon where honesty and transparency in higher education were paramount. Today, we can see with our own eyes just how much the Lebanese human capital – that is, skilled and educated people – is working to save Lebanon, which is conspicuous by the absence of politicians and their inability to elect a new president for this resilient and obstinate republic."

The Advisor to the Minister of Health, Dr Pierre Anhoury, congratulated the agreement, pointing out that "the development of the USJ-HDF network shows the extent to which the difficult situation we are going through is a source of initiatives that would never have seen the light of day just a few years ago".

He concluded by saying: "You have opened up a new path that optimizes the supply of care for the greater good of patients and the population. We renew our confidence in you and our commitment to supporting your development." MEH

such poor condition. Second, the social responsibility of Saint-Joseph University of Beirut and Hôtel-Dieu de France will be marked by a very critical period where we will support people and make it easier for them to have access to healthcare services.

Q: Is the healthcare sector still in decline today, or is it getting better?

NN: It is still declining, perhaps more slowly than before, and it will continue to decline until there is new governance in the country as well as a different political and economic situation, because they are closely related to what is happening outside the hospital. Indeed, Lebanon depends on public coverage, as 40% to 50% of the Lebanese population is covered by the army, the ISF, and the public social security system. The latter, however, is gradually disappearing.

Q: Having been ranked 23rd in the world for healthcare efficiency in 2019, can Lebanon still be considered a country where healthcare services are top-tier today?

NN: The country's situation is dire. I don't think Lebanon has the same rank as before at the international level. However, our hospital and our hospital network are ranked, if not first, second in the country and in the region in terms of quality healthcare.

Q: Lebanon was known for its top healthcare services, with people all around the world coming there to receive top-notch care and treatments. Has the healthcare sector witnessed a decline in people visiting to Lebanon to access such services because of the economic crisis?

NN: Yes, and it's mostly because of a political issue with the surrounding countries, not just because of the economic crisis. Nowadays, no one from the Gulf countries or the surrounding areas is traveling to Lebanon for tourism. The same applies to medical care. People from the Gulf countries today do not travel to Lebanon for medical treatment, as they have better, higher-quality medical care. They are building their own hospitals, thus replacing Lebanon as a medical care hub, and in doing so, they are taking a lot of doctors and nurses from our country. So, yes, it is difficult to maintain something that is not maintainable. MEH

The Hybrid OR at The LAU Medical Centre-Rizk Hospital

Against all odds, The LAU Medical Centre-Rizk Hospital continues to pursue their mission to heal with compassion

The healthcare sector in Lebanon has faced countless challenges since 2019. The LAU Medical Center-Rizk Hospital has surged through this difficult period and has continued to invest, adapt, and expand.

Committed to serving the Lebanese community, The LAU Medical Center-Rizk Hospital is determined to standby of all those who need them in good times as in times of crisis. The lynchpin of the LAUMC-RH is to Heal with Compassion, hence the importance of continually developing and improving patients experience within the LAU Medical Center.

This was well reflected during the COVID-19 pandemic, where a plan was rapidly put into place allowing the medical centres to be among the first to receive and treat patients. Furthermore, the medical centre took their mission nationwide, launching an awareness campaign through the dedicated LAU Mobile PCR Unit.

On the eve of the devastating August 4 Beirut Port blast, despite the damage the medical centre sustained, it was fully committed to the community and was able to treat more than 500 casualties. A fast-track renovation plan was put in place in order to mend what was damaged and continue to serve the community.

The LAU Medical Center-Rizk Hospital has also been at the forefront of several healthcare initiatives and has been proactive in initiating a national healthcare strategy for crisis management and public health restructuring.

They started a fundraising campaign in the US for their oncology patients to ensure the continuity of treatments of their patients and avoid major supply and medication shortages.

A mobile clinic operated by The LAU Medical Centre-Rizk Hospital

They installed and implemented the ultramodern Hybrid OR at the LAU Medical Center-Rizk Hospital to enhance OR efficiency. This has enabled its surgical team to perform more complex procedures with better outcomes and shorter patient recovery time.

They implemented best practices espoused by the American College of Surgeons that contributed to operating room safety, efficiency, and usage of operating room equipment. Through USAID's support, the medical centre doubled its capacity to sterilize surgical instruments and reduced sterilization time by half, which has enabled the hospital to carry out more surgeries.

A state-of-the-art pharmacy system was established with a closed loop medication system to help improve efficiency, quality of care and minimize dispensing errors. With this new system, pharmacists are able to provide the right patients with the right dose of the right medication at the right time with traceability across the hospital.

Furthermore, regarding the patient experience, LAU Medical Center-Rizk Hospital has:

1. Always shown compassion towards patients and their families
2. Placed patients at the centre of their services, focusing on improving the patient's experience with regards: healthcare delivery; service excellence; value for money
3. Aimed for universal coverage for all / at all levels
4. Created Private-to-Public Partnerships
5. Reshaped the public healthcare sector essentially around Primary Care Centers.

As medical staff are at the heart of their business, they has created a plan to retain and motivate staff through several financial relief packages to support their staff by adjusting their income and benefits. In addition, by expanding and launching LAUMC-SJH, numerous job opportunities were created within the medical field.

LAU Medical Center-Rizk Hospital will pursue its mission to heal with compassion and develop further its services to place Lebanon's healthcare system on the global map once again. MEH

LAU Medical Centers
Rizk Hospital | Saint John's Hospital

LAU Lebanese American University
Gilbert and Rose-Marie Chagoury School of Medicine

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Medical University of Vienna

Pioneering MRI imaging method captures brain glucose metabolism without the need for administration of radioactive substances

Pioneering MRI imaging method captures brain glucose metabolism without the need for administration of radioactive substances

Metabolic disorders play a central role in many common conditions, including Alzheimer's, depression, diabetes and cancer, which call for reliable as well as non-invasive diagnostic procedures. Until now, radioactive substances have been administered as part of the process of mapping glucose metabolism in the brain. Now a MedUni Vienna research team has developed a completely new magnetic resonance imaging (MRI) approach. Using a harmless glucose solution, the procedure generates reliable results and – in principle – can be used with all common MRI scanners. The findings from the study have been published in *N ature Biomedical Engineering* [1].

The study looked at – and has significantly enhanced – current diagnostic procedures for mapping brain glucose metabolism. The results were generated by measuring blood glucose levels and metabolic products in healthy subjects several times during a period of around 90 minutes. In contrast to existing procedures, the subjects did not receive radiolabelled glucose but a quantity of a harmless glucose solution equivalent to a can of a fizzy drink. As this substance does not produce a direct signal for the MR imaging method used, concentrations and metabolism of glucose were measured indirectly based on the drop in signal intensity for the product concerned.

"The main advantage of this indirect method is that it can be used on other MR devices without any difficulties, because no additional hardware components are required, as is the case with other, comparable approaches," explained principal investigator Wolfgang Bogner of the Department of Biomedical Imaging and Image-guided Therapy at MedUni Vienna, highlighting the clinical significance of the research findings.

Potential applications

Carried out by researchers from the Department of Psychiatry and Psychotherapy and Department of Medicine III at MedUni Vienna, the study used the university's high-performance 7-Tesla MRI scanner. Wolfgang Bogner and his team have already demonstrated that the novel approach also works on 3-Tesla MR scanners.

"That was an important step, because 3T MR systems are extremely widespread in clinical applications," said Fabian Niess, lead author of the follow-up study.

Further studies needed

Abnormalities in glucose metabolism are a feature of many common diseases. It is already known that cancer and tumour cells consume far greater amounts of glucose than normal cells – an effect that physicians can capitalise on when diagnosing and localising tumours. At present, this is done by means of positron emission tomography in combination with computed tomography (PET-CT), where patients have to be injected with a small amount of radioactive glucose. However, the findings will have to be verified in further studies before the new, less-invasive method can be deployed for the benefit of patients. MEH

Reference:

1. Bednarik, P., Goranovic, D., Svatkova, A. et al. 1H magnetic resonance spectroscopic imaging of deuterated glucose and of neurotransmitter metabolism at 7 T in the human brain. Nat. Biomed. Eng (2023). https://doi.org/10.1038/s41551-023-01035-z

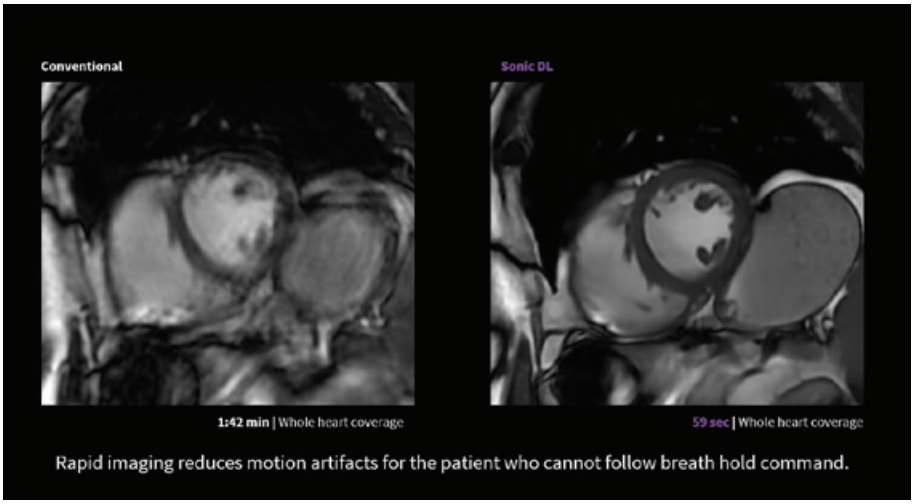
GE Healthcare's new Sonic DL deep learning tech enables sharp cardiac MR images in a single heartbeat

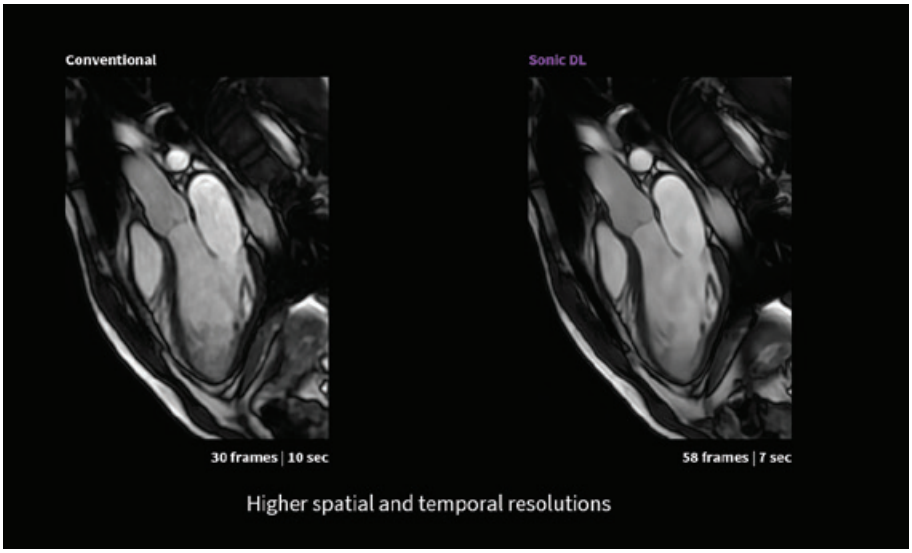
GE HealthCare has received FDA clearance and launched Sonic DL – a state-of-the-art deep learning-based technology designed to dramatically accelerate image acquisition in magnetic resonance imaging (MRI). Sonic DL enables new imaging paradigms, such as high-quality cardiac MRI in a single heartbeat. This breakthrough expands GE HealthCare's industry-leading AI-enabled solutions portfolio.

Caraiac MRI is the gold standard for assessing the structure and function of the heart in cardiovascular disease; however, its adoption globally remains relatively low, in part due to lengthy exam times. The current acquisition speed of MRI is too slow to capture the heart's contraction in real time, therefore requiring several heartbeats and multiple breath-holds. This process is time-consuming, prone to image quality degradation, and exhausting for patients. Consequently, there is a pressing need to address the growing demand for fast, high-quality, and comfortable cardiac MR imaging.

To address this need, GE HealthCare is introducing Sonic DL for cardiac MRI. Sonic DL technology is designed to scan up to 12 times faster compared to conventional methods, enabling rapid cardiac MR functional imaging in as fast as a single heartbeat, matching the speed of MRI to the speed of physiology. This advancement minimizes or removes the need for repetitive patient breath holds, simplifying procedures and expanding the pool of patients eligible for cardiac MRI to include arrhythmic patients and those with difficulty holding their breath.

"Sonic DL emerges as a game-changer in the field of cardiac imaging," explained Dr Gianluca Pontone, Director of Perioperative Cardiology and Cardiovascular Imaging Dept., Centro Cardiologico Monzino. "By capturing images within a single heartbeat, this cutting-edge technology addresses the unique needs of patients who face challenges in breath-holding, suffer from advanced heart failure, or have arrhythmias. The significance of this capability cannot be overstated, as it ensures a smoother and more comfortable experience for patients during MRI exams. Moreover, Sonic DL's ability to significantly reduce scan times mitigates the occurrence of motion artifacts that can compromise image quality, paving the way for more accurate and reliable diagnoses."





Sonic DL's capability to reduce cardiac MRI scan times by up to 83% also helps enhance productivity in radiology departments, streamlining workflows, alleviating backlogs, and reducing the burden on staff. Its cutting-edge technology tracks the beating heart with unparalleled image quality and overcomes the limitations of conventional acceleration techniques.

"Sonic DL is a paradigm shift for MR enabling high-quality imaging in a single heartbeat," said Jie Xue, President & CEO, Global MR, GE HealthCare. "It greatly expands patient access and improves diagnostic value for patients who need it the most but previously couldn't be scanned successfully. Our industry-leading deep learning technology, AIR Recon DL, has already benefited more than 10 million patients. We expect Sonic DL to further extend the lead of GE HealthCare in leveraging AI to advance healthcare and benefit patients around the world." MEH

SCHILLER's new MAGLIFE RT-1 enables vital signs monitoring during MRI scan

Monitoring of patients in the MRI environment is not often an easy task, particularly for those under anaesthesia such as children or neonates. Patient monitoring in the MRI room allows physicians to remain informed of changes to the patient's vitals that may otherwise go undetected.

The MAGLIFE RT-1 has been engineered to meet the needs of today's complex MRI environment. With the MAGLIFE RT-1, SCHILLER extends its monitoring range with a complete and innovative device. The MAGLIFE RT-1 performs patient monitoring in an MRI environment, including all necessary vital parameters. The system is designed for all patients: adults, children, and neonates. Use of the MAGLIFE RT-1 is versatile, designed for everyday use, from monitoring under anaesthesia to cardiac imaging.

The MAGLIFE RT-1 allows close monitoring during the examination and can be fully controlled from the MAGSCREEN RT-1 placed outside the Faraday cage. This allows the user to view the patient's vital parameters (curves and values) either in the MRI room, or from the control room. Thanks to the intuitive 15"6 touch screen interface, the user can adjust the display of all vital parameters and functions for a better medical analysis. The MAGLIFE RT-1 demonstrates robustness regarding artefacts allowing it to be placed at 50cm of the MRI machine and used with any MRI systems that have a field strength between 0.2 and 3 Tesla.

What makes this device a cutting-edge monitor is the use of wireless technology for the SpO_2 and ECG sensors. The sensors are easily paired to the device via Bluetooth and are stored in the integrated charging station. This technological innovation for ease of use is more reliable, more robust and is suitable for all type of patients, even premature babies.

Alongside with the ECG and SpO_2, the MAGLIFE RT-1 also monitors other parameters:

- NIBP (standard)
- IBP (optional)
- $etCO_2$, anaesthetic agents, O_2, N_2O (optional)
- Spirometry (optional)
- Temperature (optional)

With the optional spirometry measurement SCHILLER shows itself to be a pioneer. The spirometry option also allows the patient's respiratory mechanics under anaesthesia to be monitored during the MRI examination, in addition to the anaesthetic agent surveillance.

SCHILLER uses direct temperature measurement by optical interferometry. Using this optical measuring principle for temperature guarantees safe operation and immunity to electromagnetic interference.

For the wireless data transmission, the MAGLIFE RT-1 communicates with the remote display unit MAGSCREEN RT-1 via optic fibre, Ethernet, and WLAN, offering a safe Faraday cage penetration.

For a better MRI examination documentation, HL7 and DICOM communication will soon be available, allowing physicians to share the MAGLIFE RT-1 examination data (vital trends) with other hospital medical departments. MEH

MAGSCREEN RT-1

Wireless SpO2 sensor, adult

SCHILLER, an international presence

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

MAGLIFE RT-1

Revolutionary patient monitoring in the MRI environment

- Wireless ECG and SpO_2 sensors
- Spirometry
- Optical temperature measurement
- Touch screen interface

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Using fMRI, scientists discover spiral-shaped signals that organize brain activity

Scientists from the University of Sydney and Fudan University have unearthed human brain signals traversing the outer layer of neural tissue, which spontaneously organize into patterns resembling swirling spirals.

The study, released in the latest issue of *Nature Human Behaviour*, suggests that these pervasive spirals, detected as brain signals on the cortex during periods of rest and cognitive tasks, play a crucial role in orchestrating brain activity and cognitive functions.

Associate Professor Pulin Gong, the senior author from the School of Physics in the Faculty of Science, highlighted the potential of this finding to propel the development of highly advanced computing systems, drawing inspiration from the intricate mechanisms of the human brain. This breakthrough paves the way for novel avenues of comprehension regarding the inner workings of the brain, offering valuable insights into the fundamental operations of the human mind. By exploring the roles these spirals play, it may aid medical researchers in gaining a deeper understanding of brain disorders like dementia and their impact on cognitive function.

Associate Professor Gong, a member of the Complex Systems research group in Physics, emphasized the potential of unravelling the connection between these spirals and cognitive processing. He expressed that such insights could greatly enhance our comprehension of the dynamic nature and functionalities of the brain.

"These intricate spiral patterns showcase intricate and complex dynamics as they traverse the brain's surface, revolving around central points referred to as phase singularities," Prof. Gong explained.

"Similar to the way vortices behave in turbulence, these spirals engage in intricate interactions that play a vital role in organizing the intricate activities within the brain.

"The intricate interactions among multiple co-existing spirals enable neural computations to occur in a distributed and parallel manner, resulting in remarkable computational efficiency."

Yiben Xu, the lead author of the study and a PhD student from the School of Physics, highlighted that the placement of these spirals on the cortex provides them with the potential to connect activities in various sections or networks of the brain, effectively serving as bridges of communication. Additionally, many of these spirals are sufficiently large to span across multiple networks.

The cortex, or the cerebral cortex, constitutes the outermost layer of the brain and plays a pivotal role in numerous intricate cognitive functions such as perception, memory, attention, language, and consciousness.

Xu pointed out that a notable characteristic of these brain spirals is their tendency to emerge precisely at the boundaries that delineate distinct functional networks within the brain.

"Through their rotational motion, they effectively coordinate the flow of activity between these networks.

"Our research findings demonstrate that these interacting brain spirals facilitate the flexible reconfiguration of brain activity during tasks related to natural language processing and working memory. Remarkably, they achieve this by dynamically altering their rotational directions."

The scientists collected their findings by conducting functional magnetic resonance imaging (fMRI) brain scans on a group of 100 young adults. They analyzed the data using adapted methodologies employed to decipher intricate wave patterns observed in turbulence.

Traditionally, neuroscience has primarily focused on studying the interactions between individual neurons to unravel the workings of the brain. However, there is an emerging field of science that delves into broader processes occurring within the brain, aiming to shed light on its enigmatic complexities. This approach seeks to explore larger-scale phenomena and unveil new insights into the mysteries of the brain.

Prof. Gong noted that as we unravel the mysteries surrounding brain activity and delve into the mechanisms that govern its coordination, we are edging closer to fully unlocking the potential for understanding cognition and brain function.

Researchers conduct world's first studies with bedside portable MRI in paediatric ECMO patients

Patients who require ECMO therapy beyond a conservative ventilator are critically ill. Reasons may include lung failure, heart failure or infection. Children who require this special procedure can only be treated at a special treatment centre such as the Children's ECMO Center of the University Hospital of Bonn (UKB), where they are closely monitored. Here, both newborns and older children are treated with ECMO therapy.

"It is often necessary in this sensitive group of patients, even during ECMO therapy, to have an MRI of the brain to check the relevant structures in the brain. However, transport to a fixed device is unfortunately not possible," says Prof. Sabir. Last August, a grant from the Bill Gates Foundation enabled him to purchase a mobile MRI, which is being used at the UKB for the first time in Germany to clinically test diagnostics on premature and newborn infants. So far, it has only been used for research purposes in London. The mobile MRI has already been in use at the UKB for more than half a year and represents a groundbreaking further optimization of diagnostics for neonatal patients.

25 children have since been scanned in the mobile MRI at the UKB – the youngest weighed only 450 grams, the oldest was already 10 years old. The mobile MRI was used for routine examinations and for further diagnosis of abnormalities, e.g. after asphyxia (oxygen deficiency at birth). To evaluate the image quality of the mobile low-field MRI, a comparison image was taken in the permanently installed normal-field MRI at the UKB for each of the children examined. Their findings are published in *Critical Care* [1].

"We were more than satisfied with the results. Although the image quality of the mobile MRI is not as high-resolution as that of

Philips Blueseal helium-free MR magnet wins best new tech award

Philips's BlueSeal helium-free MR operations magnet has been named the 'Best New Technology Solution for Radiology' in the 7th annual MedTech Breakthrough Awards programme. The breakthrough design of Philips' BlueSeal Magnet addresses the urgent need to reduce the consumption of helium, a finite resource. It is the industry's first and only 1.5T fully sealed magnet that only requires 0.5% of the helium normally needed over the operational lifetime of industry-standard MR system magnets.

The BlueSeal Magnet was first introduced as part of the Philips MR – Ingenia Ambition and is now extended with the latest MR 5300 scanner which offers helium-free MR operations with no compromise on diagnostic confidence.

BlueSeal is one of a range of Philips leading health technologies and innovations designed to reduce hospitals' dependency on natural resources and energy consumption and help meet their sustainability goals.

"Philips' breakthrough development of its BlueSeal Magnet places it at the forefront of helium-free medical operations, supporting the transition to sustainable, helium-free-for-life operations, as well as simplifying installation and reducing costly disruptions to MR services. Congratulations on this innovation and being our pick for 'Best New Technology Solution for Radiology," said James Johnson, managing director, MedTech Breakthrough.

The MedTech Breakthrough Awards programme honours excellence and recognizes innovation, hard work, and success in a range of health and medical technology categories.

Compared to around 1,500 litres required for a conventional MR magnet, an MR scanner using Philips' BlueSeal Magnet is preloaded with a mere 7 litres of helium during manufacture, and remains essentially helium-free in operations for its life cycle. It reduces operating costs for hospitals, simplifies installation due to its reduced weight, and increases patient and staff safety by eliminating helium venting, even during a magnet quench.

"We see ourselves as a developer of resilient, energy-efficient, sustainable healthcare products and solutions. Our BlueSeal Magnet not only has the potential to steeply reduce the consumption of helium in the medical industry, but also ensures that on-site operators don't need to worry about helium-related complications and unpredictability," said Ruud Zwerink, General Manager MR at Philips.

Philips' BlueSeal Magnet comes with the unique ability to rapidly return to normal operation after an interruption, such as a magnetic object becoming stuck in the bore. It is supported by an artificial intelligence algorithm in its control electronics that enables single-click discharge and re-energization of the magnet from behind the MR console. This EasySwitch feature is one of several examples of how Philips is using AI to speed radiology workflows. MEH

a fixed device, the image data are ideal for emergency diagnostics and, above all, can be retrieved immediately. Among other things, we were able to detect brain haemorrhages, strokes or acute changes, such as the accumulation of cerebrospinal fluid, in the children examined so far and initiate the appropriate therapies immediately," said Prof. Sabir.

ECMO patients, however, pose a special challenge to the treatment team in connection with MRI diagnostics.

"While adults have a tube inserted in the groin area to transport blood during ECMO therapy, children often have access at the neck. The patients have to be moved very carefully and the tube at the neck may only be moved minimally," explained Prof. Sabir. However, reliable diagnostics, for example of brain haemorrhages, is only possible with MRI imaging. The neonatology and paediatric intensive care team was therefore able to demonstrate in four paediatric ECMO patients that imaging using mobile MRI can be performed without any problems.

The patients studied were a newborn, a two-year-old, a nine-year-old and a ten-year-old child. One of the children was diagnosed with a major brain haemorrhage using the mobile MRI and was treated immediately.

"The new findings prove that the scan can be performed safely. We obtained meaningful MRI images of the brain without changing the position of the neck cannula and without compromising the children's safety status. This represents an immense success for future MRI examinations of newborns and larger children who can only survive through the use of ECMO therapy," said Prof. Andreas Müller, Director of the Department of Neonatology at UKB. MEH

Reference:

1. Sabir, H., Kipfmueller, F., Bagci, S. et al. Feasibility of bedside portable MRI in neonates and children during ECLS. Crit Care 27, 134 (2023). https://doi.org/10.1186/s13054-023-04416-7

Chris Hemsworth chef Dan Churchill partners with Technogym, shares his nutrition tips for Summer 2023

Dan Churchill, performance chef and podcast host, took part in the very first Technogym Retreat in May of 2023. He is also the Founder and CEO of Charley St protein grounds and the Culinary Creative Director and Food and Nutrition Expert of Centr, Chris Hemsworth's lifestyle app. He holds a Masters in Exercise Science (strength & conditioning). Dan is the author of three books and has appeared on notable programs such as ABC's Good Morning America and The Drew Barrymore Show. He currently owns and operates the production company The Epic Table, along with a podcast of the same name. Dan was born on the beaches of Sydney, Australia and currently resides in New York City.

With summer coming up, Dan Churchill has provided Technogym and wellness enthusiasts with nutrition tips to help stay fit.

6 ways to improve your performance nutrition during the summer (with a focus on UAE's climate)

- **Water hydration.** Just 2% dehydration will have an impact on your performance. Especially in the UAE, this is of vital importance where heat can soar! Dehydration has an impact on blood plasma volume and blood flow, your cells do not get the required resources they need. To combat this simply consume 3L of water a day. This is a decent marker.
- **Electrolytes.** We lose between 350-700mg of sodium per hour of exercise depending on how much you perspire. Especially for those doing endurance exercise, be sure to replenish with the amount of sodium that you use (if you are a light sweater aim to the lower target of 350mg. If you are a heavy sweater 700mg per hour of exercise).
- **Protein.** Protein is naturally important to look after repairing your damaged tissue leading to a performance adaptation. Aim for 1.7x your bodyweight in kg as a base marker for the amount of protein in grams you should be consuming per day. Example: if you weigh 80kg… 80 x 1.7 = 136. So, aim for a minimum of 136g of protein daily.
- **Meal timing.** If you did not eat before your workout, be sure to consume foods or at least a smoothie directly after your workout. If you did eat before, you still have enough amino acids in your system to look after you for an hour, but make sure to have food shortly thereafter.
- **Variety of plants.** You need your dietary fibre to look after your gut which is responsible for digestion and top of funnel for nutritional absorption. By providing your body with a variety of dietary fibre you also support your central nervous system, which is responsible for sending messages between the muscles and brain for performance.
- **Sleep.** Whilst not directly nutritional, getting adequate sleep supports hormone release to help with performance adaptation, but it can also be linked to poor digestion if you do not get enough of it. Insufficient sleep can also mess with your hunger hormones, so you may think you are hungry when you are in fact not. Aim for 7 hours minimum a night.

Nutrition trends in 2023: What has changed and what to expect in the future

There has been an increasing amount research around gut health – and how this affects overall performance. A growing number of people are now in tune with their sleep patterns and are using wearable technology to assess how well they are sleeping.

Whilst we see some companies are enabling this already, I believe the future is going to include the ability for everybody to truly be able to quantify how well they are absorbing certain foods and will be able to check hourly what nutrients they are deficient in, so they can adjust their meals for the rest of the day. MEH

Technogym 2023

Technogym, brand leader in fitness, sport, and wellness and nine times Official Supplier of the Olympic Games, creates its once-in-a-lifetime Technogym Retreat (10-12 May) in one of the world's most beautiful destinations in the world. The retreat is part of the mission: "Let's Move For a Better World". It has the goal of amplifying the brand's commitment and social responsibility mission, as well as to celebrate the launch of Technogym's new treadmill Technogym Run. The new treadmill, born from Technogym's 40 years of experience in fitness and sport, offers a single solution which matches the quality and technology found in the world's best gyms. It provides an unprecedented variety of workouts: from running, to power, to bootcamp. To make it an unforgettable experience, Technogym has partnered with Jeremy Jauncey – CEO of Beautiful Destinations and invites famous influencers and experts in nutrition and training to join the event. MEH


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Target-Controlled Infusion anaesthesia: New more universal models

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

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

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

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

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

PK models are based on body compartments

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

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

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

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

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

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

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

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

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

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

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

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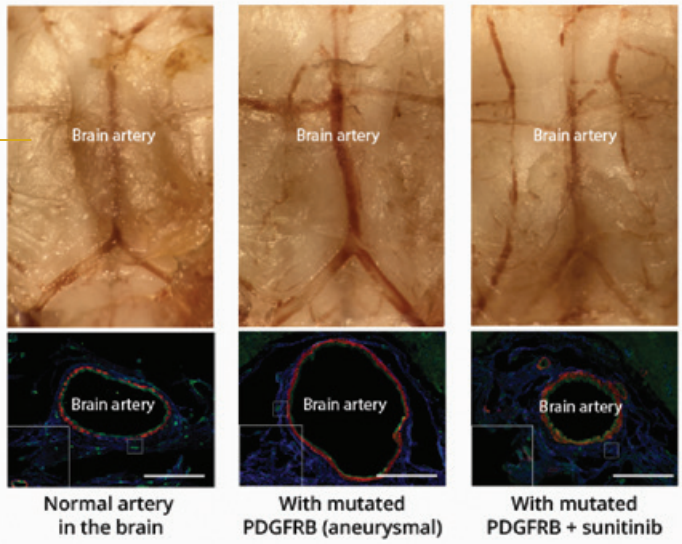

A mouse model of intracranial aneurysm and successful drug treatment. First drug treatment for aneurysm in a mouse model. (Left) A photo of normal basil artery in the mouse brain above and cross section below. (Middle) An aneurysmal basil artery that has ballooned to twice the diameter. The aneurysm was created in this specific artery by injecting a virus nearby that carried the discovered mutant PDGFRB gene. (Right) Treatment with the drug sunitinib blocks the abnormal activity of the mutant gene, and thus is able to prevent the aneurysm.

Researchers show gene mutation root to brain aneurysms and demonstrate first drug treatment

Researchers at the RIKEN Center for Brain Science (CBS) in Japan have discovered a set of related mutations that lead to intracranial aneurysms – weakened blood vessels in the brain that can burst at any time. The mutations all appear to act on the same biological signalling pathway, and the researchers report the first ever pharmaceutical treatment, which works by blocking this signal. The study was published in *Science Translational Medicine* on June 14 [1].

About 5% of the population have unruptured intracranial aneurysms in blood vessels on the surface of the brain. Despite being ballooned arteries with weakened walls, intracranial aneurysms often go undetected – until a rupture leads to deadly bleeding around the brain. Even when they are detected in advance, the only currently available treatment options involve surgery, which has its own set of risks, especially if the aneurysm is in a sensitive location. Finding other, non-surgical options is thus a high priority, and research into the origin of intracranial aneurysms has led the RIKEN CBS team to one such potential treatment.

Two types of intracranial aneurysms

Intracranial aneurysms actually come in two types called intracranial fusiform aneurysms (IFAs) and intracranial saccular aneurysms (ISAs), with about 90% being the ISA variety. Previous research reported mutations in IFA arteries, but the origins of the more common ISA type remain unclear. To address this issue, the RIKEN team sequenced the entire exomes – all protein-encoding pieces of DNA – in cells that made up 65 aneurysmal arteries and 24 normal arteries. Along with subsequent deep-targeted sequencing, they found that six genes were common among IFAs and ISAs and never appeared in non-aneurysmal arteries, while 10 others appeared only in either IFAs or ISAs. While several factors, such as age, hypertension, and alcohol consumption, increase the risk of intracranial aneurysms, project leader Hirofumi Nakatomi from RIKEN CBS notes, "the unexpected finding that greater than 90% of aneurysms had mutations in a common set of 16 genes indicates that somatic mutation could be the major trigger in most cases".

Blocking the signalling pathway

Further testing showed that mutations to all six of the genes common to IFAs and ISAs triggered the same NF-κB biological signalling pathway. The next step was to learn more about the mutations and try to block the abnormal signalling. First, they showed that mutations to one of the six genes, PDGDRB, could be traced along different layers within samples of human aneurysms. Then, after linking the PDGDRB mutation with faster cell migration and inflammation in cultured cells, they discovered that these effects could be blocked with sunitinib, a drug that prevents the changes to PDGDRB that allow signalling.

Next, they created a mouse model of intracranial aneurysm by using an adenovirus to insert mutant PDGFRB into the basilar artery at the base of the brain. After a month, the size of the artery had doubled in diameter and become very weak. As in the cultured cells, the effect of the mutant gene was blocked when the mice were given sunitinib; their basilar arteries remained normal sized and strong. "Establishing the first non-surgical animal model of intracranial aneurysm is in itself an achievement," says Nakatomi, "but more importantly, we suppressed artery expansion with a drug, indicating that intracranial aneurysms can be pharmacologically treated."

Additional research will be required to demonstrate that this kind of drug treatment is effective for human patients. But perhaps the more difficult hurdle will be detection. As Nakatomi explains, "unruptured intracranial aneurysms are usually detected by Magnetic Resonance Angiography or Computed Tomography Angiography during health checkups. If these tests are not available, then aneurysms are undetectable until they burst." In Japan, where this research was conducted, many people can receive these tests as part of their annual health checkup, making the development of drug treatments particularly useful.

- Watch: The mutant origin of brain aneurysms and the first drug treatment *https://youtu.be/5ydVLtOz2mc*

Reference:

1. Shima Y, et al. (2023) Increased PDGFRB and NF-κB signaling caused by highly prevalent somatic mutations in intracranial aneurysms. Sci Transl Med. doi: *https://doi.org/10.1126/scitranslmed.abq7721*

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