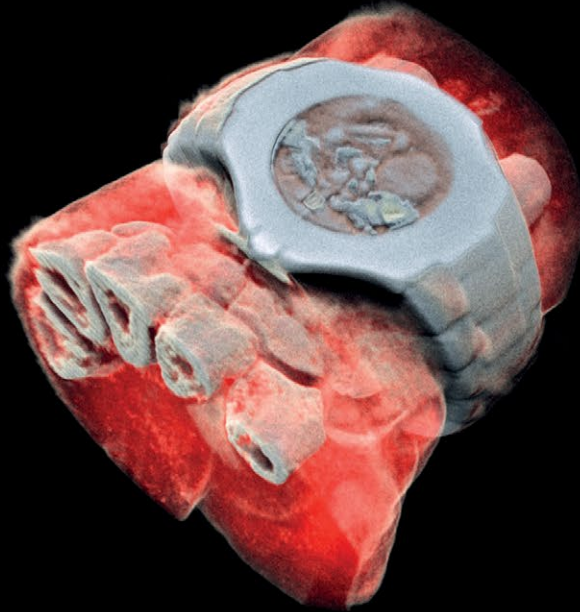


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September - October 2018



3D colour X-ray set to revolutionise imaging

Father & son team develop world's first colour spectral CT using tech from CERN's Large Hadron Collider

Health tourism

Turkey's successful drive to attract foreign patients generates US\$7 billion

Orthopaedic innovation

New robotic spine exoskeleton provides hope for improved spine deformity treatments

In the News

- Landmark changes made to TB treatment regimen
- Dr Ahmed Al-Mandhari speaks out against attacks on healthcare workers
- Study finds 3 minutes is optimal time to clamp umbilical cord of neonate
- Stress during pregnancy increases risk of mood disorders for female offspring
- Researchers make bionic eye prototype with 3D printing



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Prognosis

Innovation

One of the great enjoyments of editing *Middle East Health* is trying to keep abreast of all the new medical research that is pouring out of university laboratories around the world. There really is just too much going on to keep up with it all. But delving into this abundance of research and innovation allows you to come away feeling really positive about the future of medicine. For example, in this issue we run a brief report about researchers at the University of Minnesota who have 3D-printed a prototype of a bionic eye. As they say, this discovery marks a significant step toward creating a bionic eye that could someday help blind people see or sighted people see better. Also, a father and son team in New Zealand have taken technology from the CERN hadron collider and spent the past 10 years developing the world's first colour X-ray in the form of spectral CT scanner. You can read more about this in our focus on X-ray imaging.

The field of genetics and stem cell research is rich with new innovations. For example, we report on a clinical trial that has begun recently at Queen Mary University of London and Barts Health NHS trust, which will use stem cell transplants to grow a new immune system for people with untreatable Crohn's disease. The researchers say they're hoping that by completely resetting the patient's immune system through a stem cell transplant, they might be able to radically alter the course of the disease. While it may not be a cure, it may allow some patients to finally respond to drugs which previously did not work.

On the local front, in the UAE report, we look at the successful first double-lung transplant in the UAE carried out by surgeons at Cleveland Clinic Abu Dhabi. They say this successful procedure will now mean patients in the region no longer need to travel abroad for this treatment.

In our focus on Orthopaedics and Sport Medicine we look at a study done in Finland – the Finnish Shoulder Impingement Arthroscopy Controlled Trial (FIMPACT) which compared surgical treatment of shoulder impingement syndrome to placebo surgery. They found that the most common shoulder operation to treat shoulder impingement syndrome – decompression through keyhole surgery – is essentially not necessary, as the results after 2 years are no better than the placebo group, those who did not undergo the surgery. They expect this finding will have major repercussions on contemporary treatment practices.

Health tourism is a very competitive market with many countries around the world jumping on this bandwagon as a way to attract more tourists and revenue to their countries. Turkey has been investing a lot in this sector over the past few years and is now starting to reap the rewards. In 2017 they generated more than US\$7 billion from health tourism and expect this to increase significantly over the next few years. You can read more about this in the Turkey report.

This issue is filled with interesting research briefs and other useful information for all our readers.

Read on.

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NEWS

- 6 Middle East Monitor
- 9 Worldwide Monitor
- 12 The Laboratory

FOCUS

- 18 **Orthopaedics and Sports Medicine:** Common shoulder operation is no more beneficial than placebo
- 28 **Turkey Report:** Turkey generates \$7 billion from health tourism
- 36 **Imaging – X-ray:** New 3D colour x-ray set to revolutionise medical imaging
- 40 **UAE report:** Cleveland Clinic Abu Dhabi surgeons perform UAE's first double-lung transplant

NEWS FEATURES

- 48 Breastfeeding should begin within first hour after birth
- 52 Researchers 3D-print bionic eye prototype

REGULARS

- 50 Product News
- 54 The Back Page
- 55 Agenda



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Update from around the region



Dr Ahmed Al-Mandhari, WHO Regional Director for the Eastern Mediterranean

Dr Ahmed Al-Mandhari speaks out against attacks on healthcare workers

The Eastern Mediterranean Region is witnessing an unprecedented number, magnitude and severity of emergencies, culminating in a major humanitarian tragedy. More than 70 million people are in need of health aid, including 16 million people displaced within their countries, and 32 million people who are food insecure, according to a statement by Dr Ahmed Al-Mandhari, WHO Regional Director for the Eastern Mediterranean region, issued on 19 August 2018 to mark World Humanitarian Day.

Dr Al-Mandhari notes: Behind the numbers are real people, each one caught up in the absurdity of war and facing daily hardships and challenges: the mother wondering where the next meal for her hungry children will come from; the cancer patient struggling to find a hospital that is equipped to provide treatment; the woman who has been abused and humiliated; the elderly man exposed to scorching heat with only a tent for shelter; the little boy caught in the cross-fire and now paralyzed for life.

A number of countries in our Region, including the Syrian Arab Republic and Yemen, have become the new face of humanitarian suffering. Besieged popula-

This year alone, 423 incidents of attacks on health care occurred in countries and territories of the Eastern Mediterranean Region, in which 124 health workers and patients were killed.

tions are cut off from aid and subjected to gross human rights violations. Millions of refugees and displaced people live in overcrowded camps and non-camp settings, exposed to often unsanitary living conditions. Long-forgotten diseases have re-emerged, and people are dying of diseases that could be easily and quickly treated under normal circumstances. Mass population movement has caused infectious diseases to cross borders to neighbouring countries, putting entire regions at risk.

The need to provide life-saving health aid, protect people from deadly diseases, and ensure that all people everywhere have access to health care has never been greater. And yet, the threats facing health workers operating in conflict settings in our Region are greater than ever. The Syrian Arab Republic remains the world's most dangerous country for health workers. In Afghanistan, Gaza, Libya, Pakistan, Somalia, Sudan and Yemen, health workers are targeted and murdered.

This year alone, 423 incidents of attacks on health care occurred in countries and territories of the Eastern Mediterranean Region, in which 124 health workers and patients were killed. Beyond the senseless loss of life, these attacks have even greater consequences, depriving thousands of people of life-saving medical care at the time when they need it most, leading to even more unnecessary deaths, and eroding the trust of affected populations in health facilities as neutral spaces and safe havens for care.

People caught up in armed conflict lose their livelihoods, their homes, and almost everything they own. It is our collective responsibility to make sure that they do not

lose one of their most basic rights: their right to health. Doctors, nurses, paramedics, vaccinators, pharmacists, midwives, community volunteers and other health workers who risk their lives every day must be protected. Even in times of crisis, no one should die because they lack access to health care, and no one should die as they try to provide it.

I reiterate WHO's call for the protection of health workers and health facilities under International Humanitarian Law, for immediate and sustained access to all people-in-need of health aid, and for peaceful political solutions to conflicts in the Region that have taken their toll on millions of innocent civilians. The time has come for people to rebuild their lives and their communities, for collapsed health systems to be restored, and for countries to start the journey to reconstruction and recovery.

Israeli forces shoot dead first responder in Gaza

On 10 August, Abdullah Al-Qutati, a first responder, was killed by Israeli forces while working to help those injured during protests east of Rafah in the south of the Gaza Strip. He is the third health worker to be killed since demonstrations began as part of the Great March of Return in Gaza on 30 March.

WHO issued a statement following the incident reiterating that the protection of health workers, patients and health facilities must be respected.

Abdullah was 22 years old and grew up in Tal As-Sultan in the south of the Gaza Strip. He was in the final year of his psychology degree at Al Aqsa University in Gaza City, and from January 2018 had been volunteering with Nabd Al-Hayat (Life's Pulse), a team providing first aid training as well as mental health and psychosocial support around Rafah. Since the start of the Great March of Return, Abdullah and the Nabd Al-Hayat team had been volunteering as first responders during the demonstrations, at the Ministry of Health medical point east of Rafah. First responders provide immediate treatment and evac-



Dr Hanan Mohamed Al Kuwari, Minister of Public Health and members of HMCs ECMO team

uation for those injured. Abdullah liked to be photographed in his white coat, and his colleagues say he was proud of the work he was doing and the service he could offer to his community.

Abdullah was shot while providing care to a 55-year-old man who had also just been hit by live ammunition. Abdullah was pronounced dead after he had been taken to the European Gaza Hospital. The injured patient he was treating at the time, Ali Al-Alol, also later died.

On 10 August, initial reports indicate that there were at least 5 incidents of attacks on health with 5 health workers injured besides Abdullah, and an ambulance damaged. These attacks are in addition to the 203 recorded incidents against health staff and facilities from 30 March to 3 August, which affected 373 health workers (2 of whom had died), 59 health vehicles and 2 health facilities. Overall, 164 people have been killed and 17,566 injured since the start of the demonstrations on 30 March, including preliminary figures released by the Ministry of Health for 10 August.

Dr Gerald Rockenschaub, Head of WHO in the occupied Palestinian territory, stated: "Our thoughts are with Abdullah's family, friends and colleagues at this difficult time. The protection of health workers, patients and health facilities must be respected in accordance with international humanitarian law. Health workers like Abdullah should be able to carry out their work without fear and without risking their lives."

HMC receives international recognition for its life support program

Hamad Medical Corporation (HMC) has become the first healthcare organization in the Middle East, Western Asia, and Africa region to receive the Extracorporeal Life Support Organization's (ELSO) Award for Excellence in Life Support (Gold Level) for its extracorporeal life support program. Also called extracorporeal membrane oxygenation (ECMO), the ECMO therapy

is used as a last resort support system for the lungs or heart and has helped save the lives of around one hundred infants, children, and adults in Qatar since first being introduced at HMC in 2014.

The Ministry of Public Health commissioned the lifesaving program in 2013 in response to the MERS-CoV outbreak in the region. The MERS-CoV infection is associated with a high mortality rate due to the rapid onset of severe respiratory and renal failure. Dr Hanan Mohamed Al Kuwari, Minister of Public Health, congratulated HMC's ECMO team on the award, noting that the technology is an example of Qatar's commitment to providing patients with the world's best care.

"In early 2013, the Ministry facilitated an ECMO partnership between HMC and UK-based Guy's and St Thomas' NHS as part of our national MERS-CoV preparedness and response plan, and specifically the need to treat patients with severe respiratory illness. ECMO offers patients the highest level of life support and over the last four years, HMC's skilled ECMO team has used this technology to treat some of the sickest and most severely traumatized patients. The ELSO award signifies Qatar's commitment to bringing the world's best technologies and treatments to Qatar and it demonstrates to patients and families a dedication to providing the best care possible," said Dr Al Kuwari.

HMC's Director of the Medical Critical Care Division and ECMO Program, Dr Ibrahim Fawzy Hassan, said in addition to being one of the few healthcare systems in the Middle East region to use ECMO, HMC is also a regional training center for the technology.

Last year a group of medical experts in the country developed a first-of-its-kind mannequin to help train teams on the system. The ECMO simulation mannequin was conceptualized, designed, and built in Qatar.

"ECMO is a bridge to recovery for patients with reversible lung and heart failure. The ECMO machine acts as a temporary, artificial lung and heart and takes over the work of these organs while the body is allowed to recover with the help of

other medical and surgical measures. This technology allows us to provide the highest level of care to patients with complex illnesses," said Dr Fawzy,

"Our extracorporeal life support program is a model for quality and I am very proud of the commitment of our whole team to ensuring its successful implementation at HMC. It is because of this team effort that we reached such a high level of achievement. This award is an affirmation of the continued hard work that the ECMO team and key support staff has done, and continues to do daily, to achieve our goal of providing the best possible care to patients. It recognizes the skill and dedication of our multi-disciplinary team of physicians, nurses, perfusionists, respiratory therapists, nutritionists, pharmacists, physiotherapists, and critical care paramedics," Dr Fawzy said.

The Excellence in Life Support Award was presented to members of HMC's ECMO team on 24 May. The award is for a three-year term and recognizes centers worldwide that demonstrate an exceptional commitment to evidence-based processes and quality measures, advanced education for staff, patient satisfaction, and ongoing clinical care. It also demonstrates an assurance of high-quality standards, specialized equipment and supplies, and defined patient protocols. Recipients of the Excellence in Life Support Award are designated as Centers of Excellence.

Funding gaps threaten closure of health facilities serving 1 million in Iraq

A lack of funding is threatening to close critical health facilities in Iraq, leaving almost one million people without access to basic medicines and health care, according to the WHO.

Support for health services in Iraq has drastically declined since the end of the Mosul campaign just over one year ago. Four health partners have already shut down 22 health service delivery points in 2018 due to a shortage of funds, leaving critical gaps in the provision of health care for children, women and men who are still



displaced from their homes, and those who have returned to areas with heavily damaged infrastructure.

In total, 38% of health facilities supported by nine health cluster partners are at risk of closure by the end of July, resulting in increased risk of communicable diseases outbreaks and roll back recovery efforts in areas devastated by conflict.

These facilities currently offer health services to more than 900 000 displaced Iraqis and residents of host communities, including the treatment of common diseases, gynaecological services, vaccinations for children, nutrition screening and referral of complicated medical cases for advanced treatment.

So far, only US\$8.4 (12.5%) of the \$67.4 million required by health cluster partners for the Iraq Humanitarian Response Plan for 2018 has been funded.

\$54 million is urgently required by health partners under the Humanitarian Response Plan to ensure continuation of health services in newly-accessible governorates of Iraq.

Health cluster partners play a crucial role in providing health care for displaced people and host communities in Iraq. Since 2018, health partners have treated more than 1.2 million Iraqis.

MERS update

According to WHO, as at the end of July 2018: A total of 2237 laboratory-confirmed cases of Middle East respiratory syndrome (MERS), including 793 associated deaths (case-fatality rate: 35.5%) were reported globally; the majority of these cases were reported from Saudi Arabia (1861 cases, including 719 related deaths with a case-fatality rate of 38.6%).

During the month of July, a total of 6 laboratory-confirmed cases of MERS were reported in Saudi Arabia including 1 associated death (case-fatality rate: 16.7%).

These cases include one symptomatic household contact; no healthcare associated transmission or hospital outbreak was reported during this month.

The demographic and epidemiological characteristics of reported cases, when compared during the same corresponding

period of 2013 to 2018, do not show any significant difference or change. Owing to improved infection prevention and control practices in hospitals, the number of hospital-acquired cases of MERS has dropped significantly since 2015.

WHO says the age group 50–59 years continues to be at highest risk for acquiring infection of primary cases. The age group 30–39 years is most at risk for secondary cases. The number of deaths is higher in the age group 50–59 years for primary cases and 70–79 years for secondary cases.

Strong surveillance helps reduce viral hepatitis in Qatar

Education, increased public awareness, and surveillance are all being noted as factors contributing to the continued reduction in the number of viral hepatitis cases diagnosed in Qatar each year. Between 2010 and 2016 over 4,400 cases of the Hepatitis C virus (HCV) were diagnosed in Qatar, with 228 of those cases identified in 2015 and 163 in 2016, demonstrating a continued year-on-year decrease.

Reducing the spread of viral hepatitis has continued to be a priority for Qatar, with significant investment being made toward both diagnosing and treating those infected. All pregnant women, blood donors, and those working in high-risk professions, such as healthcare, food service, and personal care industries, including barber shops and beauty salons, are tested for the virus annually. Additionally, every newcomer to the country is screened for a number of infectious diseases, including hepatitis, to identify those infected, provide them with care, and prevent the spread of the disease. All babies born in Qatar are also vaccinated at birth against hepatitis.

Dr Muna Al Maslamani, Medical Director of Hamad Medical Corporation's (HMC) Communicable Disease Center (CDC), said: "Qatar has remained proactive in its efforts to prevent the spread of infectious diseases among the population. We have set up a national disease surveillance system for the early detection of infectious diseases. We have also fortified



Dr Muna Al Maslamani, Medical Director of HMC's Communicable Disease Center.

our healthcare structure by implementing high-quality infection control measures and ensuring that healthcare workers and others employed in what are considered to be high-risk professions are annually screened for viral hepatitis."

Dr Al Maslamani, who is also the Senior Consultant for HMC's Infectious Diseases Division, says the CDC is dedicated to the diagnosis, treatment, and prevention of infectious diseases such as hepatitis, tuberculosis (TB), leprosy, Middle East Respiratory Syndrome (MERS), influenza, measles, and human immunodeficiency virus (HIV). She says the continued decrease in the number of viral hepatitis cases diagnosed in Qatar each year is a direct result of the country's strong surveillance system and the implementation of a national immunization plan for newborns.

"The screening of all newcomers to Qatar at the Medical Commission and the vaccination of babies at birth are the main reasons for the marked decline in the prevalence of hepatitis in Qatar," said Dr Al Maslamani.

She added that all individuals in Qatar who are diagnosed with viral hepatitis are provided with adequate medical care, without discrimination. Treatment for viral hepatitis is normally supportive, meaning care given to prevent, control, or relieve complications and side effects and to improve the patient's comfort and quality of life. **MEH**

worldwide monitor

Update from around the globe

Countries step up to tackle antimicrobial resistance

Countries are making significant steps in tackling antimicrobial resistance (AMR), but serious gaps remain and require urgent action, according to a report released recently by the Food and Agriculture Organization of the United Nations (FAO), World Organisation for Animal Health (OIE) and the World Health Organization (WHO).

The report charts progress in 154 countries and reveals wide discrepancies. Some, including many European countries, have been working on AMR policies in human and animal sectors for more than four decades. Others have only recently started to take action to contain this growing threat. Progress in developing and implementing plans is greater in high-income than low-income countries but all countries have scope for improvement. No country reports sustained capacity at scale in all areas.

The report looks at surveillance, education, monitoring and regulating consumption and use of antimicrobials in human health, animal health and production, as well as plants and the environment – as recommended in the Global Action Plan published in 2015.

Promising findings include 105 countries with a surveillance system in place for reporting drug-resistant infections in human health and 68 countries with a system for tracking consumption of antimicrobials. In addition, 123 countries reported that they have policies to regulate the sale of antimicrobials, including the requirement of a prescription for human use – a key measure to tackle overuse and misuse of antimicrobials.

But implementation of these policies varies and unregulated medicines are still available in places such as street markets, with no limits on how they are used. Medicines are very often sold over the counter and no prescription is requested. This puts

human and animal health at risk, potentially contributing to the development of antimicrobial resistance.

The report highlights areas, particularly in the animal and food sectors, where there is an urgent need for more investment and action. For example, only 64 countries report that they follow FAO-OIE-WHO recommendations to limit the use of critically important antimicrobials for growth promotion in animal production. Of these, 39 are high-income countries, with the majority in WHO's European Region. By contrast, only 3 countries from WHO's African Region and 7 countries from the WHO Region of the Americas have taken this important step to reduce the emergence of antimicrobial resistance.

A total of 67 countries report at least having legislation in place to control all aspects of production, licensing and distribution of antimicrobials for use in animals. But 56 either said that they had no national policy or legislation regarding the quality, safety and efficacy of antimicrobial products used in animal and plant health, and their distribution, sale or use, or that they were unable to report whether they have these policies in place.

There is also a substantial lack of action and data in the environment and plant sectors. Although 78 countries have regulations in place to prevent environmental contamination generally, only 10 of them report having comprehensive systems to ensure regulatory compliance for all waste management, including regulations that limit the discharge of antimicrobial residues into the environment. This is insufficient to protect the environment from the hazards of antimicrobial production.

"This report shows growing global momentum to combat antimicrobial resistance," says Dr Ranieri Guerra, Assistant Director-General for Antimicrobial Resistance at WHO. "We call on governments to make sustained commitments across all sectors – human and animal health, plant

health and the environment – otherwise we risk losing the use of these precious medicines."

"Supporting low- and middle-income countries to follow guidance of responsible and prudent use of antimicrobials in animals is an urgent priority," says Dr Matthew Stone, Deputy Director General of the World Organisation for Animal Health (OIE). "Implementation of dedicated OIE international standards, appropriate national legislation and strengthening of veterinary services are essential steps to help all animal health stakeholders contribute to controlling the threat posed by antimicrobial resistance."

"FAO welcomes that many countries are taking concrete steps towards the responsible use of antimicrobials in agriculture," says Maria Helena Semedo, FAO Deputy Director-General. "However, countries need to do more to reduce the unregulated and excessive use of antimicrobials in agriculture. We particularly urge countries to phase out the use of antimicrobials for growth promotion in animal production – terrestrial and aquatic."

From this survey and other sources, the Tripartite (FAO, OIE and WHO) is aware that 100 countries now have national action plans for AMR in place and a further 51 countries have plans under development, but more needs to be done to ensure that they are implemented. Only 53 countries report that they have a multisectoral working group that is fully functional, although a further 77 have established such a group. Only 10 countries report that the funding for all actions in the plan is identified and many middle- and low-income countries may need long-term development assistance to implement their plans effectively and sustainably. Positively, among the top ten chicken-, pork- and cattle-producing countries that responded to the AMR survey, 9 out of 10 have at minimum developed a national action plan; the majority of these have plans in operation with a monitoring arrangement.



US NIH Clinical Center releases dataset of 32,000 CT images

The US National Institutes of Health's (NIH) Clinical Center has made a large-scale dataset of CT images publicly available to help the scientific community improve detection accuracy of lesions. While most publicly available medical image datasets have less than a thousand lesions, this dataset, named DeepLesion, has over 32,000 annotated lesions identified on CT images.

The images, which have been thoroughly anonymized, represent 4,400 unique patients, who are partners in research at the NIH.

Once a patient steps out of a CT scanner, the corresponding images are sent to a radiologist to interpret. Radiologists at the Clinical Center then measure and mark clinically meaningful findings with an electronic bookmark tool. Similar to a physical bookmark, radiologists save their place and mark significant findings to be able to come back to at a later time. These bookmarks are complex - they provide arrows, lines, diameters, and text that can tell the exact location and size of a lesion so experts can identify growth or new disease.

The bookmarks, abundant with retrospective medical data, are what scientists used to develop the DeepLesion dataset. DeepLesion is unlike most lesion medical image datasets currently available, which can only detect one type of lesion. The database has great diversity - it contains all kinds of critical radiology findings from across the body, such as lung nodules, liver tumours, enlarged lymph nodes, and so on.

The conventional methods for collecting image labels like a search engine does, cannot be applied in the medical image domain. Medical image annotations require extensive clinical experience. But, that could change. The dataset released is large enough to train a deep neural network - it could enable the scientific community to create a large-scale universal lesion detector with one unified framework.

With the release of the dataset, researchers hope the others will be able to:

- Develop a universal lesion detector that will help radiologists find all types of lesions. It may open the possibility to serve as an initial screening tool and send its detection results to other specialist systems trained on certain types of lesions.

- Mine and study the relationship between different types of lesions. In DeepLesion, multiple findings are often marked in one CT exam image. Researchers are able to analyze their relationship to make new discoveries.

- More accurately and automatically measure sizes of all lesions a patient has, enabling the whole body assessment of cancer burden.

- Images are available via Box: <https://nihcc.box.com/v/DeepLesion>

In the future, the NIH Clinical Center hopes to keep improving the DeepLesion dataset by collecting more data, thus improving its detection accuracy. The universal lesion detecting capability will become more reliable once researchers are able to leverage 3-D and lesion type information. It may be possible to further extend DeepLesion to other image modalities such as MRI and combine data from multiple hospitals, as well.

In 2017, the research hospital released anonymized chest x-ray images and their corresponding data.

- Images are available via Box: <https://nihcc.app.box.com/v/ChestXray-NIHCC>

Countries urged to implement landmark changes to TB treatment regimen

Major improvement in treatment outcomes and quality of life of patients with multi-drug-resistant tuberculosis (MDR-TB) are expected, following key changes in MDR-TB treatment announced by WHO.

The first important change is a new priority ranking of the available medicines for MDR-TB treatment, based on a careful balance between expected benefits and harms. Treatment success for MDR-TB

is currently low in many countries. This could be increased by improving access to the highest-ranked medicines for all patients with MDR-TB.

The second important change is a fully oral regimen as one of the preferred options for MDR-TB treatment, with injectable agents proposed to be replaced by more potent alternatives such as bedaquiline (the first-ever medicine to be developed specifically for the treatment of MDR-TB). Injectable agents cause pain and distress to patients, with many experiencing serious adverse effects that often lead to treatment being interrupted.

"The treatment landscape for patients with MDR-TB will be dramatically transformed for the better with the announcement today," said Dr Soumya Swaminathan, WHO Deputy Director-General for Programmes. "Building on the available new data, and with the involvement of a large number of stakeholders, WHO has moved forward in rapidly reviewing the evidence and communicating the key changes needed to improve the chances of survival of MDRTB patients worldwide. Political momentum now needs to urgently accelerate, if the global crisis of MDR-TB is to be contained."

The WHO rapid communication aims to encourage and prepare countries to implement the upcoming new consolidated, updated and more detailed WHO policy guidelines on MDR-TB treatment which will be released later this year. WHO is also establishing a multi-stakeholder Task Force to coordinate support to national TB programmes in their rapid transition to the key changes envisaged.

The announcement follows an in-depth assessment of the latest evidence on the efficacy and safety of medicines available to treat MDR-TB by an independent panel of experts convened by WHO. The outcomes of the meeting, held 16-20 July, also have major and immediate implications for countries, donors and technical partners as clinical care, national diagnostic and treatment policies, medicine and diagnostic procurement strategies, and training plans will require rapid review and adaptation.

The meeting was the culmination of an extensive process initiated by WHO in 2017. Following WHO's public call for data, anonymized individual patient records from clinical trials, observational studies and national TB programmes were incorporated into a global database hosted by McGill University, Canada under contract with WHO. International standards for data analyses by the McGill group ensured high confidence in the findings and enabled WHO to rapidly communicate the key changes.

"Evidence-based interventions are essential for optimal clinical care of patients and effective public health service delivery," said Professor Holger Schünemann, Director of Cochrane Canada and member of the International GRADE Working Group, who chaired the expert panel meeting. "WHO is a leader in ensuring that its policies and guidelines meet the highest scientific standards, which should generate full trust by its member states and other stakeholders."

TB is among the oldest diseases known to mankind, yet remains one of the top 10 causes of death worldwide today, as well as the leading global infectious disease killer. About 600,000 new cases of MDR-TB (or other rifampicin-resistant TB) emerge each year and about 240,000 people die of these forms of TB each year according to WHO estimates.

MDR-TB is a major driver of antimicrobial resistance worldwide and threatens hard-earned gains made in the global TB response over the past twenty years. Diagnosis and treatment of MDR-TB remain a major challenge, with only one in four affected people currently being detected and even fewer being treated successfully.

"We would like to thank countries, technical partners, donors, civil society and other key TB stakeholders for their contribution that has culminated in these positive changes for MDR-TB patients," said Dr Tereza Kasaeva, Director of WHO's Global TB Programme. "We now ask for their urgent support to national TB programmes in their transition to new MDR-TB treatment regimens."

Measles cases hit record high in the European Region

Over 41,000 children and adults in the WHO European Region have been infected with measles in the first 6 months of 2018. The total number for this period far exceeds the 12-month totals reported for every other year this decade. So far, the highest annual total for measles cases between 2010 and 2017 was 23,927 for 2017, and the lowest was 5273 for 2016. Monthly country reports also indicate that at least 37 people have died due to measles so far this year.

"Following the decade's lowest number of cases in 2016, we are seeing a dramatic increase in infections and extended outbreaks," says Dr Zsuzsanna Jakab, WHO Regional Director for Europe. "We call on all countries to immediately implement broad, context-appropriate measures to stop further spread of this disease. Good health for all starts with immunization, and as long as this disease is not eliminated we are failing to live up to our Sustainable Development Goal commitments."

Seven countries in the Region have seen over 1000 infections in children and adults this year (France, Georgia, Greece, Italy, the Russian Federation, Serbia and Ukraine). Ukraine has been the hardest hit, with over 23,000 people affected; this accounts for over half of the regional total. Measles-related deaths have been reported in all of these countries, with Serbia reporting the highest number of 14.

Uneven progress towards measles and rubella elimination

According to the latest assessment by the European Regional Verification Commission for Measles and Rubella Elimination (RVC), released today, 43 of the Region's 53 Member States have interrupted the endemic spread of measles and 42 have interrupted rubella (based on 2017 reporting).

At the same time, the RVC expressed concerns about inadequate disease surveillance and low immunization coverage in some countries. It also concluded that

chains of measles transmission continued for more than 12 months in some countries that had interrupted the endemic spread of the disease, reverting their status back to endemic.

"This partial setback demonstrates that every person who is not immune remains vulnerable no matter where they live, and every country must keep pushing to increase coverage and close immunity gaps, even after achieving interrupted or eliminated status," says Dr Nedret Emiroglu, Director of the Division of Health Emergencies and Communicable Diseases at the WHO Regional Office for Europe.

The measles virus is exceptionally contagious and spreads easily among susceptible individuals. To prevent outbreaks, at least 95% immunization coverage with 2 doses of measles-containing vaccine is needed every year in every community, as well as efforts to reach children, adolescents and adults who missed routine vaccination in the past.

While immunization coverage with 2 doses of measles-containing vaccine increased from 88% of eligible children in the Region in 2016 to 90% in 2017, large disparities at the local level persist: some communities report over 95% coverage, and others below 70%.

WHO is working closely with Member States currently facing outbreaks to implement response measures, including enhanced routine and supplemental immunization as well as heightened surveillance to quickly detect cases. WHO is also working with other countries to attain the 95% threshold.

"At this midterm juncture for the European Vaccine Action Plan, we must celebrate our achievements while not losing sight of those who are still vulnerable and whose protection requires our urgent and ongoing attention," concludes Dr Jakab. "We can stop this deadly disease. But we will not succeed unless everyone plays their part: to immunize their children, themselves, their patients, their populations – and also to remind others that vaccination saves lives." MEH

the laboratory

Medical research news from around the world

Researchers find key control mechanism of DNA replication

Researchers from Osaka University in Japan have uncovered a key control mechanism of DNA replication with potential implications for better understanding how cells maintain genetic information to prevent diseases or cancer.

The team published their results in July in *The EMBO Journal*, <doi: 10.15252/emboj.201898997> the flagship publication of the European Molecular Biology Organization.

“DNA replication initiates from a number of different locations known as replication origins,” said author Hisao Masukata, a professor of biology in the Graduate School of Science at Osaka University.

To ensure faithful duplication of the cell’s genetic blueprints, replication begins at distinctly different times as well as locations. Each cell’s genetic material is arranged into specific “files” called chromosomes. The “tabs” labelling these files are called telomeres – they help ensure the DNA sequences begin and end in the correct order and at the correct times.

The mechanism underlying this spatio-temporal control was unknown, but the team suspected an answer could be found by more closely examining the telomeres.

“Relation between time and space of chromosomal DNA replication was a long-term question and there were controversial observations,” Masukata said. “The main problem we set out to solve was whether a specific intra-nuclear compartment plays a role in regulation of DNA replication.”

The researchers found that telomeres don’t work on their own. Proteins bind to them, attaching messages of timing and other work notices. One protein, called Taz1, is of particular importance: It binds to the telomeres and a small number of Taz1 binds to the internal regions of chromosomes. The researchers were able to observe the internal regions and the telomeres by using different fluorescent proteins that light up in different colours.

They used a microscope to follow their movement as the internal regions associate with telomeres during the replication process in live cells.

They saw that Taz1, together with its partners draws the internal regions to telomeres, like a paper clip to prevent free movement of papers.

Masukata calls this clip “tethering.” It links a replication timing program of the internal regions to that of later replicating telomeres. However, he noted, the replication origins – the location of replication initiations – are only tethered to telomeres in the beginning phases of the cell cycle. It’s still unclear how the tethering is regulated by the cell cycle.

By better understanding this intricate process of cell duplication, including when and how specific genetic information is copied, scientists may be able to inform future research into how cells maintain genetic information to prevent diseases or cancer.

“Our ultimate goal is to understand the principle and the significance of [the organization of DNA replication]. Our results emphasized the importance of telomeres for structures and functions of whole chromosome regions,” Masukata said. “Because telomeres are essential and highly conserved among [most organisms], they might play many important roles in various levels of chromosome architecture and function.”

New trial tests stem cell transplants for Crohn’s disease treatment

A clinical trial has begun which will use stem cell transplants to grow a new immune system for people with untreatable Crohn’s disease.

The study, led by Queen Mary University of London and Barts Health NHS trust, is funded with £2 million (about US\$2.5 million) from a Medical Research Council and National Institute for Health Research partnership. The trial is coordinated through the Clinical Trials Unit at the University of Sheffield.

Crohn’s disease is a long-term condition

that causes inflammation of the lining of the digestive system, and results in diarrhoea, abdominal pain, extreme tiredness and other symptoms that significantly affect quality of life.

Current treatments include drugs to reduce inflammation but these have varying results, and surgery is often needed to remove the affected part of the bowel. In extreme cases, after multiple operations over the years, patients may require a final operation to divert the bowel from the anus to an opening in the stomach, called a stoma, where stools are collected in a pouch.

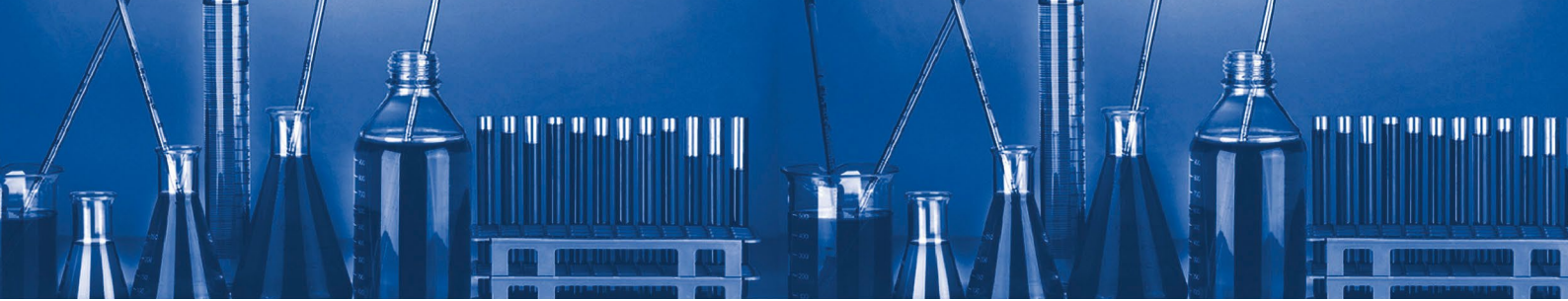
Chief investigator Professor James Lindsay from Queen Mary University of London and a consultant at Barts Health NHS Trust said: “Despite the introduction of new drugs, there are still many patients who don’t respond, or gradually lose response, to all available treatments. Although surgery with the formation of a stoma may be an option that allows patients to return to normal daily activities, it is not suitable in some and others may not want to consider this approach.

“We’re hoping that by completely resetting the patient’s immune system through a stem cell transplant, we might be able to radically alter the course of the disease. While it may not be a cure, it may allow some patients to finally respond to drugs which previously did not work.”

The use of stem cell transplants to wipe out and replace patients’ immune systems has recently been found to be successful in treating multiple sclerosis. This new trial will investigate whether a similar treatment could reduce gut inflammation and offer hope to people with Crohn’s disease.

In the trial, patients undergo chemotherapy and hormone treatment to mobilise their stem cells, which are then harvested from their blood. Further chemotherapy is then used to wipe out their faulty immune system. When the stem cells are re-introduced back into the body, they develop into new immune cells which give the patient a fresh immune system (see diagram in Notes to Editors).

In theory, the new immune system will then no longer react adversely to the pa-



patient's own gut to cause inflammation, and it will also not act on drug compounds to remove them from their gut before they have had a chance to work.

Professor Tom Walley, Director of the NIHR Evaluation, Trials and Studies programmes, which funded the trial, said: "Stem cell therapies are an important, active and growing area of research with great potential. There are early findings showing a role for stem cells in replacing damaged tissue. In Crohn's disease this approach could offer real benefits for the clinical care and long term health of patients."

The current clinical trial, called 'ASTIClite', is a follow up to the team's 2015 'ASTIC' trial, which investigated a similar stem cell therapy. Although the therapy in the original trial did not cure the disease, the team found that many patients did see benefit from the treatment, justifying a further clinical trial. There were also some serious side effects from the doses of drugs used, so this follow-up trial will be using a lower dose of the treatment to minimise risks due to toxicity.

Studies find 2 diabetes medications don't slow progression of type 2 diabetes in youth

In youth with impaired glucose tolerance or recent-onset type 2 diabetes neither initial treatment with long-acting insulin followed by the drug metformin, nor metformin alone preserved the body's ability to make insulin, according to results published online June 25 in *Diabetes Care*

The results come from a study of 91 youth ages 10-19, part of the larger Restoring Insulin Secretion (RISE) study. To determine if early, aggressive treatment would improve outcomes, participants at four study sites were randomly assigned to one of two treatment groups. The first received three months of glargine – a long-acting insulin – followed by nine months of metformin. The second received only metformin for 12 months. Participants were then monitored for three more months after treatment ended.

The RISE Pediatric Medication Study found that beta cell function – key to the body's ability to make and release insulin – declined in both groups during treatment and worsened after treatment ended. An earlier NIH-funded study also found that type 2 diabetes progresses more rapidly in youth than previously reported in adults despite comparable treatment.

"Only two drugs are currently approved for youth with type 2 diabetes, and we were disheartened to find that neither effectively slows disease progression," said Dr Ellen Leschek, project scientist for the RISE Consortium and program director in NIDDK's Division of Diabetes, Endocrinology, and Metabolic Diseases. "Type 2 diabetes in youth has grown with the obesity epidemic, and we need treatments that work for kids. It's clear from this study and others that type 2 diabetes in youth is more aggressive than in adults."

The results were published concurrently in *Diabetes Care* with two other manuscripts that compared participants of the pediatric trial with their adult counterparts in two other RISE trials. Using baseline assessments, RISE researchers found that the youth had more insulin resistance and other signs of disease progression than their adult counterparts at the same stage in the disease, results consistent with other earlier studies. As well, the pediatric group at baseline responded to the severe insulin resistance with a greater insulin response than adults, potentially a reason for the youth's more rapid loss of beta cell function.

While the RISE pediatric group's treatments did not preserve or improve beta cell function, results showed modest improvement in blood glucose with metformin in both groups.

"Metformin is still a useful method to lower the blood glucose levels of youth with type 2 diabetes, but metformin alone is not a long-term solution for many youth," said Dr Kristen Nadeau, principal investigator of the RISE Pediatric Medication Study and professor of pediatric endocrinology at the University of Colorado, Anschutz Medical Campus. "As RISE shows, there is an urgent and growing need for more re-

search to find options to adequately slow or prevent progression of type 2 diabetes in youth."

The longer a person has type 2 diabetes, the greater the likelihood of developing complications including heart, kidney, eye, and nerve diseases, making it critical for young people with type 2 diabetes to quickly achieve and sustain control of their blood glucose. However, because type 2 diabetes has historically been an adult condition, information about how to effectively treat youth is limited, and pediatric diabetes experts have had to rely on best practices for adult treatment – an imperfect translation given the differences in physiology between the groups.

The RISE Consortium comprises three trials, all using similar assessments to measure results, to be compared with one another when all trials of the study are completed. The goal of RISE is to find ways to reverse or slow the loss of insulin production and insulin release, so people at risk for type 2 diabetes or recently diagnosed with the disease can stay healthier longer.



RISE consortium

<http://care.diabetesjournals.org/collection/rise-consortium>

Dormant herpesvirus in Purkinje cells associated with bipolar disorder, depression

Purkinje cells are a central part of the human cerebellum, the part of the brain that plays an important role in motor learning, fine motor control of the muscle, equilibrium and posture but also influences emotions, perception, memory and language.

Scientists from the Institute for Virology and Immunobiology of the University of Würzburg and their US colleagues have now made a surprising discovery in these nerve cells. They found a high infection rate of Purkinje neurons with the human herpesvirus HHV-6 for the first time in patients with bipolar disorder and/or severe depression. The study was led by Dr Bhupesh Prusty, group leader at the Depart-



ment of Microbiology. The scientists have published their findings in the journal *Frontiers in Microbiology*.

“Inherited factors have long been known to increase the risk of developing several types of psychiatric disorders including bipolar disorder, major depressive disorder and schizophrenia,” Dr Prusty explained. But there is also strong evidence that environmental factors, particularly those that lead to neuroinflammation early in life, might play an important etiologic role in the pathogenesis of these disorders as well. Viruses are such an environmental factor.

“Pathogens may disrupt neurodevelopment and cross talk with the immune system at key developmental stages,” Dr Prusty explained. Children that are infected at a young age usually recover without any late complications. However, the viruses lie dormant in various organs and tissues including the central nervous system and the salivary glands and can be reactivated under certain circumstances, even after years.

Dr Prusty and his team suspected the human herpesviruses HHV-6A and HHV-6B to play a key role in the genesis of psychiatric disorders. So they studied two of the largest human brain biopsy cohorts from Stanley Medical Research Institute and what they found confirmed their assumption: “We were able to find active infection of HHV-6 predominantly within Purkinje cells of human cerebellum in bipolar and major depressive disorder patients,” Dr Prusty summed up the central result of their study. The results show for the first time that type HHV-6 viruses are capable of infecting neurons and possibly causing cognitive disturbances leading to mood disorder.

According to the scientists, the study disproves the belief that viruses which lie “dormant” and hidden in organs and tissues never cause any disease. “Studies like ours prove this thinking as wrong,” Dr Prusty said and he cited another study which shows that Alzheimer’s disease can also be caused by human herpesvirus 6A.

In the next step, the Würzburg researchers want to figure out the molecular mechanisms behind HHV-6A mediated cellular damage to Purkinje neurons.

- doi: 10.3389/fmicb.2018.01955



Javier Orenda, professor at the Nursing and Podiatry School of Valencia University

3 minutes is optimal time to clamp umbilical cord of neonate

A study aimed at determining which is the best moment to carry out the clamping of the umbilical cord of neonates, has found that it is at around three minutes of life. This way there are no health complications for the babies and the iron reserves are increased, which decreases the risk of anaemia during the breastfeeding period. Regarding the mother, the research reports benefits for her haematological wellbeing, satisfaction with the delivery and improved adherence to lactation.

The study was conducted by Javier Orenda, professor at the Nursing and Podiatry School of Valencia University and nurse specialised in Obstetrics and Gynaecology at the Hospital Universitario de la Plana (Castellón), Spain.

The research analysed 156 births to determine the relation between the moment when the clamping takes place and the baby and mother’s iron reserves.

The work compared the effects of premature clamping (before the first minute of life) with a late one (after the first minute of life), and takes into account the consequences that this moment can have on the iron reserves of both the baby and the mother.

To date, if the clamping is carried out when the umbilical cord stops beating, which can occur after the first three minutes, there have been no signs of complica-

tions for the mother or the baby. There is currently no scientific evidence that justifies premature clamping as the practice that most benefits the baby or the mother.

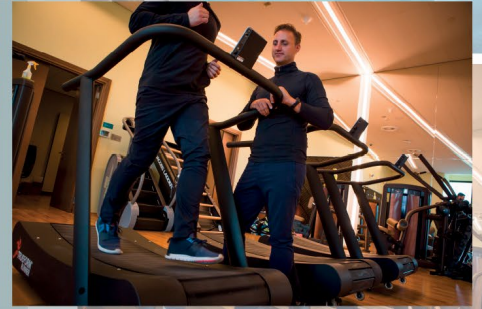
It is worth noting that during the work carried out there was no reporting of any newborns who, at six months old, had iron-deficiency anaemia and required iron supplements. Furthermore, the study suggests it is important to put back the clamping at least until the first minute of life, as there is an increase in iron reserves and to contribute to a natural transition of the baby towards life outside the womb.

The book which included this research, “*Influencia del tiempo de ligadura del cordón umbilical en la morbilidad secundaria neonatal, los depósitos de hierro en el neonato y lactante, y efectos maternos Asociados*” was edited by the Fundación Dávalos Fletcher in Castellón. The publication looks into the history of umbilical cord clamping: “It was customary to tie up the umbilical cord minutes after the birth, generally when the beating stopped, a situation which typically takes place between one and three minutes after being born. Several centuries later, probably coinciding with the beginning of scientific medicine in the second half of the 18th Century, clamping the cord during the first seconds of life started being implemented,” explained paediatrician Pasqual Gregori.

This controversy, already disputed in scientific publications of the 19th Century, still exists in today’s clinical practice. For this reason, the objective of this work has been

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to evaluate the relation between early/late clamping, and secondary neonatal morbidity, the iron reserves of the neonate and breast-feeding baby, and describing the effects of this intervention as it pertains to the mother.

Viennese researchers create in-vitro 3D model of placenta

Researchers from Medical University of Vienna's Department of Obstetrics and Gynecology have created a 3D "in vitro" model of the early human placenta. They hope it will help in the understanding of placental malfunctions which are the main cause of pregnancy complications and can lead to miscarriage and other serious disorders that endanger both mother and child. The mechanisms underlying these disorders have remained largely unexplained.

"Over the last few years, 3D tissue culture models, called organoids, have rapidly been established for many different human organs. In most cases, these organoids consist of only a few cell types from the respective tissue and therefore have a simpler structure than the original organ," explained the researchers in the collaborative project involving the research groups of Martin Knöfler from MedUni Vienna's Department of Obstetrics and Gynecology (Division of Obstetrics and Gynaecology) and Paulina Latos from MedUni Vienna's Center for Anatomy and Cell Biology.

Working on this basis, the team from the Medical University of Vienna managed to develop an organoid model of the placenta, consisting of the prevailing placental cell population, so-called trophoblasts.

A significant advantage of the placenta organoids is their capacity for self-organisation, self-renewal and constant growth, stress the MedUni Vienna scientists, since they contain both stem cells and progenitors. Moreover, these 3D structures also contain the three main cell types of the human trophoblast population.

Knöfler and Latos explained: "As a puretrophoblast organoid without blood vessels or connective tissue components, this model mirrors the trophoblast-specific placental structure in a Petri dish."

This was done by optimising the culture

conditions that had already been successfully applied in organoid models of other tissues.

The MedUni Vienna researchers were able to underpin the groundbreaking advantages of this organoid system with a study substantiating the role of the WNT signaling pathway (which is crucial for development and growth of many tissues) in self-renewal and differentiation of the trophoblast organoids. The organoid model system can also be pharmacologically and genetically manipulated. This opens up new possibilities for studying physiological and pathophysiological processes of the human placenta.

"The fact that there were no self-renewing cell culture model systems available for the human placenta made it difficult, if not impossible, to study the causes of malfunctions. Establishment of the placenta organoid system will improve this situation significantly and will help advancing drug development and consequently medical treatments for dangerous gestational disorders," emphasised Knöfler, a leading international expert in placental research and an author of the study.

- doi: 10.1016/j.stemcr.2018.07.004

Stress during pregnancy increases risk of mood disorders for female offspring

High maternal levels of the stress hormone cortisol during pregnancy increase anxious and depressive-like behaviours in female offspring at the age of 2, reports a new study in *Biological Psychiatry*. The effect of elevated maternal cortisol on the negative offspring behaviour appeared to result from patterns of stronger communication between brain regions important for sensory and emotion processing. The findings emphasize the importance of prenatal conditions for susceptibility of later mental health problems in offspring.

Interestingly, male offspring of mothers with high cortisol during pregnancy did not demonstrate the stronger brain connectivity, or an association between maternal cortisol and mood symptoms.

"Many mood and anxiety disorders are approximately twice as common in females as in males. This paper highlights

one unexpected sex-specific risk factor for mood and anxiety disorders in females," said John Krystal, MD, Editor of *Biological Psychiatry*. Dr Krystal is Chairman of the Department of Psychiatry at the Yale University School of Medicine, Chief of Psychiatry at Yale-New Haven Hospital, and a research psychiatrist at the VA Connecticut Healthcare System.

"High maternal levels of cortisol during pregnancy appear to contribute to risk in females, but not males," he added.

First author Alice Graham, PhD, of Oregon Health & Science University, said: "This study measured maternal cortisol during pregnancy in a more comprehensive manner than prior research."

To estimate the overall cortisol level during pregnancy, senior author Claudia Buss, PhD, of Charité University Medicine Berlin and University of California, Irvine and colleagues measured cortisol levels over multiple days in early-, mid-, and late-pregnancy. Measurements taken from the 70 mothers included in the study reflected typical variation in maternal cortisol levels. The researchers then used brain imaging to examine connectivity in the newborns soon after birth, before the external environment had begun shaping brain development, and measured infant anxious and depressive-like behaviours at 2 years of age.

"Higher maternal cortisol during pregnancy was linked to alterations in the newborns' functional brain connectivity, affecting how different brain regions can communicate with each other," said Dr Buss. The altered connectivity involved a brain region important for emotion processing, the amygdala. This pattern of brain connectivity predicted anxious and depressive-like symptoms two years later.

The findings reveal a potential pathway through which the prenatal environment may predispose females to developing mood disorders. The study supports the idea that maternal stress may alter brain connectivity in the developing foetus, which would mean that vulnerability for developing a mood disorder is programmed from birth. This could be an early point at which the risk for common psychiatric disorders begins to differ in males and females.

- doi: 10.1016/j.biopsych.2018.06.023 

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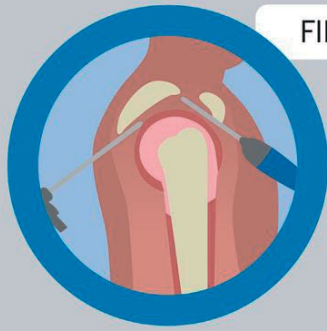
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Shoulder impingement

Subacromial decompression versus diagnostic arthroscopy



FIMPACT trial

139

Patients with subacromial pain and unresponsive to conventional treatment

Aged 35 to 65

Pain for 3 or more months



Randomisation
After exclusions

59 ASD

Arthroscopic subacromial decompression

63 DA

Diagnostic arthroscopy, a placebo surgical intervention

Primary outcome

Shoulder pain at rest and with arm activity at 24 months

Visual analogue scale (VAS)
0–100: 0 denotes no pain

Threshold for minimal clinically important difference = 15

Mean change in pain at rest

-36.0

Difference between arms 95% CI

4.6 lower -11.3 to 2.1

-31.4

Mean change in pain with activity

-55.4

9.0 lower -18.1 to 0.2

-47.5

Arthroscopic subacromial decompression provides no clinically relevant benefit over diagnostic arthroscopy.



Most common shoulder operation is no more beneficial than placebo surgery

One of the most common surgical procedures in the Western world is probably unnecessary, suggests a new study. *Middle East Health* reports.

The Finnish Shoulder Impingement Arthroscopy Controlled Trial (FIMPACT) compared surgical treatment of shoulder impingement syndrome to placebo surgery. Two years after the procedure the study participants, both those in the group who underwent surgery and the ones in the placebo group, had equally little shoulder pain and were equally satisfied with the overall situation of their shoulder.

“These results show that this type of surgery is not an effective form of treatment for this most common shoulder complaint. With results as crystal clear as this, we expect that this will lead to major changes

in contemporary treatment practices,” said the study’s principal investigators chief surgeon Mika Paavola and professor Teppo Järvinen from the Helsinki University Hospital and University of Helsinki.

Shoulder problems are very common and place a significant burden on the healthcare system. The most common diagnosis for shoulder pain that requires treatment is shoulder impingement, and the most common surgical treatment is decompression through keyhole surgery.

“With nearly 21,000 decompression surgeries done in UK every year, and ten times that many in the United States, the

impact of this study is huge,” explained adjunct professor Simo Taimela, the research director of the Finnish Centre for Evidence-Based Orthopedics (FICEBO) at the University of Helsinki.

This research confirms previous randomised studies showing that keyhole decompression surgery of the shoulder does not alleviate the symptoms of patients any better than physiotherapy. Paradoxically, however, the number of decompression surgeries has increased significantly, even though solid proof of the impact of the surgery on the symptoms has been lacking.

The FIMPACT study involved



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189 patients suffering from persistent shoulder pain for at least three months despite receiving conservative treatment, physiotherapy and steroid injections. Patients were randomised to receive one of three different treatment options, subacromial decompression surgery, placebo surgery (diagnostic arthroscopy, which involved arthroscopic examination of the shoulder joint but no therapeutic procedures) or supervised exercise therapy.

No one involved in the study – including the patients, the persons involved in their care after surgery, and the researchers who analysed the results – knew which patient was in the decompression or placebo group.

Two years after the start of the study, patients were asked about shoulder pain and other symptoms they had experienced, as well as their satisfaction with the treatment and its results. The patients in the decompression or placebo groups were also asked which group they believed they had been in – actual surgery or placebo.

Overall, shoulder pain was substantially

improved in all three groups from the start of the trial. However, decompression surgery offered no greater benefit to shoulder pain than placebo surgery. The patients in the diagnostic arthroscopy group were no more likely than those in the decompression group to guess that they had had a placebo procedure.

The group that received exercise therapy also improved over time, to the point that patients who initially had decompression surgery were only slightly more improved than those who had physiotherapy only. Although this latter finding could be interpreted as evidence to support decompression surgery, the authors did not find the difference in improvement to be clinically significant.


“Based on these results, we should question the current line of treatment according to which patients with shoulder pain attributed to shoulder impingement are treated with decompression surgery, as it seems clear that instead of surgery, the treatment of such patients should hinge on

With results as crystal clear as this, we expect that this will lead to major changes in contemporary treatment practices.

nonoperative means,” Järvinen said.

“By ceasing the procedures which have proven ineffective, we would avoid performing hundreds of thousands useless surgeries every year in the world,” Järvinen pointed out. “Fortunately, there seems to be light at the end of the tunnel as the NHS in England just released a statement that they will start restricting funding for ‘unnecessary procedures’ and the list includes subacromial decompression. We applaud this initiative and encourage other countries to follow this lead.”

• The FIMPACT research project includes the Helsinki and Tampere University Hospitals in Finland. The study is published in *The BMJ* on 19 July 2018.

doi: 10.1136/bmj.k2860 

Risk of fracture increases after gastric bypass

A study published in the *Journal of Bone and Mineral Research* shows that the risk of fractures increases by about 30% after a gastric bypass operation. Middle East Health reports.

Mattias Lorentzon, professor of geriatrics at Sahlgrenska Academy, University of Gothenburg, Sweden, and Chief Physician at the University Hospital looked at the association of gastric bypass surgery and the risk of fracture.

The study was based on the records of 38,971 patients who underwent gastric bypass operations, of which 7,758 had diabetes and 31,213 did not. Those who had had the operation were compared with an equally large group of individuals who had not been operated on and who had the equivalent morbidity and background data.

Regardless of diabetes status, those who had been operated on had about a 30% increased risk of fractures. Individuals without diabetes had an increased risk of 32% and those with diabetes had an increased risk of 26%. The risk increase applies to fractures in general, with the exception of the lower leg. After surgery,



Kristian Axelsson, doctoral student at Sahlgrenska Academy, University of Gothenburg, and resident physician in orthopaedics at Skaraborg Hospital Skövde.

fractures of the lower legs occurred less frequently.

The results correspond well with earlier research in the field, but the current study is statistically stronger due to its size.



Mattias Lorentzon, professor of geriatrics at Sahlgrenska Academy, University of Gothenburg, Sweden, and Chief Physician at the University Hospital.

The data is also more equivalent since the researchers focused on the dominant method of obesity surgery, gastric bypass, and exclude other forms.

“Gastric bypass is a well-established ►

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► (continued...)


method that has proven effective in reducing obesity, diabetes and mortality, so naturally our findings do not mean that you should stop providing these types of operations,” says Prof Lorentzon.

With gastric bypass operations, most of the stomach and part of the small intestine are removed. Food goes directly into the small intestine instead of passing through the entire stomach, which increases the sense of being full. The person eats less and nutrient uptake decreases leading to weight loss.

The most common hypothesis of the mechanism behind increased fracture after obesity surgery has been weight loss and that the skeleton becomes weaker with less load. The study did not show a relationship between the fracture rate and the degree of weight loss. An increased risk of falls after surgery, however, was noted, which in itself could contribute to increased risk of fractures. The question of why individuals who have had operations fall more often, with or without fractures

as a consequence, has no clear answer yet.

“The fact that the risk of fractures increases and also seems to increase over time means that it will be important to follow patients, evaluate the fracture risk and, when required, institute measures to prevent fractures,” says Kristian Axelsson, doctoral student at Sahlgrenska Academy, University of Gothenburg, and resident physician in orthopaedics at Skaraborg Hospital Skövde.

• doi: 10.1002/jbmr.3553 

New Robotic Spine Exoskeleton provides hope for improved treatments for spine deformities

Designed by Columbia Engineers, RoSE is the first device to measure 3D stiffness of the human torso and could lead to new treatments for children with spine deformities such as idiopathic scoliosis and kyphosis. *Middle East Health* reports.

Spine deformities, such as idiopathic scoliosis and kyphosis (also known as “hunchback”), are characterized by an abnormal curvature in the spine. The children with these spinal deformities are typically advised to wear a brace that fits around the torso and hips to correct the abnormal curve. Bracing has been shown to prevent progression of the abnormal curve and avoid surgery. However, the underlying technology for bracing has not fundamentally changed in the last 50 years.

While bracing can retard the progression of abnormal spine curves in adolescents, current braces impose a number of limitations due to their rigid, static, and sensor-less designs. In addition, users find them uncomfortable to wear and can suffer from skin breakdown caused by prolonged, excessive force. Moreover, the inability to control the correction provided by the brace makes it difficult for users to adapt to changes in the torso over the course of treatment, resulting in diminished effectiveness.

To address these deficiencies, Columbia

Engineering researchers have invented a new Robotic Spine Exoskeleton (RoSE) that may solve most of these limitations and lead to new treatments for spine deformities. The RoSE is a dynamic spine brace that enabled the team to conduct the first study that looks at in vivo measurements of torso stiffness and characterizes the three-dimensional stiffness of the human torso. The study was published online 30 March 2018 in *IEEE Transactions of Neural Systems and Rehabilitation Engineering*.

“To our knowledge, there are no other studies on dynamic braces like ours. Earlier studies used cadavers, which by definition don’t provide a dynamic picture,” says the study’s principal investigator Sunil Agrawal, professor of mechanical engineering at Columbia Engineering and professor of rehabilitation and regenerative medicine at Columbia University Vagelos College of Physicians and Surgeons.

“The RoSE is the first device to measure and modulate the position or forces in all six degrees-of-freedom in specific regions

of the torso. This study is foundational and we believe will lead to exciting advances both in characterizing and treating spine deformities.”

Developed in Agrawal’s Robotics and Rehabilitation (ROAR) Laboratory, the RoSE consists of three rings placed on the pelvis, mid-thoracic, and upper-thoracic regions of the spine. The motion of two adjacent rings is controlled by a six-degrees-of-freedom parallel-actuated robot. Overall, the system has 12 degrees-of-freedom controlled by 12 motors. The RoSE can control the motion of the upper rings with respect to the pelvis ring or apply controlled forces on these rings during the motion. The system can also apply corrective forces in specific directions while still allowing free motion in other directions.

Eight healthy male subjects and two male subjects with spine deformities participated in the pilot study, which was designed to characterize the three-dimensional stiffness of their torsos. The researchers used the RoSE, to control



The Robotic Spine Exoskeleton consists of two six-degrees-of-freedom parallel-actuated modules connected in series, each with six actuated limbs. Each module controls the translations/rotations or forces/moments of one ring in three dimensions with respect to the adjacent ring.

the position/orientation of specific cross sections of the subjects' torsos while simultaneously measuring the exerted forces/moments.

The results showed that the three-dimensional stiffness of the human torso can be characterized using the RoSE and that the spine deformities induce torso stiffness characteristics significantly different from the healthy subjects. Spinal abnormal curves are three-dimensional; hence the stiffness characteristics are curve-specific and depend on the locations

of the curve apex on the human torso.

"Our results open up the possibility for designing spine braces that incorporate patient-specific torso stiffness characteristics," says the study's co-principal investigator David P. Roye, a spine surgeon and a professor of pediatric orthopedics at the Columbia University Irving Medical Center. "Our findings could also lead to new interventions using dynamic modulation of three-dimensional forces for spine deformity treatment."

Lead author Joon-Hyuk Park, who


"Our findings could also lead to new interventions using dynamic modulation of three-dimensional forces for spine deformity treatment."

worked on this research as a PhD student and a team member at Agrawal's ROAR laboratory, said: "We built upon the principles used in conventional spine braces, i.e., to provide three-point loading at the curve apex using the three rings to snugly fit on the human torso.

"In order to characterize the three-dimensional stiffness of the human torso, the RoSE applies six unidirectional displacements in each DOF of the human torso, at two different levels, while simultaneously measuring the forces and moments."

While this first study used a male brace designed for adults, Agrawal and his team have already designed a brace for girls as idiopathic scoliosis is 10 times more common in teenage girls than boys. The team is actively recruiting girls with scoliosis in order to characterize how torso stiffness varies due to such a medical condition.

"Directional difference in the stiffness of the spine may help predict which children can potentially benefit from bracing and avoid surgery," says Agrawal.

• The study is titled "Robotic Spine Exoskeleton (RoSE): Characterizing the Three-dimensional Stiffness of the Human Torso in the Treatment of Spine Deformity." doi: 10.1109/TNSRE.2018.2821652 



Low back pain

■ By Professor Abdul Karim Msaddi
Head of Neurosurgery and Spine Department,
Neuro Spinal Hospital Dubai

Low back pain is considered chronic if it has been present for longer than three months.

Pain generators can be muscles, ligaments, discs, facet joint (posterior vertebral joints), bone and nerves (as spinal cord lower limit stop at first lumbar vertebra).

What are the causes of chronic LBP?

Most frequent causes are disc disease in people younger than 60 years old and spinal stenosis above 60 in elderly which results from spine changes, dryness and bulge of the disc, ligaments hypertrophy, facet joints hypertrophy, and possible instability (abnormal movement of one vertebra over the other).

Other causes are osteoporotic fractures in elderly, spinal infection, bony or nerve tumours including metastatic disease (especially in patients who are known to have tumour somewhere else in the body).

In young population, disc herniation is the main cause (rupture of the disc and

extruded or bulging of the annulus, fibrosis: the fibrous ring containing the proper disc inside disc space).

How to get an accurate diagnosis?

Diagnosis start always by detailed history (onset of pain, how it started, trauma, lifting or others; increases after long sitting, standing or driving; improves by short walk; radiates to one leg or both, etc.) followed by meticulous examination where we check the posture, the back range of motion, the absence of motor or sensory deficit (weakness) and reflexes abnormalities.

After we have full picture about the history and clinical examination, we order, in general, radiological investigations:

- X-rays help showing the bony structure, disc height and slippage of vertebra with instability, possible fracture if there is trauma or even spontaneous fractures in case of severe osteoporosis or osteolytic tumour in the bone.

- The MRI is the exam of choice nowadays as it shows the spinal cord and nerves, ligaments, disc, stenosis, tumours, fresh from old fractures, and infections.

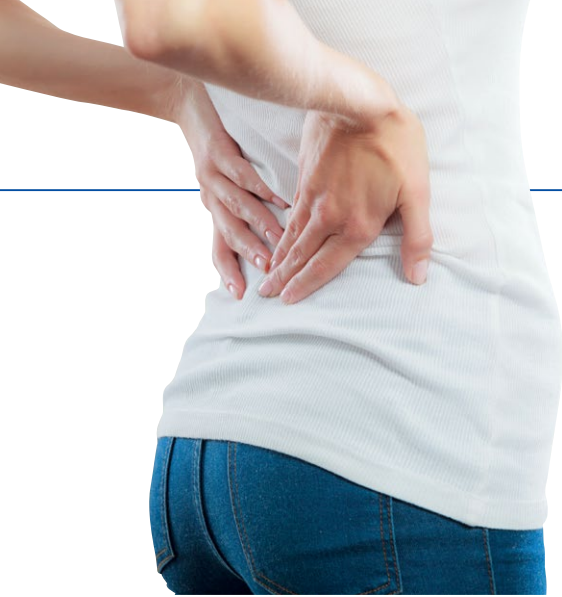
- Dynamic MRIs start to be available and can show the hidden causes of pain and walking difficulties (like in spinal canal stenosis). This can be done in the painful positions like the sitting with weight-bearing, or in flexion and extension.

- The CT scan shows perfectly the smallest details of the bony structures of the spine. It is good for fractures, bony tumours, and when we cannot perform MRI because of contraindications or bad pictures due to artefacting metal implants: in this situation we may inject a contrast media into the spinal fluid and take the CT scan (CT myelography).

- There are investigations which can help like the PET scan in case of tumours (or infection), and neurophysiological studies such as EMG/NCS/SSEP and other, to help differentiating the causes of nerve diseases and assess the degree of neurological weakness.

What are the treatments for chronic LBP?

Treatment of disc herniation start always as conservative except for only emergency situation when we have cauda equina



syndrome (severe compression on multiple nerve roots or conus medullaris - end of spinal cord) which causes motor and sensory weakness with urine and stool loss of control or weak control.

The patient must know that leg pain or numbness even weakness in the foot or difficulty walking are not indications for emergency surgery. It may need rapid surgery but not emergency. Patients have the right to think and to seek a second opinion if they want.

Physiotherapy represents the first line of treatment which includes teaching of the good postures, strengthening exercises of abdominal and back muscles, instructions about healthy daily life habits and the rest of pain management, like electrotherapy, laser, ultrasound and many other techniques.

The physiotherapy can be helped by oral medications and if needed by the epidural injection of local anaesthetics and cortisone (long-acting). In general, less than 10% of patients may need surgical solution.

Interventional management can be the epidural injection or foraminal nerve root epidural injection (block), facet joint and medial branches injection (for dominant or associated facet joint pain) or sacroiliac joint injection (SIJ) if the SIJ is responsible for the pain.

Percutaneous disc procedures can be done in case of contained disc herniation with no significant stenosis or very large disc herniation or sequestration, many techniques can be done such as nucleoplasty, laser disc decompression, automated nucleotomy and many others. The results are relatively good in about 65-70% when the indication is correct.

Microdiscectomy is the gold standard in the treatment of lumbar disc herniation. It is minimally invasive, using the surgical microscope, with high success rate and less complication. It is much superior to the endoscopic discectomy with better results and less complications.



Spinal fusion and stabilization is reserved for patients with severe degenerative disc disease, instability, fractures and massive decompression to the spine, sometimes for recurrent disc herniation.

Artificial (or total) disc replacement can be done for young patients with no osteoporosis, with no migrating disc herniation behind the vertebral body or far in the spinal canal, as surgery is done from the abdomen. It may need an access surgeon (vascular surgeon is preferable).

In general, surgery for spinal diseases, if the diagnosis and the indications are correct, and if the expertise of the surgeon is associated to the technology (like microscope, spinal navigation, intraoperative monitoring), results will be much better.

Failure in spine surgery is not rare, if persisting or recurrent symptoms happened, meticulous assessment and investigations must be performed. If the

cause is diagnosed and can be treated, results of treatment in general will be good, but in some patients we may not find a treatable cause. In that situation, we treat the pain as it is the disease and patients may benefit from electrical nerve stimulation such as spinal cord stimulation, which can help a lot in neuropathic pain persisting after failed back surgery syndrome (FBSS).

Minimally invasive technique is a good concept in experienced hands but exposes the patient to a lot of radiation if no advanced technology such as the spinal navigation with O-Arm 3D scan and navigated implants which allow spinal fixation without exposing the patient to a lot of radiation.

After all, any spine disease treated either surgically or not need to have good rehabilitation in the form of instructions and physical exercises.

- For more information, visit: www.nshdubai.com MEH

Shoulder and knee injuries



By Dr Charalmpos Harris Zourelidis
Consultant Orthopedic Surgeon,
Emirates Specialty Hospital

Sports and exercise are wonderful activities, that can prevent heart disease, obesity, diabetes and can improve our happiness and wellbeing.

These facts are widely accepted, which has led to more people from all generations taking part in sports and exercise.

Sport injuries can occur in experienced or amateur athletes. There are two types of sport injuries – acute or chronic, and overuse injuries

Acute injuries

Acute injuries, such as pulled or torn muscles or ligaments and fractured bones occur as a result of a single traumatic event, such as a fall.

Overuse injuries occur as the result of accumulating microinjuries to the musculoskeletal system. They are more common than acute injuries. They occur due to repetitive loading of the joints, ligaments and muscles. A change of the intensity of training, inadequate warming up or stretching before sports activity, and faulty technique can lead to these injuries. Overuse injuries can be therefore prevented.

Injuries of the knee and shoulder are most common in athletes. Early diagnosis and treatment can speed up the recovery and facilitate an early return to exercise and sports. If left untreated they can become chronic and more difficult to treat.

It is very important to educate athletes about the possible injuries, so they can recognize early signs themselves and prevent deterioration.

Acute knee injuries normally occur as a result of direct impact or twisting. Twist-

ing can distort internal ligaments in the knee and cause meniscal injury.

The most commonly injured ligament in the knee is the anterior cruciate ligament – ACL. It is responsible for maintaining knee stability in two directions – front to back and rotation. It is a cord-like structure and in the case of complete disruption, it will not heal on its own as the fibres distract and there is no direct contact between them.

In most cases, the ACL ruptures as a result of a non-contact twisting injury. One of the signs of an ACL injury is swelling which occurs on the same day as the injury due to internal bleeding. A complete ACL tear can lead to persistent knee instability and is an indication for reconstructive arthroscopic surgery.

Recurrent knee instability can lead to further injuries, causing irreversible damage to menisci and articular cartilage especially during offline sports such as football, basketball, etc.

Meniscal injuries are also very common in athletes. The meniscus is an important cartilage-like structure located between the ends of the bone covered by articular cartilage. It distributes the load in the knee joint and acts as cushion to absorb the shock. These injuries can occur as a result of an acute event or repetitive loading.

Incomplete, partial thickness or stable meniscal tears can be treated conservatively. Complete, unstable, displaced meniscal tears causing blocking or clicking in the knee and usually requires arthroscopic surgery. Preferably the meniscus should be preserved by suturing if the torn fragment is viable and is big enough. Smaller tears located in the periphery may require trimming.

The commonest overuse injuries around the knee joint are patellar or quadriceps tendinopathy – “jumper’s” knee, and ilio-tibial band tendinopathy – “runner’s” knee. Tendinopathy is chronic inflammation of the tendons or ligaments due to accumulation of microtears occurring as a result of repetitive stress. If neglected they are difficult to treat and treatment can take a long time.

Early signs of tendinopathy include pain or discomfort occurring during exercise. Athletes can distinguish muscular pain from overuse pain. Overuse pain appears during first minutes of exercise. It settles later after warming up.

Pain from tendinopathy comes back again as the body cools down.

Injuries of the shoulder joint are the second most common sports injury after knee injuries.

Acute shoulder injuries include sprains and strains, partially or completely torn ligaments, joint dislocations and bone fractures.

The shoulder is the most mobile joint in our body. But the mobility comes at the expense of stability. The shoulder joint is composed of ball and a socket, similar to the hip joint. However, the socket is much smaller and therefore stability largely depends on surrounding soft tissues – cartilage like tissue called labrum, the joint capsule, ligaments and muscles.

Shoulder subluxations or dislocations can occur as a result of a fall during sports activity. This injury distorts the labrum, joint capsule and internal ligaments. If it fails to heal, it can lead to recurrent shoulder instability. Recurrent subluxations or dislocations can lead to irreversible damage to articular cartilage of the shoulder joint.

Instability depending on the frequency of dislocations can be treated conservatively by physiotherapy or may require surgery for arthroscopic stabilization.

Overuse shoulder injuries are caused by repetitive overhead activity, which is common in certain sports. such as tennis, cricket, weightlifting swimming, etc.

The tendons of the muscles that move the shoulder are called the rotator cuff, as they form a single tendon surrounding the humeral head. They pass through bony tunnel between the humeral head and acromion, which is a projection of shoulder blade. Overhead movement increases loading of tendons by surrounding bones and can lead to microinjuries. This condition is called impingement syndrome.

Impingement syndrome can also occur due to imbalance of different muscle groups surrounding the shoulder.

Impingement syndrome can be successfully treated by physiotherapy when recognized early. During the treatment, shoulder muscles are carefully assessed and any disbalance is corrected.

It is widely recognised in the modern world, that most sport injuries are avoidable. Health practitioners can play significant role in prevention by educating athletes how to improve safety in sports and exercise. MEH



Sport and undetected cardiovascular conditions



High intensity sport may trigger a cardiac event if a patient has an undetected cardiovascular condition. But, for most people, exercise should be an important part of their daily lives.

Several high-profile sportspeople under the age of 35 have been affected by undetected cardiovascular conditions. Footballer Fabrice Muamba and cricketer James Taylor both survived their cardiac events but, tragically, there are fatalities every year in endurance events.

Dr Mark Mason, consultant cardiologist at Royal Brompton & Harefield Hospitals Specialist Care, explains: “Affected people under the age of 35 could have an inherited condition – although they may be the first person in their family to experience it.”

Broadly, problems result from different types of cardiomyopathy (which affects

the heart ventricles) or harder-to-find channelopathies, which cause abnormal rhythms in an otherwise normal heart. Most over-35s who experience a cardiac event, meanwhile, will do so because of previously undiagnosed coronary artery disease.

Know the symptoms

If someone has an undetected cardiovascular condition then longer duration, high intensity exercise could heighten the risk of a cardiac event, particularly in the over-35s. However, Dr Mason stresses, the overwhelming evidence is that exercise is hugely beneficial for most people. So, it’s important to keep active.


Symptoms can include shortness of breath, light-headedness or blackouts, heart palpitations or chest pain, “which could be tightness, heaviness, or the sensation of having a belt being tightened around your chest”, says Dr Mason.

Make lifestyle changes

Over-35s can reduce their risk of cardiovascular disease by lifestyle modifications. In the under-35s, however, reducing the risk of a cardiac event is more challenging – particularly if you don’t know you have a problem to begin with.

In Italy, anyone between the ages of 16 and 35 has to undergo screening – by law – before participating in sport at any level. “As a result, it’s estimated that Italy has reduced its instances of cardiac events by around 90%,” says Dr Mason.

However, as high-profile cases such as Piermario Morisini and David Astori show, there is still a risk.

- To find out more about RB&HH Specialist Care heart screening services, email privatepatients@rbht.nhs.uk or visit rbhh-specialistcare.co.uk. 



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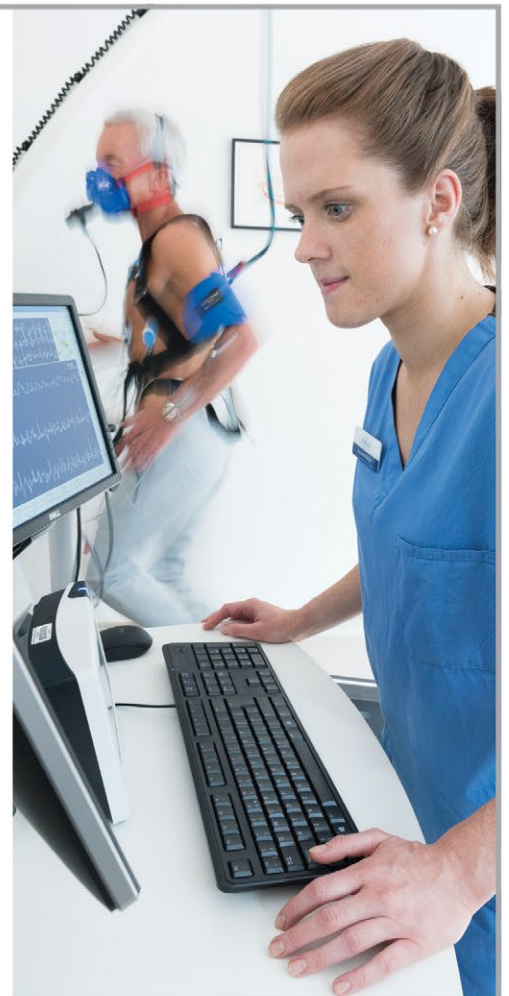
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The Acibadem ecosystem sets an example for the world in patient-centred healthcare services

From supporting healthcare services to the university, Acibadem serves as a leading model of integrated world-class health care.

Acibadem Healthcare Group, which has developed rapidly since 1991 and became the leading institution in Turkey within the field of private healthcare services, is moving forward on the global healthcare platform with the partnership with IHH Healthcare Berhad, one of the biggest healthcare groups in the Far East, in 2012. Comprised of 21 hospitals and 16 medical centres, Acibadem has become the world's second largest healthcare chain with this partnership.

Each year many patients from different parts of the world, prefer to visit Turkey to receive treatment. Their first preference is Acibadem, which provides services using the most advanced technology and with an expert team following international quality standards.

Apart from hospitals and medical centres, Acibadem Healthcare Group offers an integrated special healthcare system model that serves as an example for the world, with various healthcare support institutions. Within the healthcare services framework, Acibadem Labmed, offers a wide range of services including genetics, pathology, stem cell and cord blood banking. Acibadem Project Management, which develops hospital projects; Acibadem Mobile Health, which provides emergency ambulance and home care, APlus addresses the hygiene and catering requirements of hospitals and Acibadem University transfers the experience acquired by the group within the health industry to the next generations that will provide healthcare services in the future with its medical school, nursing and health management departments.

Providing compact services with centres of excellence

All the hospitals within the group that meet the global standards, also stand out with the centres of excellence. Eleven Cancer centres (surgical, radiotherapy, chemotherapy), 16 Heartcare centres (pediatric and adult cardiology and cardiac surgery), 13 In Vitro Fertilization centres (infertility - IVF), 10 Organ Transplantation centres (liver, kidney, bone marrow), 9 Spine centres, 1 Sports Medicine centre accredited by FIFA and 6 Robotic Surgery centres are all among the nationally and internationally accredited and qualified centres due to their advanced technology equipment and experts that have significant experience in their own fields.

International quality in healthcare

The quality of the services provided by Acibadem Healthcare Group is also supported by independent institutions. Joint Commission International (JCI) is an independent international accreditation institution that determines and monitors the quality standards in relation to healthcare services. Acibadem Healthcare Group has adopted JCI accreditation standards in order to reinforce its quality improvement and patient safety approaches. Collaborating with Labmed Dortmund GmbH, which has been actively operating in Germany for more than 30 years, with regards to "reference laboratory services", Acibadem Labmed has also been issued with "ISO 15189 Clinical Laboratory Accreditation Certificate".


The International Patient Centre

Acibadem International Patient Centre

has been designed as a "one-stop" service centre and offers healthcare services from the day of the request of patients until the time patients return to their home country. Team of professionals offers a comprehensive range of services for international patients and visitors including consultations, diagnostic services, billing and insurance, travel and lodging arrangements and language interpretation services. Acibadem has launched 33 Information offices, which are located in 22 countries and 34 cities outside Turkey for offering these range of services. Once patients choose to come to Turkey for their treatment, they will be warmly welcomed at our Health Point desk at the airport. They can wait and use wifi until their transfer. After a short time they will be transferred directly to their hotel or to hospital by private transportation. At our Health Point desks, located in hospitals, our translators (speaking 20 different languages) will welcome them and support them throughout their treatment.

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Turkey generates \$7 billion from health tourism

For the past several years Turkey has been on a major drive to attract healthcare tourists to the country. It's an attractive place for foreigners seeking healthcare. Its central geographical location and well-connected flight routes make it an easy destination to get to. The country's standard of healthcare in its leading hospitals is on a par with the best in the world. The cost of treatment is, in many cases, considerably less than that of Western Europe and the United States.

And the many world-renowned tourist attractions make it a wonderful place to spend some time recuperating following treatment.

By the looks of things, it has been quite successful in this drive. According to Emin Cakmak, founding chairman of the Turkish Healthcare Travel Council, some 756,000 health tourists were welcomed to the country in 2017, generating US\$7.2 billion. Clearly this serves as a major

boost to the Turkish economy and for this reason health tourism attracts significant support from the state.

Referring to the support from government, Çakmak was quoted as saying: "Whatever you can think of in terms of marketing, we have it: TV advertising, magazines, exhibitions, conferences, workshops, international medical tourism events."

The Turkish Healthcare Travel Council

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points out that in the past 10 years, the Turkey has invested more than US\$30 billion in the development of new hospitals and the acquisition of new technology.

The council notes that “the forerunners of this transformation are Turkey’s private healthcare investors. The Turkish private health care industry has fostered Turkey’s health services standards by employing state-of-art medical technology. Today, not only for local patients, but also for global healthcare seekers, Turkish entrepreneurs have created a unique proposal.”

In Turkey, among the state-of-art hospitals, 54 are accredited by Joint Commission International (JCI). This constitutes over 21% of the total accredited hospitals by JCI in 58 countries around the world.

These hospitals offer a full range of treatments through a network of locations, employing approximately 150,000 healthcare professionals, with more than 15,000 physicians.

Çakmak said that most of the foreign patients visit Turkey for oncology treatments, adding that they make up around 32% of the cases.

He added that Turkey’s healthcare system was also well known for its paediatric care, as well as organ transplants.

Referring to organ donation, he stressed that there is an ethics board that oversees all transplants, to prevent black market trading in human organs. “We never make transplants for foreign patients if they don’t bring their own donors,” Çakmak was quoted as saying to *Ahval News*, a Turkish online news service.

He said patients have two options for payment: private insurance or self-payment. Most foreign patients pay in cash he said, adding they were largely in the medium-to-high income bracket.

The Turkish Healthcare Travel Council expects the healthcare tourist numbers to increase from 756,000 in 2017 to 1 million in 2019 and two million by 2023. Foreign patients include not only those visiting the country specifically for treatment, but also foreign residents working in the country for multinational companies that have offices in Turkey. MEH

Successful scoliosis treatment for young Irish dancer

The Acibadem Healthcare Group in Turkey reports that it has successfully treated a difficult case of scoliosis in a young dancer from Northern Ireland.

Professor Ahmet Alanay completed the surgery at Acibadem Hospital in Istanbul.

After she was diagnosed with scoliosis, 14-year-old Megan Fleming’s budding career as a professional dancer was in jeopardy. Scoliosis is the abnormal curvature of the spine. Megan’s case was particularly distressing as the scoliosis was progressing rapidly, making corrective surgery all the more urgent and difficult.

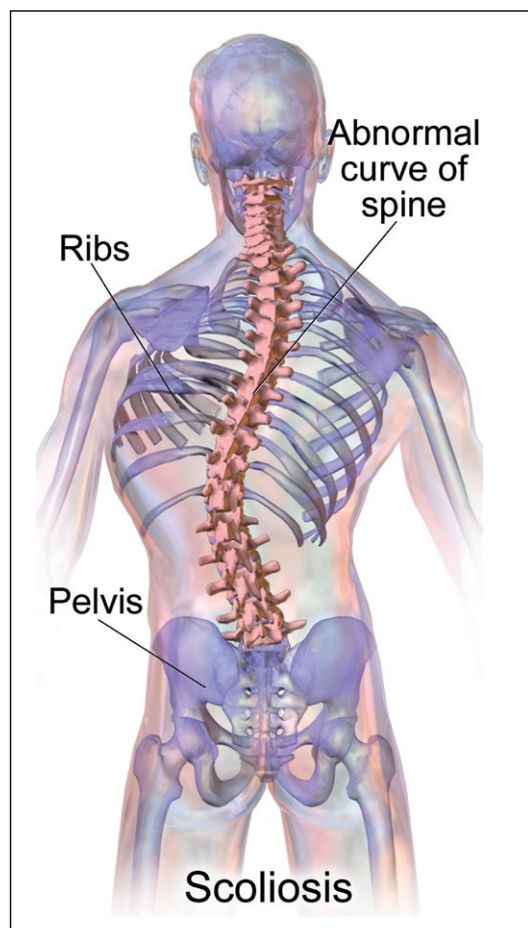
If the scoliosis were to continue progressing at its rapid pace, Megan’s lung capacity would be critically reduced and her chances of continuing dancing would be over. Compounding these difficulties was a growth hormone deficiency which had led to underdeveloped bones already under the pressure from the scoliosis.

As Megan, along with her parents, Karen and William Fleming, consulted with doctors, they read about Professor Alanay in Turkey and his history of successful scoliosis treatments. After meeting with him at a medical conference in Dublin, the family flew to Istanbul for the life-saving surgery at Acibadem Maslak Hospital.

The surgery was a success. Professor Alanay and his team were able to create a “mobile backbone” that allows Megan to continue dancing. Using osteotomy and fusion techniques, parts of the bones were removed to soften the spine, allowing it to be fixed with screws and rods.

“Thanks to the high technology we used in surgery, we achieved our goal and created a spine for Megan to dance with,” said Professor Alanay. “Even more importantly, Megan will be able to move without getting out of breath since her lung capacity has returned to its former levels.”

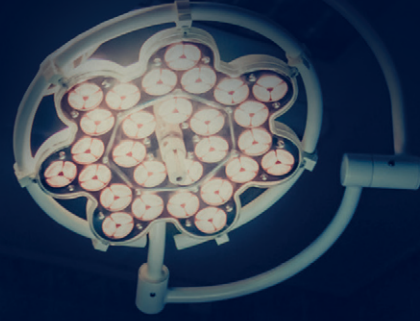
“Because dance is my energy of life, I was very happy when my doctor said I would dance again,” said Megan.



MOST COMPREHENSIVE CANCER DIAGNOSTIC AND TREATMENT PLANNING CENTER IN THE REGION

New radiation oncology and nuclear medicine facilities will establish Kent Hospital as a complex cancer care center offering a full range of cancer treatments:

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- Enhanced Radiology equipments (4D CT, MRI, USG, etc.)
- Medical Oncology
- Surgical Oncology



Kent Hospital is
Accredited by JCI
Joint Commission
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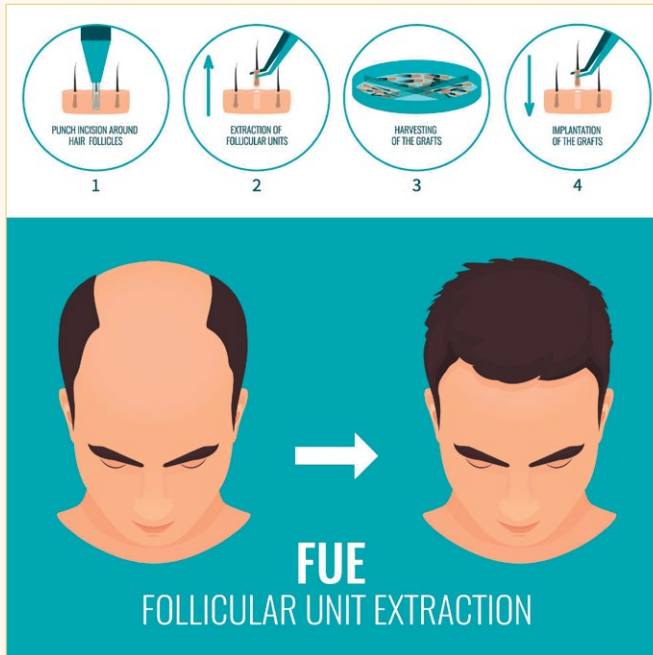
Hair transplant procedure using follicular unit extraction

Turkey-based Acibadem Hospitals Group is offering painless FUE hair transplantations that enable quick and non-invasive hair follicle extraction, considerably cheaper than in Europe or the US.

Ozlem Safiye Kurt, a professional in the medical tourism sector, said that Turkey's success in hair transplantation has drawn huge interest from Saudi Arabia, Kuwait, Qatar and the United Arab Emirates in the Middle East, as well as Germany, Britain, the Netherlands, Italy, Spain and France.

FUE (follicular unit extraction) was developed after the FUT (follicular unit transplantation) method had lost its validity and is now being used for special cases or in local hair restoration. The FUE method provides aesthetically pleasing results, leaving no scar and allowing patients to recover quickly. The operation is performed under local anaesthesia with no limit on graft transfer.

Approximately 25-30 hair follicle transplants are planned per centimetre.



The appropriate region is determined on the nape area for hair extraction, and the whole region is anesthetized with thin needles. The connection of hair follicles with the scalp is removed without damaging the follicles. When the transplant area is anaesthetised, and small holes are opened, grafts are placed in these canals. The patient is discharged on the same day with the new hair starting to grow from three to six months later.

According to Abdullah Etöz MD, the starting place of the transplant should not be distinct and in a straight line. A natural appearance is achieved by avoiding excessive hair density, providing slight variety on the transplant margin, and opening channels in the direction of hair growth.

Turkey has recently become one of the world's leaders in hair transplantation, attracting around 65,000 foreign patients in 2016. Turkish hospitals are appealing because of the price:

treatments cost between 2,000 and 3,000 euros each, including a few nights in a hotel. This is five or six times cheaper than in Europe or the United States. According to Pau Vilanova, a manager at Capil Clinic, a company that takes to Istanbul, "this is because the operations do not require costly material, but mostly human capital, and with wages in Turkey being less, this reduces the price." MEH

International healthcare partnerships

ISS Turkey has entered into two five-year integrated services partnerships in the healthcare sector with Kayseri Hospital and Elazı Hospital respectively. The two contracts will have a combined annual revenue of around US\$40 million.

The ISS Group was founded in Copenhagen in 1901 and has grown to become one of the world's leading facility services companies.

With a strong portfolio of contracts servicing the healthcare sector, ISS Turkey is now one of the largest providers of integrated facility services to hospitals in Turkey.

The contract with Kayseri Hospital ramps up from May to November 2018, while the contract at Elazı Hospital ramps up from July to November 2018. Both contracts cover a fully integrated

portfolio of services, including catering, technical services, waste management, cleaning, and security. Once fully operational, approximately 3,000 ISS employees will be employed at the two hospitals.

Cavit Habib, Country Manager for ISS Turkey, said: "We are very excited about entering into these two new partnerships with Kayseri Hospital and

Turkey donates funds for Gaza healthcare

With the aim of saving lives and reducing the suffering of populations in Gaza, the Turkish Government donated US\$1.2 million to WHO in May this year. The fund will be used to provide essential drugs and disposables for trauma and emergency non-trauma cases across the Gaza Strip.

"It is a timely contribution, which will address the immediate needs of populations most affected by the recurring shortcomings of the health system in Gaza, thus giving communities a renewed sense of priority in emergency health care," said Head of the WHO Gaza sub-office Dr Mahmoud Daher.

The Cooperation Agreement will provide targeted support to public hospitals. Over 150,000 patients will benefit with access to essential treatment through this funding.

"Funding provided to the World Health Organization is a sign of our determination to facilitate immediate support to Gaza medical staff working under exceptionally challenging circumstances to ensure the best possible emergency care to the substantial number of injured Palestinians overflowing hospitals at present," said Erman Topcu, Charge d'affaires ad interim of the Republic of Turkey in Jerusalem.

"We will continue working with the State of Palestine and relevant international organizations with a view to contributing to efforts to ease the dire humanitarian situation on the ground, the root cause of which is the illegal closure of the occupied Gaza Strip," Topcu said. **MEH**

boost revenue

Elazi Hospital, and look forward to applying the skills and expertise we have built up within the healthcare industry here in Turkey. By self-delivering services with our own dedicated employees, we will be able to deliver the best service possible to all patients, visitors and staff at the hospitals."

The contracts add to an already well-established portfolio of healthcare contracts in Turkey, including a major integrated services contract with Adana Hospital, which was launched in 2017. **MEH**

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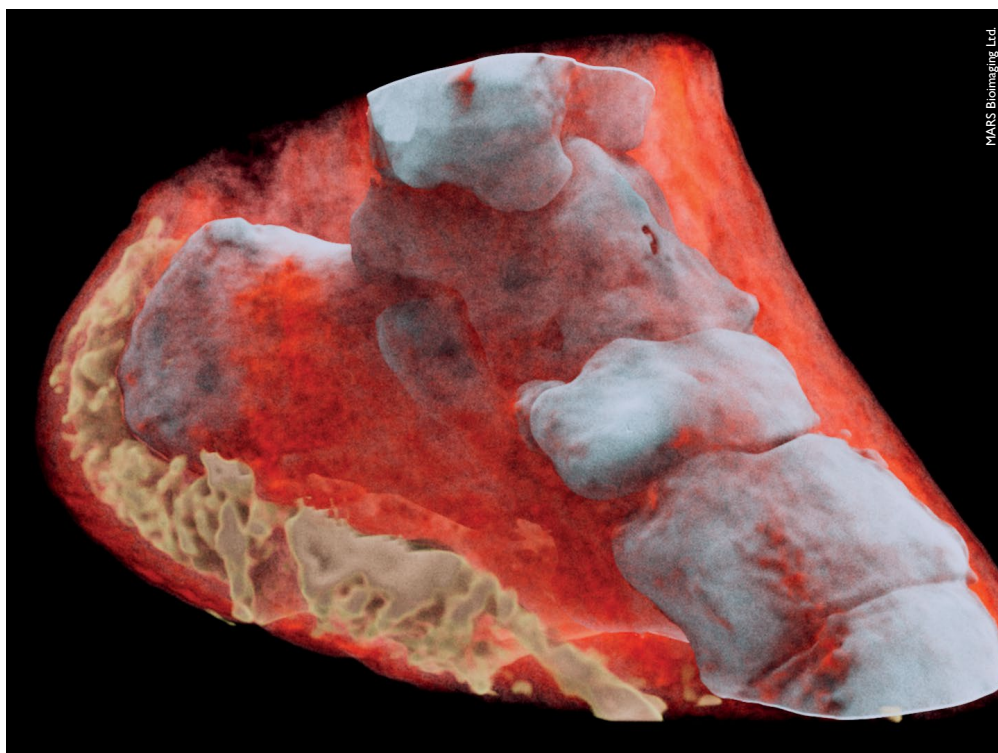
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A 3D MARS image of an ankle viewed from the side where the soft tissue (coloured in red) has been made translucent to show the bones (white) and lipid-like material (yellow) inside the ankle.

3D colour X-ray set to revolutionise medical imaging

A father and son team in New Zealand have developed the world's first colour 3D x-ray scanner – a colour spectral CT – which looks set to revolutionise medical diagnostic imaging.

What if, instead of a black and white X-ray picture, a doctor of a cancer patient had access to colour images identifying the tissues being scanned? This colour X-ray imaging technique could produce clearer and more accurate pictures and help doctors give their patients more accurate diagnoses.

This is now a reality, thanks to a New Zealand company that scanned, for the first time, a human body using a breakthrough colour CT scanner based on the Medipix3 technology developed at CERN (the European Organization for Nuclear Research). Father and son scientists Professors Phil and Anthony Butler from Canterbury and Otago Universities spent a

decade building and refining their product.

Medipix is a family of read-out chips for particle imaging and detection. The original concept of Medipix is that it works like a camera, detecting and counting each individual particle hitting the pixels when its electronic shutter is open. This enables high-resolution, high-contrast, very reliable images, making it unique for imaging applications in particular in the medical field.

Hybrid pixel-detector technology was initially developed to address the needs of particle tracking at the Large Hadron Collider at CERN, and successive generations of Medipix chips have demonstrated over 20 years the great

potential of the technology outside of high-energy physics.

MARS Bioimaging Ltd, which is commercialising the 3D scanner, is linked to the University of Otago and Canterbury. The latter together with more than 20 research institutes forms the third generation of Medipix collaboration. The Medipix3 chip is the most advanced chip available and Prof Phil Butler recognises that “this technology sets the machine apart diagnostically because its small pixels and accurate energy resolution mean that this new imaging tool is able to get images that no other imaging tool can achieve”.

MARS' solution couples the spectroscopic information generated by the

MARS Spectral CT System specifications

MARS scanners generate multi-energy images with high spectral & high spatial resolution and with low noise. This allows functional imaging by simultaneously identifying cartilage as well as exogenously administered contrast agents, nanoparticles and pharmaceuticals in a single scan.

The specimen to be imaged remains stable on a translatable bed with rotating gantry that houses an x-ray tube and a MARS camera. With current MARS scanners, specimens up to 100mm

diameter and 280mm in length can be imaged. A MARS camera is an assembly of multiple photon counting, energy resolving detectors, each comprising a Medipix3RX CMOS ASIC, bump-bonded onto the high-Z semi-conductor sensor crystal of doped cadmium zinc telluride (CdZnTe or CZT). CZT has a high quantum detection efficiency within the human diagnostic energy range (30-120 keV). This makes it highly suitable for pre-clinical/clinical spectral imaging.

Each CZT-Medipix3RX detector is an array of 128 x 128 pixels, each 110 x 110 μm^2 , giving an active area of 14.1 x 14.1 mm².

The energy-resolving photon counting detectors are the unique, patented technology that enable spectral imaging in the human diagnostic energy range.

Medipix3RX has a “charge summing mode” that enables more accurate energy measurement, and a super-pixel mode enabling the collection of images using up to 8 energy bins simultaneously.

Medipix3 enabled detector with powerful algorithms to generate 3D images. The colours represent different energy levels of the X-ray photons as recorded by the detector hence identifying different components of body parts such as fat, water, calcium, and disease markers.

So far, researchers have been using a small version of the MARS scanner to study cancer, bone and joint health, and vascular diseases that cause heart attacks and strokes.

“In all of these studies, promising

early results suggest that when spectral imaging is routinely used in clinics it will enable more accurate diagnosis and personalisation of treatment,” Prof Anthony Butler said.

CERNs Knowledge Transfer group has a long-standing expertise in transferring CERN technologies, in particular for medical applications. In the case of the 3D scanner, a license agreement has been established between CERN, on behalf of Medipix3 collaboration and MARS

Bioimaging Ltd. As Aurélie Pezous, CERN Knowledge Transfer Officer stated: “It is always satisfying to see our work leveraging benefits for patients around the world. Real-life applications such as this one fuels our efforts to reach even further.”

In the coming months, orthopaedic and rheumatology patients in New Zealand will be scanned by the revolutionary MARS scanner in a clinical trial that is a world first, paving the way to a potentially routine use of this new generation equipment. MEH

Some of the benefits of the spectral CT colour scanner

- Delivers high spatial resolution material reconstruction and quantification.

By using the energy information captured by a Medipix 3 detector chip, MARS spectral CT delivers the next generation of CT imaging, with identification and quantification of both intrinsic and extrinsic materials, from low contrast materials such as lipid and water to high contrast materials including calcium, gadolinium and iodine.

- Simultaneously differentiates and quantify up to 6 different materials in a single scan.

The unique algorithm and processing of data allows the simultaneous detection and quantification of materials, with no additional scanning requirement. The benefits of simultaneous detection is the reduction of artefacts due to sample movement, as well as dose reduction and time savings.

- Reduces metal artefacts.

The nature of spectral CT, and the use

of photon counting and charge summing mode means that metal artefacts such as beam hardening can be removed during the reconstruction and material decomposition process.

- Delivers improved tissue characterization.

Until now traditional CT offered poor differentiation of low contrast soft tissue, but, with material quantification, MARS spectral CT delivers assessment of the lipid/water composition of soft tissue, with benefits to the research in the ▶

► (continued...)

areas of fatty liver disease, atherosclerosis, obesity, and more.

- Provides spectral molecular imaging with histology level information.

Using commercially available nanoparticle probes, MARS spectral CT provides histology level information about specific cell types within tissues, without the need for expensive radiotracers or low penetration fluorescent probes.

- Provides new diagnostic x-ray information.

By using photon counting technology at multiple energy ranges, MARS spectral CT generates more information than ever before, all stored in easily accessible DICOM format.

- Easily translatable to clinical human imaging.

The MARS scanner operates in the human energy range (30 -120 keV) and the applications demonstrated on MARS scanners are easily translated to human

scale imaging.

- Offers access to both pre-reconstructed and post reconstructed data.

Whilst the MARS spectral CT comes with its own proprietary reconstruction algorithm, users are also able to access all raw data. This offers flexibility to users to apply their own image processing and reconstruction techniques if they wish.

- Utilizes individualized scan protocols.

MARS spectral CT is designed for a wide range of applications; hence users are given the flexibility to design or adapt protocols to optimize their scans for their needs and specific applications. This includes the ability to change energy bins, voxel size, source to detector distance and more.

- Enables low radiation dose due to ability to count single photons.

As all the information is contained within the energy of the photon and the distribution of photons, a high dose is not

necessary to achieve a high-quality image. This has benefits for researchers planning to do longitudinal studies, repeatedly scanning the same subject.

- Enables improving precision medicine.

MARS spectral CT delivers more accurate information about location and density of specific targets, which offers the potential to improve the accuracy of dose calculation in treatments such as radiotherapy.

- Advanced 3D visualisation and analysis of materials.

The MARS visualisation software allows users to view datasets in 2D and 3D with both qualitative, and quantitative assessment of materials. It incorporates a range of measurement tools, pre-defined colour look-up tables, the magic lens, and the HP zVR – a state-of-the-art stereoscopic 3D virtual reality display with stylus input. **MEH**

Researchers develop ground-breaking flexible X-ray detector

New X-ray detector technology developed at the University of Surrey could lead to mammogram machines tailor-made to individual patients as well as more accurate security screenings at airports.

Detectors that are presently used for mammograms and for dose measurements in radiotherapy are often rigid, causing errors in screening, or dose delivery to surrounding healthy tissue. This has raised concerns of additional tissue damage or the growth of secondary tumours. While flexible x-ray films such as those used in dentistry or chest x-rays bypass this issue, they are not able to achieve real-time imaging. Similarly, high-speed monitoring of people and vehicles over large geographical areas, which is important in border security, is impeded with the current technology.

In a study published in *Nature Communications*, researchers from

the University of Surrey's Advanced Technology Institute (ATI) detail how they have developed an x-ray detector by embedding oxide nanoparticles in a bulk organic structure that allows for large area detectors to be produced inexpensively. The detectors created by ATI researchers are able to achieve high sensitivity levels that strongly compete with current technologies, while still operating at low voltages, as well as over the whole x-ray energy range spectrum.

The team also proved that it is possible to create a device that conforms to the subject – something that is not possible with current x-ray detectors. This means that it could be possible for breast cancer screenings to be carried out by adapting the x-ray detector arrays to the specification of different patients. A new start-up company has been formed to further develop this technology and bring it to market – looking

specifically at the health, food monitoring and pharmaceuticals sectors.

Hashini Thirimanne, lead author of the study and PhD student at the University of Surrey, said: "Our new technology has the potential to transform many industries that rely on x-ray detectors. We believe that this innovation could help save lives, and keep our borders more secure, and make sure that the food we eat is as safe as it could possibly be."

Professor Ravi Silva, Director of ATI at the University of Surrey, and corresponding author said: "We are incredibly proud of the young researchers at ATI who have progressed this project and have produced technology that could very well save lives and make the world safer. We look forward to helping the team bring this technology to market. We are grateful to the Leverhulme Trust who funded the work via a major research programme." **MEH**

Low-dose X-ray exposure does not harm human stem cells

Biophysicists have shown that following low-dose exposure to X-rays (at 80 milligrays), stem cells remain healthy, proliferate, and do not accumulate DNA damage to be passed on to their progeny. The paper was published in the journal *Aging*.

“The 80-milligray dose is equivalent to the radiation exposure during a medical diagnostic imaging procedure such as a CT scan, which is routinely used in conjunction with stem cell therapy,” explains Sergey Leonov, director of the Phystech School of Biological and Medical Physics at MIPT, who also heads the institute’s Laboratory for the Development of Innovative Drugs. “Our research helps predict the side effects and health risks for patients, who are increasingly often undergoing both stem cell therapy and diagnostic X-ray procedures at the same time.”

The field of regenerative medicine, which is now making rapid advances, holds the promise of using stem cells to replace or restore damaged human tissues and organs. Stem cells have a high potential for division and self-renewal, and are capable of differentiating into various cell types. They are present in most organs and tissues in an adult organism and can identify damage sites, migrate toward them, replace damaged cells, and promote healing. However, stem cells are believed to be harmed by frequent medical diagnostic procedures involving the use of ionizing radiation, such as CT scans and mammography. According to this view, X-rays cause damage that is accumulated in stem cells and passed on to their progeny. This supposedly leads to cell death, accelerated cellular aging, and malignant transformations.

The international research team, including Andreyan Osipov from Burnasyan Federal Medical Biophysical Center and MIPT’s Sergey Leonov and Anastasia Tsvetkova, ran a series of experiments aimed at obtaining the much needed data on the delayed effects of low-dose radiation exposure. They showed that low-dose X-ray exposure does not induce genome instability, premature aging, or the accumulation of DNA damage in the progeny of irradiated cells.

Cellular response to X-ray irradiation

During a regular X-ray exam, a dose of about 0.001-10 milligrays – depending on

the procedure – is delivered to the patient. Receiving 100 mGy is considered low-dose exposure, while 1,000 mGy is regarded as an intermediate dose. The effects of larger-dose exposure have been studied extensively. It is known to cause a dose-dependent increase in the incidence of DNA lesions, including the so-called double-strand breaks in which both strands of the double helix are severed. These breaks can lead to cell death, oncogene activation, and anti-oncogene inactivation.

In contrast, the effects of low-dose radiation exposure during routine X-ray exams are still poorly understood. The regulatory agencies responsible for radiation protection currently use the so-called linear no-threshold model to estimate radiation risks. Under this model, ionizing radiation is harmful to living cells, no matter how low the dose. However, this crude assumption does not reflect the actual state of affairs: We are regularly exposed to natural background radiation, and its absence even has adverse effects on the ability of cells to repair DNA damage.

Criteria for assessing the effects of low-dose exposure

Among the various types of DNA lesions caused by ionizing radiation, double-strand breaks get most of the attention of researchers, because their long-term effects on cells are the most pronounced. Their repair takes long, and uncorrected double-strand breaks lead to serious cytogenetic abnormalities, tumour suppressor gene inactivation, oncogene activation, and cell death.

For a long time, no method was available for evaluating the generation of DNA double-strand breaks due to low-dose radiation exposure. The classical methods could only describe the effects of large-dose exposure. Now, advances in immunocytochemistry, have given biophysicists the tools needed to quantify double-strand breaks caused by low-dose X-ray exposure and look into how they are distributed in the nucleus and repaired by the cell.

As proteins involved in the correction of DNA damage accumulate at the site of a double-strand break, they can be observed with a microscope thanks to immunofluorescence staining – a technique that involves treating antibodies with fluorescent dyes. This enables scientists to


visualize DNA lesions as bright dots called foci. One of the proteins widely used as a DNA damage marker is the histone variant called H2AX.

Effects on progeny cells

The cell has two main mechanisms for repairing double-strand breaks. The first one, called homologous recombination, is a slow but virtually error-free way of restoring the lost information in a damaged DNA sequence. The other one, nonhomologous end joining, may lead to a loss of genetic information, resulting in errors and mutations. And yet it is this faster but inaccurate mechanism that is used to repair eight out of 10 breaks occurring in an irradiated cell.

The researchers found that 24 hours after low-dose X-ray treatment, more H2AX foci are observed in stem cells, compared to those exposed to an intermediate dose of radiation. However, this was only true for cells undergoing division and not for quiescent cells. DNA double-strand breaks are known to occur naturally during cell division. Such breaks are usually mended correctly via homologous recombination. When the progeny of the cells were examined 11 passages, or “cellular generations”, after the exposure to low-dose radiation, the researchers found them to be no different from the progeny of the control cells, which were not treated with X-rays. Furthermore, the progeny of the cells that received low-dose irradiation did not exhibit genome instability, proliferation abnormalities, or accelerated senescence.

Andreyan Osipov, professor of the Russian Academy of Sciences and the head of the Experimental Radiobiology and Radiation Medicine Department at Federal Medical Biophysical Center, comments on the team’s findings: “Our research suggests that the presence of H2AX foci in cultured human stem cells 24 hours after low-dose X-ray irradiation is associated with cell division processes and does not lead to delayed effects related to aging. This is an important conclusion to draw, because H2AX foci are now actively used in biodosimetry. Misunderstanding the biological significance of residual foci might lead to a severe overestimation of the risks associated with low-dose exposure.”

• doi: 10.18632/aging.101327 



Cleveland Clinic Abu Dhabi surgeons perform UAE's first double-lung transplant

45-year-old patient continues impressive recovery with post-operative care

After her history-making operation, the UAE's first double-lung transplant recipient is recovering well, according to physicians at Cleveland Clinic Abu Dhabi.

Rahima Younis, a 45-year-old expatriate, underwent the complex procedure on June 10 after suffering from idiopathic pulmonary fibrosis (IPF), a debilitating, progressive disease that causes extensive scarring of the lungs, for the past few years.

The patient, who had to use a wheelchair and oxygen cylinders prior to the operation, can now walk and breathe freely.

"I am very happy to have had this surgery," said Rahima, a mother of six children who has lived in Abu Dhabi for 32 years. "I cannot describe how it feels to breathe again – it is the first time that I have not been plugged into oxygen for three-and-a-half years.

"Living without oxygen has been a dream of mine for a long time, but I never thought this day would come. I am very happy to have this second chance at life," added Rahima, who worked as a private tutor before she was diagnosed with IPF.

Dr Fadi Hamed, a pulmonologist and critical care physician who heads the



Dr Mohammed Redha Souilamas, Chair of Thoracic Surgery at Cleveland Clinic Abu Dhabi

medical-surgical intensive care unit (ICU) and also acts as a director of the lung transplant program at Cleveland Clinic Abu Dhabi, said Rahima's recovery was impressive since undergoing the five-and-a-half-hour surgery, which was performed by Dr Redha Souilamas, the hospital's Chair of Thoracic Surgery, and a team of specialists.

"While a double-lung transplant is a complex procedure, following the surgery Rahima is continuing to recover well,



Dr Fadi Hamed, Pulmonologist and critical care physician, head of medical-surgical intensive care unit and acting director of the lung transplant program at Cleveland Clinic Abu Dhabi.

having been discharged from Cleveland Clinic Abu Dhabi just nine days after her surgery," said Dr. Hamed.

"This is the result of having well-trained, experienced surgeons, transplant pulmonologists and a comprehensive Intensive Care Unit with multidisciplinary transplant teams to assist in Rahima's recovery – it is a very positive sign," he added.

There is no definitive cure for IPF and

No need to travel abroad for lung transplant

The Lung Transplant program at Cleveland Clinic Abu Dhabi is one of the first in the region to provide experienced care for patients who have received, or require lung transplant surgery. In the past patients would have had to travel abroad for lung transplant evaluation and surgery. This is no longer necessary with the establishment of this program. Cleveland Clinic Abu Dhabi provides comprehensive pre-transplant evaluation, transplant, surgery, and long-term post-transplant care.

According to Cleveland Clinic Abu Dhabi, lung transplant surgery is now a widely accepted treatment option for patients with advanced end-stage lung diseases. It is typically recommended for patients who have not achieved successful results with other available treatments. Some of the conditions that can be treated with lung transplant surgery include:

- Chronic obstructive pulmonary disease (COPD)
- Idiopathic pulmonary fibrosis
- Cystic fibrosis
- Idiopathic pulmonary hypertension
- Bronchiectasis
- Sarcoidosis
- Interstitial lung disease (ILD)

Cleveland Clinic Abu Dhabi, part of Mubadala's network of world-class healthcare providers, is a multispecialty hospital

on Al Maryah Island in Abu Dhabi, UAE. Cleveland Clinic Abu Dhabi is a unique and unparalleled extension of US-based Cleveland Clinic's model of care, specifically designed to address a range of complex and critical care requirements unique to the Abu Dhabi population.

Cleveland Clinic Abu Dhabi has the following Institutes: Heart & Vascular, Neurological, Digestive Disease, Eye, Respiratory & Critical Care, Surgical Subspecialties, Medical Subspecialties, Emergency Medicine, Anesthesiology, Pathology & Laboratory Medicine, Imaging, Quality & Patient Safety, and Clinical & Nursing. In all, more than 30 medical and surgical specialties are represented at Cleveland Clinic Abu Dhabi.

The facilities at Cleveland Clinic Abu Dhabi combine state-of-the-art amenities and world-class service standards. The hospital is a 364 (expandable to 490) bed facility, with five clinical floors, three diagnostic and treatment levels, and 13 floors of critical and acute inpatient units. It is a physician-led medical facility served by North American/European Board Certified (or equivalent) physicians. Cleveland Clinic Abu Dhabi provides patients in the region direct access to the world's best healthcare providers and Cleveland Clinic's unique model of care, reducing their need to travel abroad for treatment.

patients are typically given a low survival rate after diagnosis without transplant surgery. IPF symptoms include severe breathing difficulties, a dry cough, fatigue, weight loss, swelling of the legs and 'clubbing', a widening and rounding of the fingertips.

"I want to thank Dr. Redha Souilamas and Dr. Fadi Hamed, the UAE leadership and everybody from the team at Cleveland Clinic Abu Dhabi for this life-saving surgery. Cleveland Clinic Abu Dhabi provides healthcare for everyone and I am very grateful for their excellent care," said Rahima. "I would also like to thank the donor and their family, who I have thought about every day since waking up from the surgery. Not everyone is so generous, and I don't know how to reward them, but I wish them the best."

Cleveland Clinic Abu Dhabi has a comprehensive follow-up program for lung transplant patients, which includes regular visits to the hospital for tests to prevent infection and rejection.

Cleveland Clinic Abu Dhabi is the UAE's first and only multi-organ transplant center, working in partnership with other organizations to help improve the health of the community. In February this year, the hospital performed successful lung and liver transplants, as well as the country's first full heart transplant in December 2017. **MEH**

Cleveland Clinic Abu Dhabi extends access to health care

Cleveland Clinic Abu Dhabi, part of Mubadala's network of healthcare providers, is introducing a number of new initiatives designed to make it easier for patients to access health care.

The hospital is extending the opening hours of a range of outpatient clinics covering the most in-demand subspecialties, including cardiology, internal medicine, gastroenterology, neurology and other services. Patients can now schedule appointments between 8am and 8pm.

The extended hours are designed to better serve the needs of patients who use Cleveland Clinic Abu Dhabi's services. There has been a significant volume of requests for late afternoon and evening appointments, particularly from professionals who want to see their doctors after work.

"Since opening the hospital in 2015, we've treated hundreds of thousands of patients, and we now have the capacity and experience to treat millions more over the years to come. We're here to serve the

community and we are taking steps to ensure they can access our services where they need us and when they need us," says Dr Rakesh Suri, CEO, Cleveland Clinic Abu Dhabi.

As part of efforts to increase patient access, the hospital has opened Cleveland Clinic Abu Dhabi – Al Ain, a facility designed to support the community in the city and surrounding areas.

The clinic, located on the Tawam Hospital Campus in Al Ain, offers clinical services daily. Patients who need surgery or a longer-term care program, and those requiring highly specialized procedures and multi-disciplinary care, can be seamlessly referred to Cleveland Clinic Abu Dhabi's main facility in the capital after initial consultations in Al Ain.

The hospital has also started work on rolling-out a new mobile healthcare app which will enable patients to correspond directly with their physicians, schedule appointments and review test results using their personal device or mobile phone. **MEH**



Healthcare Organisations in the UAE can secure their IoT infrastructure in 7 steps



By Gamal Emara

IoT devices may offer extraordinary benefits to healthcare organizations in the United Arab Emirates. From improving patient outcomes, staff effectiveness and operational cost savings, it could also bring with them new security risks. Any type of connected device is a potential risk, even wireless lightbulbs, so it's imperative that healthcare institutions do everything they can to stem the flow of malicious attackers. This calls for a multi-layered security approach to mitigate these threats.

Step 1: Know your network, inside and out
To secure the network that your IoT infrastructure connects into, it's important

to know exactly what's running on it. As more employees and users become more network savvy, it's hard to keep track of what is being connected to the network because it's no longer just IT professionals who are making the connections.

To combat this threat, a modern network access control solution is a great starting place, with a roles-based management and network segmentation solution. These solutions will enable network and security managers to set policies around 'things' and devices, meaning that not just anyone can connect to the network. On top of this, it's also possible to set permissions on what data and applications they can access, as well as setting rules to who can manage and maintain these networks and devices.

These solutions automatically monitor connections to the network, and can isolate without the need for IT staff to action the quarantine. Assigned IT staff will then be notified to take action against the suspected malicious incident.

Step 2: Users, devices and things have roles, know them

To ensure the efficient running of the network, it's important to consider the myriad of devices that carry the ability to transmit data, locate them on the network,

and consider how they could be used to create an integrated and innovative experience.

In healthcare, patient monitoring within a surgery ward could keep track of vital signs, such as heart rate, without physically attending the bedside. This ability could be critical in detecting a potential issue quicker, and taking action (for example alerting a nearby nurse) without the need for caregivers to be everywhere at once.

Clearly, this use case is integral to safe and efficient running of healthcare institutions, and it also fits into part of the IoT puzzle within healthcare, helping those running the institutions to better make use of the equipment they already have.

Step 3: Use AI-enabled intelligence to monitor change

By bringing devices together in a single management platform on the network, security staff are better able to take a holistic view of all equipment, and begin to build smarter security policies. The unfortunate truth is that, no matter how much planning and patience is put into securing a network, threats will find their way in.

Thankfully, for organisations that want to combat this to their utmost ability, AI-based machine learning is becoming more sophisticated in helping to identify early

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and mid-threat scenarios. Sophisticated Cyber-attacks manifest themselves slowly over several months but through leveraging analytics, this technology can spot changes in behaviour that often indicate that the profile of a user's device is not conforming to usual patterns. In fact, a recent report showed that two thirds of breaches were perpetrated by insider actors, and not external forces.

The combination of integrating a powerful Access Control solution, along with AI, allows suspicious devices or actors to be temporarily quarantined to support security teams to focus their precious time on analyzing only the most pertinent anomalies. The savings associated with this model allows IT teams to rebalance their workload to a more proactive security posture.

Step 4: Shape the network around better security

With the global rise of cyber-attacks, there can no longer be a disconnect between network and security teams. Primary security elements must now be embedded into the network to allow more sophisticated security policies to leverage the network to gate or grant access to bandwidth.

The challenge with this, is that historically some of these features were not embedded as standard, but charged as optional extras. Therefore, devices and applications were able to bypass flaws in the network design, creating exposure to risk. Today, there are far more robust security features that are deeply embedded into the wireless and wired network allowing security teams to build around this in a world where the attack

surface has grown exponentially due to mobility and IoT. This requires an inside out view of the security strategy.

Step 5: Don't just use default settings

It's surprising to find the frequency of breaches that occur as a result of not changing default credentials and passwords. The fact is, most IoT-related breaches to date were as a result of organisations failing to update these details and have suffered as a result.

Vendors are now getting wise to this and have started offering more unique options than the standard 'admin' and 'password' defaults, which, surprisingly, is well documented on the internet. However, this does not require unique credentials for every connected device. Instead, role-based credentials that adhere to security recommendations for character length and combinations can be supplied to all of the same devices. In healthcare, this could mean that all door locks, or heart monitors that have their set roles, can have unique credentials.

For employees, having the correct login credentials based on their roles can access certain applications depending on the context of their location, device type and organizational governance. This allows security teams to use these parameters to set policies so that when they change a number of actions can be performed; ranging from multi-factor authentication to a security software update or perhaps quarantine for further inspection.

Step 6: People are usually the weakest link in security

Regardless of the technology in place, or the permission set into practice,

individuals using and accessing devices remain critically important to educate, inform and monitor. Traditionally, unsafe practices are usually a result of a poor understanding and therefore, it's key to regularly review and recertify all staff members to understand the protocols in place to keep the organisation safe.

By creating a set of processes and practices with password hygiene and prompts, employees can do their bit in ensuring the network remains safe. Password prompts that are unique to the individual is key to building a strong protective perimeter with everyone owning, and protecting their own credentials, and ultimately the network.

Step 7: Reassess and revise

No matter how much effort is put into securing the network, the work is never really complete. Instead, organisations should always look to evolve and improve their practices as new technology and recommendations become available. This shouldn't mean that everyone has to become experts in security. Rather, it would mean that organisations look at their vendors and partners for what is new and improving the industry. By taking all these steps security isn't guaranteed but the healthcare organisation that takes its security hygiene seriously will mitigate for the majority of weak links whether that be People, Process or Technology.

The Author

Gamal Emara is the Country Manager, UAE at Aruba, a Hewlett Packard Enterprise company. MEH

American Hospital Dubai and Roche partner to provide personalized treatment for cancer patients

American Hospital Dubai, one of the leading private hospitals in the Middle East, and Roche, one of the world's largest biotechnology companies, have announced a partnership to bring to the UAE the latest and most advanced genomic profiling solutions. This new solution – FoundationOne® – will be available to patients with aggressive and/

or late stage cancers, in the UAE and will offer cancer specialists unprecedented insights into the molecular make-up of individual cancer patients as a basis for a more personalized and targeted approach to cancer care.

Cancer is unique to each patient and by understanding the molecular basis of the cancer – physicians can deliver

appropriate personalized treatments including targeted therapies and immunotherapies.

The new genomic test – FoundationOne – is an assay for solid tumours, to help guide personalized cancer care by determining the comprehensive genomic profile of a patient's tumour through a tissue biopsy sample. FoundationOne ►

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Facts & Figures



11

Scientific
Sessions



30

Speakers



19

CME Points

Speakers:



Dr. Asif Muneer
Consultant Urological Surgeon
London, UK



Dr. Carlo Bettocchi
Professor of Urology
Bari, Italy



Dr. Dean Elterman
Urologist Professor
Toronto, Canada



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Consultant Urologist
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► (continued...)

applies sequencing to identify all four classes of genomic alterations across 315 cancer-related genes known to be drivers of solid tumours.

Dr Robert Harris, Chief Medical Officer, and Acting CEO at American Hospital Dubai, said: "Our partnership with Roche is a commitment to supporting cancer patients, and especially those with aggressive and late-stage forms of the disease, with a new option that could potentially offer a more personalized and effective form of treatment

and care. We believe this partnership could make a significant difference to the lives of these patients."

The American Hospital Dubai's Cancer Care Center is a dedicated facility providing a range of medical oncology and hematology services for all forms of cancers and blood disorders, with a specialist team. In addition to the traditional cancer treatment options of surgery, chemotherapy, and palliative care, the Cancer Care Center offers new therapies, which are creating remarkable

new treatment possibilities. Services include a radiation therapy program which uses the latest technology to provide alternative solutions to cancer patients.

The American Hospital Dubai is a 254-bed, acute care, general medical/surgical private hospital with a multi-specialty physician group practice, designed to provide a high quality, American standard of healthcare to meet the needs of the people of Dubai, the UAE and the surrounding Gulf States. **MEH**

UAE MOHAP, GSK sign agreement to ensure availability of medications in emergencies

The UAE Ministry of Health and Prevention (MOHAP) signed a strategic agreement with GlaxoSmithKline Export Limited (GSK) for the provision and distribution of medical and pharmaceutical stocks in emergency situations. The agreement is in line with the government's efforts to strengthen the UAE's medical health security.

The list of medicines covered under the agreement includes several products for the treatment of respiratory diseases, nervous system diseases, infections, urology diseases, gynecology and obstetrics, immune system disorders, and other chronic diseases.

The signing ceremony was attended by Dr Mohammed Salim Al Olama, Undersecretary of the Ministry; Dr Abdul Karim Abdullah Al Zarouni, Director of Emergency, Crisis and Disaster Operations Center at the Ministry; and Sally Storey, Vice President and General Manager, representative of GSK.

Dr Al Zarouni said that the signing of the agreement is in line with government's policies to promote proactive plans and rapid response to deal with emergencies, through ensuring the supply of medical stock, which covers the needs for one year, and includes ready-to-use medicines for six months. A cooperative committee has been formed to follow up on coordination between all stakeholders.

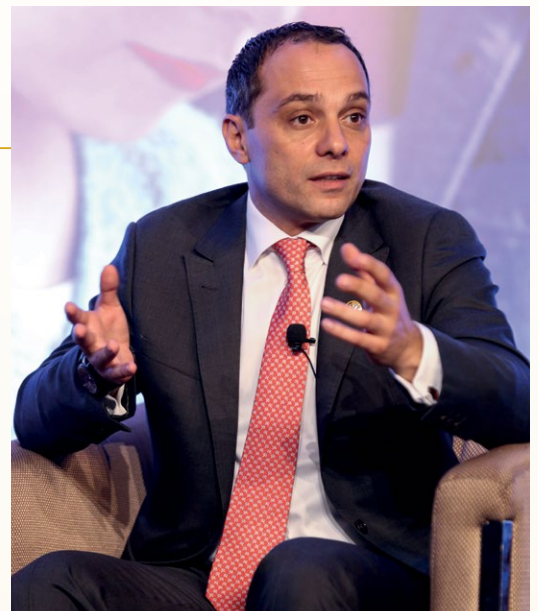


Dr Mohammed Salim Al Olama, Undersecretary of MOHAP; Dr Abdul Karim Abdullah Al Zarouni, Director of Emergency, Crisis and Disaster Operations Center at MOHAP and; Sally Storey, Vice President and General Manager, representative of GSK, sign the emergency medicines agreement.

The Ministry will facilitate the movement of medicines covered under the agreement from storage places to be delivered to the concerned destinations in case of emergency, as agreed upon by the stakeholders and other medical

departments, in accordance with the UAE's federal laws and regulations.

GSK will keep a stock of emergency medical supplies in its warehouses and maintain an electronic link with the Crisis and Disaster Operations Center at the Ministry. **MEH**



Michel Amous, Managing Director at InterSystems

TrakCare as a service launched in the Middle East to meet needs of growing market

TrakCare as a service, a new private cloud-hosted EMR service offered by InterSystems, is now available to UAE and Middle East hospitals. Integrating administrative, clinical and financial health data into a unified system, the service follows a Pay-Per-Usage (PPU) model and is set to enable hospitals and clinics to achieve their clinical and financial objectives without making major capital expenditures.

Today, most private healthcare organizations are looking at adopting the latest healthcare IT systems. They know that this will help them to provide safer, faster, and more efficient healthcare services. However, this could require a massive upgrade of their existing IT infrastructure and may involve huge upfront capital expenditure and sizeable operating expenses. Investing in a cloud-hosted service mitigates the need to invest in IT infrastructure by providing access to hardware, computing resources, applications and services in a PPU fashion. This approach dramatically brings down the cost and simplifies the adoption and ongoing ownership of technology.

TrakCare as a service

In order to address the UAE and Middle East specific market needs while incorporating global best practice, InterSystems introduced TrakCare as a service, a private cloud-hosted Electronic Medical Record, to help hospitals to benefit from the following:

- A turnkey Electronic Medical Record (EMR) solution that combines the administrative, clinical and revenue cycle management capabilities of InterSystems TrakCare®, the world's most proven EMR system;
- A flexible PPU model that allows healthcare providers to expand their businesses without facing the burden of a large upfront capital investment



- A focus on delivering quality patient care profitably, while entrusting InterSystems with their EMR landscape

With TrakCare, clinicians and administrators can improve safety and outcomes, control costs by eliminating duplicate tests, reduce medication errors, expedite billing, maximize resource utilization, coordinate care across care settings, and achieve other strategic initiatives. TrakCare's design emphasizes usability and localized configurations that reduce complexity and help care providers adopt the system and improve care quickly.

TrakCare is built on the InterSystems health informatics platform and thus provides exceptional interoperability for the sharing of health information both beyond the enterprise (i.e. connecting to other regions and services) and within it. Connecting, sharing and taking needed action is easier when all parts of the solution are provided on the same core technology and built from the ground up to be patient-centric and interoperable by design.

TrakCare's advanced interoperability also enables hospitals to comply with the "Nabidh" initiative. The Network & Analysis

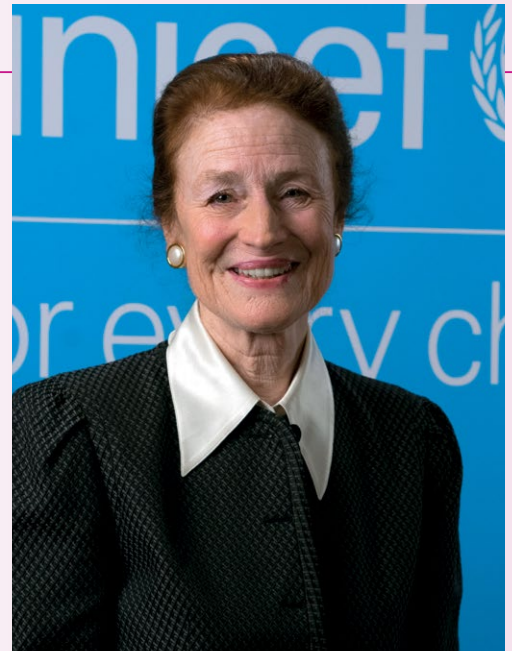
Backbone for Integrated Dubai Health "Nabidh" project from Dubai Health Authority is dedicated to the implementation of a regional Health Information Exchange (HIE) in the Emirate of Dubai with the intention of making patient information richer, better, more timely and easier to access within the ecosystem so that better treatment and -at the end- better health can be expected as an outcome.

InterSystems TrakCare electronic medical record system is trusted by leading healthcare providers in more than 25 countries and consistently receives top customer satisfaction scores. TrakCare comes preconfigured to meet local market requirements, reducing implementation complexity and risk.

Whether you manage a single hospital or a nationwide network, TrakCare empowers you to deliver seamless patient care across your organization and improve safety, efficiency, and patient experience.

- For more information on how TrakCare as a service can help your health system, contact the InterSystems Middle East team at: MEmarketing@interSystems.com

Breastfeeding should be initiated in the first hour after birth



Henrietta Fore, Executive Director
UN Children's Fund's (UNICEF)

The annual World Breastfeeding Week was celebrated from 1 to 7 August to encourage breastfeeding and improve the health of babies around the world by providing infants with the nutrients they need.

“When it comes to the start of breastfeeding, timing is everything,” said Henrietta Fore, the UN Children’s Fund’s (UNICEF) Executive Director.

“In many countries, it can even be a matter of life or death,” she added.

In the report, *Capture the Moment*, UNICEF and the World Health Organization (WHO) note that while newborns who breastfeed in the first hour of life are significantly more likely to survive, they estimate that 78 million newborns are excluded.

“Each year, millions of newborns miss out on the benefits of early breastfeeding and the reasons – all too often – are things we can change,” she continued. “Mothers simply don’t receive enough support to breastfeed within those crucial minutes after birth, even from medical personnel at health facilities.”

Even a few hours delay after birth could pose life-threatening consequences. Skin-to-skin contact along with suckling at the breast stimulate the mother’s production of breastmilk, including colostrum, which is produced ahead of regular milk, in the first few days after giving birth. It is so rich in nutrients and antibodies, that it is often referred to as the baby’s first vaccine.

According to the report, 65% of countries in Eastern and Southern Africa have the highest rate of breastfeeding

within the first hour, while East Asia and the Pacific have the lowest rate with only 32% benefitting from the early initiation.

While nearly nine-in-ten babies born in Burundi, Sri Lanka and Vanuatu are breastfed within that first hour, only two-in-10 born in Azerbaijan, Chad and Montenegro were nursed.

“Breastfeeding gives children the best possible start in life,” said Tedros Adhanom Ghebreyesus, WHO Director-General. “We must urgently scale up support to mothers – be it from family members, health care workers, employers and governments, so they can give their children the start they deserve.”

Reasons why many newborns are left waiting

Analyzing data from 76 countries, the report reveals some of the reasons why too many newborns are left waiting.

One common practice is to discard colostrum, and instead feed the infant honey, sugar water or infant formula, which also delays a newborn’s first critical contact with its mother.

The rise in elective C-sections also has an impact, with a study across 51 countries noting that in this type of delivery, initiation rates among newborns are significantly lower.

Risk of death

Earlier studies, cited in the report, show that newborns who began breastfeeding between two and 23 hours after birth, had a 33% greater risk of dying, compared to those who breastfed within one hour. And the

Three-in-five babies, mostly born in low- and middle-income countries, are not breastfed within the first hour of life, placing them at higher risk of death and disease, according to a new United Nations report launched on Tuesday.

risk more than doubled among newborns who started a day or more after birth.

The report urges governments and other decision-makers to adopt strong legal measures to restrict the marketing of infant formula and other breastmilk substitutes to help address the situation.

The WHO and UNICEF-led Global Breastfeeding Collective <www.unicef.org/breastfeeding> also released the 2018 Global Breastfeeding Scorecard, which tracks progress for and urges countries to advance breastfeeding policies and programmes to help mothers breastfeed their babies in the first hour of life.



Capture the Moment

www.unicef.org/publications/index_102949.html



2018 Global Breastfeeding Scorecard

<https://tinyurl.com/y7xykmfa>

The TEN STEPS to Successful Breastfeeding



You can download these posters for your hospital here: www.who.int/nutrition/bfhi/infographics

Ten steps to successful breastfeeding

The Ten Steps to Successful Breastfeeding, issued jointly by UNICEF and the WHO, encourages new mothers to breastfeed and informs health workers how best to support breastfeeding.

“Breastfeeding saves lives,” said UNICEF Executive Director Henrietta Fore. “It’s benefits help keep babies healthy in their first days and last well into adulthood.”

Infants are at greater risk of death due to diarrhoea and other infections when they are only partially breastfed or not breastfed at all. Breastfeeding for the first two years would annually save the lives of more than 820,000 children under age five.

Hospitals are not there just to cure the ill. They are there to promote life and ensure people can thrive and live their

lives to their full potential – WHO chief Breastfeeding also improves IQ, school readiness and attendance, and is associated with higher income in adult life. It is vital to a child’s lifelong health, and reduces costs for health facilities, families, and governments. It also reduces the risk of breast cancer in the mother.

WHO Director-General Tedros Adhanom Ghebreyesus said that in many hospitals and communities around the world, whether or not a child is breastfed can make the difference between life and death, and whether a child will develop to reach his or her full potential.

“Hospitals are not there just to cure the ill. They are there to promote life and ensure people can thrive and live their lives

to their full potential,” said Tedros.

The new guidance provides the immediate health system platform to help mothers initiate breastfeeding within the first hour and breastfeed exclusively for six months, and describes how hospitals should have in place a written breastfeeding policy, staff competencies, and antenatal and post-birth care, including breastfeeding support for mothers.

It also recommends limited use of breastmilk substitutes, rooming-in, responsive feeding, educating parents on the use of bottles and pacifiers, and support when mothers and babies are discharged from hospital.

on the WEB Ten Steps to Successful Breastfeeding www.who.int/nutrition/bfhi/ten-steps

On the pulse

Researchers develop virtual reality software platform with haptics for surgical training

FundamentalVR, pioneers of immersive training technology for the medical community, has launched Fundamental Surgery, a first-of-its-kind SaaS software platform that combines virtual reality (VR) with cutting-edge haptics (the sense of touch) to create a low-cost and scalable flight simulator experience for trainee and qualified surgeons. Unlike other medical training simulations that make professionals feel like they have been through a game-like experience, Fundamental Surgery creates an authentic environment that allows users to experience and navigate the same

visuals, sounds and feelings they would during a real surgical procedure.

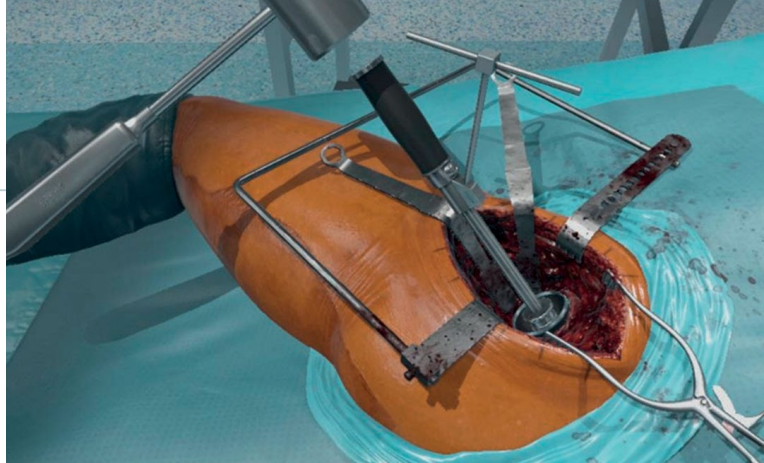
At the heart of the system is its unique *Surgical Haptic Intelligence Engine (SHIE)*, which is calibrated to mimic real life sensations of numerous medical tools and tissue variants. By combining immersive haptic technology with low cost, off-the-shelf hardware, Fundamental Surgery is democratizing surgical simulation through plug-and-play simplicity and a hitherto unachievable price point.

Designed to improve patient outcomes while combating the increasing cost of

medical training, Fundamental Surgery was created by a team of VR, haptic specialists and surgical training experts and has been extensively tested by over 500 surgeons.

Current procedures supported include Spinal Pedicle Screw Placement, Posterior Hip Replacement and Total Knee Arthroplasty. Further orthopaedic procedures will be added during Q4 2018 with other disciplines, including general surgery and cardiovascular slated for 2019.

● For more information, visit: www.fundamentalsurgery.com



Tiny neural implant set to have major impact on brain disorders

A United States-based company, Draper, has developed a tiny neural implant that is set to make a big impact in treating disease through its networked abilities.

A driving factor in the new implant design is the growing awareness that disease often involves complex interactions between multiple systems in the body. This networked perspective has led to the emergence of the fields of networked physiology and networked medicine. Experts say, however, that today's implantable devices aren't reaching their potential. Systems are too big – resembling large pacemakers of the past – and are limited to stimulation at a single location in the body.

"Patients and clinicians want smarter medical implants," said Jesse J. Wheeler, Draper's Neurotechnology Business Lead. "They see small wireless technologies shaping other parts of their lives and wonder why the medical field isn't responding with better devices." Draper tackled this challenge by developing a miniature, wireless and networked neuromodulation system that is about 20 times smaller than existing implants.

"The system consists of tiny implantable devices, called Gemstones, that are only one cubic centimetre – the size of

a kidney bean," Wheeler said.

Each Gemstone is wirelessly powered and equipped with advanced microelectronics (ASICs) that provide 32 channels of recording and stimulation. Recorded biosignals can be monitored by distributed Gemstones and used to trigger coordinated stimulation therapies on-the-fly to target disease in ways not previously possible. Each Gemstone can interface with multiple types of electrodes, and the number of networked Gemstones can be varied based upon the patient's clinical needs. Draper's current system supports networking among as many as four Gemstones for a total of 128 electrodes.

The current work extends Draper's growing portfolio of extreme miniaturization and closed-loop networked implants. In other Draper systems, miniature implants are networked by implantable leads. By designing the Gemstones so that it doesn't need leads and connectors, the implanted volume was significantly reduced, which ultimately translates to improved patient safety.

The Gemstones' small size means they



can easily go where other implants can't – for example, the head. Existing deep brain stimulation (DBS) systems are large and require implantation in the chest with an electrode lead tunnelled through the neck and head to access the brain.

However, many brain disorders, like neuropsychiatric illnesses, affect multiple distributed neural regions that can't all be accessed by existing systems. Gemstones' network capability may provide new opportunities to restore balance to these brain networks. Potential peripheral applications that can benefit from distributed systems include hypertension, diabetes, incontinence, pain, reanimation of paralyzed limbs and restoration of limb function for amputees through neuroprosthetics.

● For more information, visit: www.draper.com

Philips introduces two new cardiac ultrasound scanners with anatomical intelligence

Philips has introduced the EPIQ CVx cardiovascular ultrasound system. Built on the powerful EPIQ ultrasound platform, EPIQ CVx is specifically designed to increase diagnostic confidence and simplify workflow for clinicians, giving them more time to interact with their patients and reducing the need for repeat scans.

Philips also introduced the EPIQ CVxi, specifically tailored for use in the interventional lab.

“The EPIQ CVx brings together advanced image quality, quantification and intelligence specifically for the cardiologist,” said Roberto Lang, MD, Professor of Medicine, Director, Noninvasive Cardiac Imaging Laboratory at the University of Chicago Medicine. “I was impressed with the TrueVue feature, which elevates 3D ultrasound imaging to a totally new level and could impact diagnostic ability of echocardiography in different clinical scenarios, like better understanding of the anatomy of mitral valves.”

“By using advanced 3D organ modelling, image slicing, and proven quantification, anatomical intelligence is helping make ultrasound exams easier to perform and more reproducible,” said David Handler, General Manager Cardiac Ultrasound at Philips.

The EPIQ CVx includes higher processing power, exceptional image clarity and

sharpness, improved exam efficiencies and more robust and reproducible quantification, enabled by anatomical intelligence. The EPIQ CVx includes TrueVue, giving clinicians the ability to see photorealistic renderings of the heart, which improves cardiac anatomy analysis by offering detailed tissue and depth perception imaging through a new virtual light source. The system provides cardiologists with high image quality through the latest generation OLED monitor, offering a more dynamic, wider viewing angle for side-by-side image comparison.

The system offers a variety of new features including Dynamic Heart Model. Building on Philips HeartModelA.I., it uses anatomical intelligence to automatically quantify left ventricle function to produce a multi-beat analysis for adult patients. Dynamic Heart Model has been shown to reduce the amount of time to generate a 3D Ejection Fraction. It also delivers a high level of robustness and reproducibility, even for patients with an arrhythmia. The systems also includes the new S9-2 PureWave Transducer, which simplifies paediatric cardiac exams by displaying high levels of detail and contrast resolution through the single-crystal technology. It also provides tissue information

at greater depths and enhances paediatric capability for coronary artery visualization.

The EPIQ CVx includes a cardiology-specific user interface that simplifies the exam experience through a user-configurable touch-screen interface, allowing clinicians to personalize their controls and improve workflow for their cardiology exams.

EPIQ CVxi

Specifically designed for use in the cath lab, the EPIQ CVxi with EchoNavigator is Philips’ third-generation interventional solution to streamline communication between the interventional cardiologist and the echocardiographer during complex interventional exams, improving patient care and enhancing workflow.

Combining live ultrasound and X-ray information into one intuitive view, EchoNavigator helps interventional cardiologists oversee procedures along with the location of key anatomical structures. In addition, MultiVue provides more flexibility when using 3D during diagnostic or interventional procedures as the clinician can see multiple and flexible views at once.

● For more information, visit: www.philips.com



Self-powered sensor could help doctors monitor patient rehabilitation progress

A self-powered sensor developed at the University of Waterloo could allow doctors to remotely monitor the recovery of surgical patients.

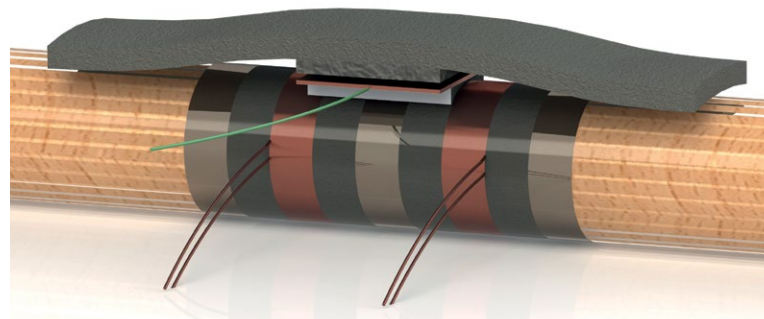
The small, tube-like device is designed to be fitted to braces after joint surgery to wirelessly send information to computers, smartphones or smartwatches to track range of motion and other indicators of improvement.

“That data would be continuously collected, so it would be as though the physician or physiotherapist was always there, always

observing the patient,” said Hassan Askari, an engineering doctoral candidate at Waterloo.

The same sensor could also be used in a variety of other ways, including in the tires of autonomous vehicles to detect and respond to icy roads.

A prototype built and tested by the researchers combines electromagnetism and triboelectricity, a relatively new energy harvesting technique that involves bringing different materials together to produce current.



When bent or twisted, the device generates enough electricity for sensing and powering electronic circuits for processing and wireless signal transmission.

“The aim was to develop a sensor that works without having a battery attached to it,” said Askari. “It is its own power source.”

Researchers make bionic eye prototype with 3D printing

A team of researchers at the University of Minnesota have, for the first time, fully 3D printed an array of light receptors on a hemispherical surface. This discovery marks a significant step toward creating a “bionic eye” that could someday help blind people see or sighted people see better.

The research is published in *Advanced Materials*. The author also holds the patent for 3D-printed semiconducting devices.

“Bionic eyes are usually thought of as science fiction, but now we are closer than ever using a multimaterial 3D printer,” said Michael McAlpine, a co-author of the study and University of Minnesota Benjamin Mayhugh Associate Professor of Mechanical Engineering.

Researchers started with a hemispherical glass dome to show how they could overcome the challenge of printing electronics on a curved surface. Using their custom-built 3D printer, they started with a base ink of silver particles. The dispensed ink stayed in place and dried uniformly instead of running down the curved surface. The researchers then used semiconducting polymer materials to print photodiodes, which convert light into electricity. The entire process takes about an hour.

McAlpine said the most surprising part of the process was the 25% efficiency in converting the light into electricity they achieved with the fully 3D-printed semiconductors.

“We have a long way to go to routinely print active electronics reliably, but our 3D-printed semiconductors are now starting to show that they could potentially rival the efficiency of semiconducting devices fabricated in microfabrication facilities,” McAlpine said. “Plus, we can

easily print a semiconducting device on a curved surface, and they can’t.”

McAlpine and his team are known for integrating 3D printing, electronics, and biology on a single platform. They received international attention a few years ago for printing a “bionic ear”. Since then, they have 3D printed life-like artificial organs for surgical practice, electronic fabric that could serve as “bionic skin”, electronics directly on a moving hand, and cells and scaffolds that could help people living with spinal cord injuries regain some function.

McAlpine’s drive to create a bionic eye is a little more personal.


“My mother is blind in one eye, and whenever I talk about my work, she says, ‘When are you going to print me a bionic eye?’” McAlpine said.

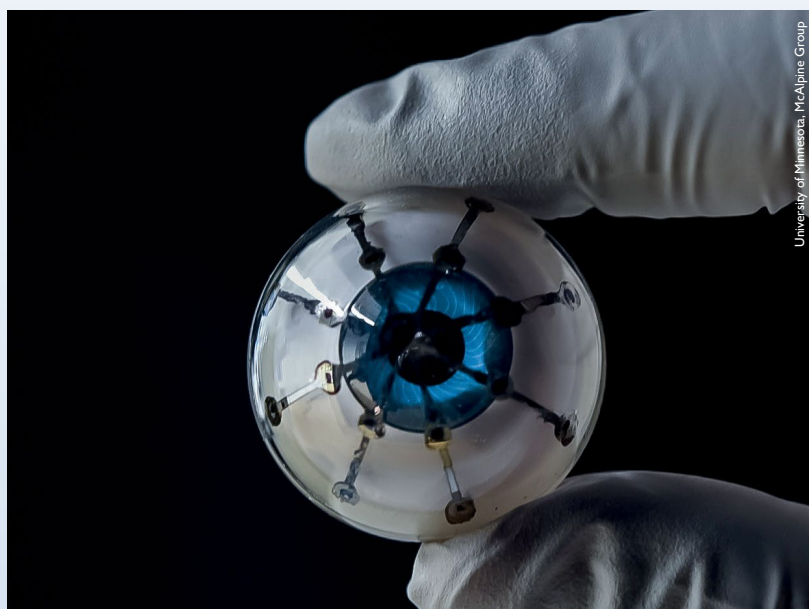
McAlpine says the next steps are

to create a prototype with more light receptors that are even more efficient. They’d also like to find a way to print on a soft hemispherical material that can be implanted into a real eye.

McAlpine’s research team includes University of Minnesota mechanical engineering graduate student Ruitao Su, postdoctoral researchers Sung Hyun Park, Shuang-Zhuang Guo, Kaiyan Qiu, Daeha Joung, Fanben Meng, and undergraduate student Jaewoo Jeong.

The research was funded by the National Institute of Biomedical Imaging and Bioengineering of the US National Institutes of Health, The Boeing Company, and the Minnesota Discovery, Research, and Innovation Economy (MnDRIVE) Initiative through the State of Minnesota.

• doi: 10.1002/adma.201803980 



Researchers at the University of Minnesota have fully 3D printed an image sensing array on a hemisphere, which is a first-of-its-kind prototype for a “bionic eye.”

University of Minnesota, McAlpine Group

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The neurons that rewrite traumatic memories

Neuroscientists at Ecole Polytechnique Federale de Lausanne (EPFL) have located the cells that help reprogram long-lasting memories of traumatic experiences towards safety, a first in neuroscience. The study is published in *Science*.

Memories of traumatic experiences can lead to mental health issues such as post-traumatic stress disorder (PTSD), which can destroy a person's life. It is currently estimated that almost a third of all people will suffer from fear- or stress-related disorders at one point in their lives.

Now, a new study shows – at the cellular level – how therapy can treat even long-term memories of trauma. “Our findings shed, for the first time, light onto the processes that underlie the successful treatment of traumatic memories,” says EPFL Professor Johannes Gräff, whose lab carried out the study.

In the field of treating traumatic memories there has been a long-debated question of whether fear attenuation involves the suppression of the original memory trace of fear by a new memory trace of safety or the rewriting of the original fear trace towards safety. Part of the debate has to do with the fact that we still don't understand exactly how neurons store memories in general. Although they don't exclude suppression, the findings from this study show for the first time the importance of rewriting in treating traumatic memories.

Research in this area focuses on understanding the brain's capacity to reduce traumatic memories, but surprisingly few studies have investigated treatment options for attenuating long-lasting trauma (aka “remote fear”) in animal models.

The EPFL scientists found that remote fear attenuation in the brain is connected to the activity of the same group of neurons that are also involved in storing these memories. Working with mice, the scientists have located these neurons in the brain's dentate gyrus, an area of the hippocampus that is involved in the encoding, recall, and the reduction of fear.



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Cross section of the mouse hippocampus – a brain region involved in learning and memory – indicated in green cells that are active when mice recall a one-month-old traumatic memory, and in red cells that are active when mice underwent an extinction training, which resembles exposure therapy in humans.


The mice used in the study are genetically modified to carry a “reporter” gene that produces an identifiable and measurable signal, e.g. a fluorescent protein, following neuronal activity. Using a fear-training exercise that produces long-lasting traumatic memories, the scientists first identified the subpopulation of neurons in the dentate gyrus that are involved in storing long-term traumatic memories.

The mice then underwent fear-reducing training, which resembles exposure-based therapy in humans – the most efficient form of trauma therapy in humans today. Surprisingly, when the researchers looked again into the brain of the mice, some of the neurons active at recalling the traumatic memories were still active when the animals no longer showed fear. Importantly, the less the mice were scared, the more cells became reactivated. This was a first

hint that the same population of neurons may be involved in storing and attenuating traumatic memories.

The researchers then reduced the excitability of the recall neurons during the exposure therapy and found that the mice showed poorer fear reduction compared to controls. But when they reduced the excitability of other neurons in the dentate gyrus, there was no such effect, showing that the recall neurons in the dentate gyrus are crucial for fear attenuation.

Finally, when the researchers enhanced the excitability of these recall neurons during the therapeutic intervention, they found that the mice showed improved fear reduction. Thus, they concluded that attenuating remote fear memories depends on the continued activity of the neurons they identified in the dentate gyrus.

• doi: 10.1126/science.aas9875 

Agenda

Selected schedule of regional medical meetings, conferences and exhibitions



Event	Date / City	Contact
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■ September 2018

20th World Conference on Pharmaceutical Chemistry and Drug Design	3-5 September 2018 Dubai, UAE	https://drug-chemistry.pharmaceuticalconferences.com
Egy Health Expo	9-12 September, Cairo, Egypt	www.egyhealthexpo.com
2nd International Conference on Prevention and Control of Infection	13-15 September 2018, Dubai, UAE	https://go.evvnt.com/221370-0
4th International Anesthesia and Pain Medicine Conference	17-18 September 2018 Dubai, UAE	https://anesthesiology.conferenceseries.com
1st Emirates Pediatric Hematology & Oncology Conference	21 September 2018, Dubai, UAE	https://go.evvnt.com/235755-0
3rd Conference on Breast and Cervical Cancer	27-28 September 2018 Abu Dhabi, UAE	https://breast-cervical.cancersummit.org
Fourth Annual MENA International Orthopaedic Congress	27-29 September 2018, Dubai, UAE	http://www.ptmg.com/meeting-details/-358277
4th Annual MENA Women's Health Congress	27-29 September 2018 Dubai, UAE	https://go.evvnt.com/238554-0
International Clinical Pharmacy Conference	28 September 2018, Abu Dhabi, UAE	www.conferences.ae/ehome/clinicalpharmacy



■ October 2018

3rd Middle East International Dermatology & Aesthetic Medicine Conference & Exhibition	4-6 October 2018, Dubai, UAE	www.meidamconf.com
Heart Transplant Conference	5 October 2018, Abu Dhabi, UAE	www.conferences.ae/ehome/hearttransplant
14th Conference on Infectious Diseases, Prevention and Control	14-15 October 2018, Abu Dhabi, UAE	https://infectious-diseases.conferenceseries.com
5th International Conference on Hypertension and Healthcare	18-19 October 2018, Abu Dhabi, UAE	https://hypertension.cardiologymeeting.com
Abu Dhabi International Mental Health Conference	19-20 October 2018, Abu Dhabi, UAE	https://go.evvnt.com/219604-2
Thyroid Masterclass	19 October 2018 Abu Dhabi, UAE	http://www.icldc.ae/event/thyroid-masterclass#Home
AHIMA World Congress (AWC) Healthcare Information Summit	25-26 October 2018, Abu Dhabi, UAE	https://go.evvnt.com/221370-0



Agenda

Selected schedule of regional medical meetings, conferences and exhibitions

Event	Date / City	Contact
■ November 2018		
Harvard Medical School: Introduction to Clinical Research Training - Dubai Program	3-5 November 2018, Dubai, UAE	hms.harvard.edu/icrt
5th World Holistic Nursing Conference	5-7 November 2018, Abu Dhabi, UAE	https://holistic.nursingconference.com
International Patient Experience Symposium	12-14 November 2018, Abu Dhabi, UAE	https://pxsymposium.com
7th International Conference on Chronic Obstructive Pulmonary Disease (COPD)	15-16 November 2018, Dubai, UAE	https://copd.healthconferences.org
The 4th Annual International Neonatal Medical Congress	15-17 November 2018, Dubai, UAE	https://go.evvnt.com/244596-0
International Paediatric Medical Congress	15-17 November 2018, Dubai, UAE	https://go.evvnt.com/235756-0
3rd Annual Sports Medicine Conference	16 November 2018, Abu Dhabi, UAE	https://www.conferences.ae/ehome/index.php?eventid=321382&
Advanced Medicine Congress	16-17 November 2018, Abu Dhabi, UAE	http://www.icldc.ae/event/advanced-medicine-congress#Home
MENA Pharmaceutical Manufacturing Congress	27-29 November 2018, Riyadh, KSA	info@pharmamanufacturingmena.com
■ December 2018		
12th International Conference on Orthopedics and Sports Medicine	10-11 December 2018, Dubai, UAE	https://orthopaedics.healthconferences.org
19th Annual Conference on Inhalation Toxicology	13-14 December 2018, Dubai, UAE	https://inhalationtoxicology.conferenceseries.com
13th Annual Conference on Dementia and Alzheimer's Disease	13-15 December 2018, Abu Dhabi, UAE	https://dementia.neuroconferences.com



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Giving new hope to children with metabolic disease

Children's Hospital of Pittsburgh of UPMC is a leading international center for liver transplantation as a treatment for metabolic disease.

As one of the top ten pediatric hospitals in the United States, as ranked by *U.S. News & World Report*, Children's Hospital of Pittsburgh of UPMC is a pioneer in the field of liver transplantation, which has proven to be a life-changing solution for patients with metabolic disease.

Liver transplantation can dramatically reduce symptoms, and in cases like maple syrup urine disease (MSUD), can provide a cure.

Liver transplantation is more than a lifesaving procedure; it's also an attractive approach for improving quality of life for many patients with metabolic disease. In 2004, we developed the protocol for liver transplantation for MSUD. Today, we've performed more transplants on patients with MSUD than any other center in the world. That's more than 65 patients with a 100-percent survival rate. All of these patients show normal liver function, have avoided the risk of neurological complications, and enjoy an unrestricted diet.

We've performed more liver transplants for patients with metabolic disease than any other transplant center.

Since the inception of our program in 1981, our world-renowned experts have performed more than 1,700 liver transplants — that's more than any other center in the United States — with survival rates that exceed national averages. Additionally, we've performed more than 320 liver transplants for patients with metabolic disease, which is more than any other center, including adult facilities. Also, we're leaders in living-donor liver transplants, which eliminate wait times for a deceased donor and can provide excellent outcomes.

Find out more about our excellent outcomes and extraordinary care.

Our experience, expertise, and commitment to innovation and compassionate care are reasons why patients and families from around the world travel to Children's Hospital of Pittsburgh of UPMC. For a free phone consultation with one of our experts on liver transplantation as a therapeutic option for metabolic disease, please visit www.chp.edu/metabolic or send an email to international@chp.edu

Sources: Internal data, Hillman Center for Pediatric Transplantation; Scientific Registry of Transplant Recipients (www.srtr.org), December 2015 release.

