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Cover image: Transmission electron microscopic image of an isolate from the first US case of COVID-19 (SARS-COV-2). The spherical viral particles, coloured blue, contain cross-sections through the viral genome, seen as black dots. Credit: CDC





middle east monitor

Update from around the region

WHO: 494 attacks on health facilities in Syria – grim testament to disrespect for international law

The World Health Organization condemns in the strongest terms, attacks on health care that have been a hallmark of the complex humanitarian crisis in Syria that in March entered its tenth year.

“The data we can now reveal on attacks on health in Syria is a grim testament to a blatant disrespect for international humanitarian law and the lives of civilians and health workers,” said Richard Brennan, WHO’s Regional Emergency Director in the Eastern Mediterranean.

Of all armed conflicts across the globe, Syria has for years been one of the worst examples of violence affecting health care. Intentionally attacking sites where the sick and wounded are treated, to either restrict or deny civilians access to health care, is prohibited under international humanitarian law. Indiscriminate attacks in civilian areas can also result in damage to health care, reflecting a callous disregard for lives and welfare of the most vulnerable.

“What is troubling, is that we’ve come to a point where attacks on health – something the international community shouldn’t tolerate – are now taken for granted; something we have become accustomed to. And they are still taking place. Only 2 weeks ago (late February 2020), attacks on two hospitals in Idleb governorate were carried out, injuring 4 health workers and temporarily suspending services,” said Brennan.

A total of 494 attacks on health were confirmed between 2016 and 2019, of which 68% or 337 attacks were recorded in Syria’s northwest; among the last areas in the country that are not under government control. The data show that attacks on health in Syria peaked in 2016 and were lowest in 2019, likely due to

the reduced size of the area where active fighting was taking place. The fact that the northwest – Idlib, Aleppo and Hama – has suffered more attacks compared to other regions in Syria, is notable. In 2019, 82% occurred in the northwest, 49% in 2018, 58% in 2017 and 85% in 2016.

The total death toll in attacks on health care in Syria between 2016 and 2019 is 470, peaking in 2016 with 241 confirmed deaths. The lowest number of deaths recorded was in 2019 at 54, again due to the reduced territory undergoing military operations. Northwest Syria represents the highest total numbers of deaths in those 4 years – 309 or 66%.

In addition to the deaths, 968 people were injured by these attacks across Syria since 2016; many of whom have been left with permanent disabilities.


“A clear example of how conflict impacts an individual’s right to health is northwest Syria, where today only half of 550 health facilities remain open either due to insecurity, damage from previous attacks, threats of future attacks, or surrounding areas being completely deserted as people are forced from their homes,” Brennan marks.

“Health facilities are now the least safe places in the area,” said one physician, a few days after 2 hospitals in Darat Izza were hit in an airstrike on 17 February 2020. Another physician working in a child and maternity hospital in Harim in Idleb governorate, described to WHO how he and his medical team worked in constant fear of shelling.

In September last year, an internal UN Board of Inquiry started investigating a series of incidents in northwest Syria, since the signing of a Memorandum on Stabilization of the situation in the Idlib De-escalation area between the Russian Federation and the Republic of Turkey on 17 September 2018.

The investigation covers destruction of or damage to facilities on the deconfliction list, containing UN-supported humanitarian sites such as health facilities. The previous month, two thirds of the United Nations Security Council requested an inquiry based


on the suspicion that making their location public through deconfliction had made these facilities a target and that some of the attacks had been deliberate. The Board of Inquiry has yet to present its findings.

So far, in 2020, confirmed attacks on health in Syria are 9 – all of them in the northwest - resulting in 10 deaths and 35 injuries. 

MBRU completes 11 successful organ transplants

Dubai’s Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU) has successfully completed 11 organ transplants, in collaboration with Mediclinic City Hospital and Al Jalila Children’s Specialty Hospital (AJCH), who all work hand-in-hand with the Ministry of Health and Prevention’s (MoHAP) National Transplant Program.

The transplants have been performed on four children and seven adults who were diagnosed with kidney failure, following the objective of the MBRU Transplant Program which was launched in 2016 in line with national efforts to enhance health services in the UAE. Through the program, MBRU aims to advance health by directly impacting patients’ lives and improving the sector in the UAE, while helping position the UAE as a prominent destination for organ transplantation. In 2016, MBRU successfully carried out the first kidney transplant surgery in Dubai in collaboration with Mediclinic City Hospital on a 29 -year-old Emirati woman who had kidney failure due to diabetes. The mother of two needed to undergo four hours haemodialysis, three times a week prior to surgery.

The successful transplants are a tribute to the commitment and support of the UAE Government in approving an organ transplant law and donation scheme, the Hayat initiative, and the steadfast commitment of healthcare institutions and stakeholders to the potentially life-changing program. 

Extended healthcare services to create thriving integrated care systems in Saudi Arabia, says KPMG

Saudi Arabia's health system will benefit tremendously from better out of hospital and community-based services, as the Kingdom adopts Integrated Care Systems (ICS) to deliver great patient experience and outcomes at lower costs, KPMG Al Fozan & Partners said in its latest report titled "The Essence of Extended Care".

The healthcare sector is undergoing a huge transformation as part of the Saudi Vision 2030, which aims to strengthen primary care as a key vehicle for better access and affordability.

Although direct international comparisons are difficult, on average, member countries of the Organization for Economic Co-operation and Development (OECD) spend around 28 per cent of their healthcare resources on inpatient care, compared to 47 per cent in Saudi Arabia.

Emmeline Roodenburg, Head of Healthcare, KPMG in Saudi Arabia, commented: "Many Saudi patients could be better cared for through dedicated pre- and post-acute extended services such as community nursing, rehabilitation, long-term and palliative care.

"The ICS and Model of Care components of the National Healthcare Transformation Strategy are tasked with tackling this and will stand or fall on whether the reforms go beyond organizational restructuring and payment model redesign," she added.

Since strengthening out of hospital services is critical to fulfilling the aims of the Kingdom's 2030 Healthcare Transformation Strategy, KPMG proposes a cluster-based approach in which each region designs its services based on the local needs of their population.

The 7-step transformation journey should include: Create and agree on the vision based on population needs; Agree on measures and outcomes, Outline governance and accountability


arrangements; Create partnerships; Co-produce services and solutions; Implement, and Scale and sustain.

Furthermore, the report found that staff working to improve integrated care across hospitals and the community frequently cite fragmented technology platforms as one the biggest barriers to improving out of hospital care services and better managing patient transitions.

Saudi Arabia's Ministry of Health (MOH) has itself developed an ambitious eHealth strategy that seeks to connect all levels of care digitally, alongside a five-year implementation plan. This represents a major investment in healthcare technology, as well as a significant clinical, operational and cultural challenges.

"Managing a program of this nature will require a highly organized governance structure, as well as flexibility to change as new technological tools become available during the period of implementation," said Roodenburg.

KPMG stressed that the difference is in action and not clever policy design alone: the detailed work of bringing partners together, co-designing services with patients and caregivers, supporting staff to work differently, and investing in the technologies that can link up different professionals and settings.

"There is strong evidence to suggest that from a structural perspective, healthcare provision in Saudi Arabia is far more skewed towards traditional hospital-based services. We believe that successful global extended care initiatives can guide Saudi Arabia's path to success," Roodenburg concluded. 

Gulf States record high incidence of colorectal cancer in people under 40 years of age

Non communicable diseases are having a huge impact on the health and economy of the world. Cancers are rising in incidence and prevalence. Colorectal

Cancer (CRC) is the third most common cancer worldwide, with approximately 1.8 million new cases in 2018. Department of Health, Abu Dhabi (DOH) reports that CRC is the second most common cancer and the second highest cause of cancer deaths in the UAE.

In Gulf countries, such as Oman and Saudi Arabia, the incidence of colorectal cancer in people under 40 years of age has been found to be relatively high. Normally, people above the age of 50 years are affected. However, there is an increasing CRC incidence in the patients younger than the age of 50, globally.

"Prevention is better than cure, but when treating cancers – a balance has to be maintained between length of survival and quality of life. As such it is imperative that people have thorough information on CRC," said Dr. Narasimhaiah Srinivasaiah, Senior Consultant Colorectal surgeon, Apollo Hospitals.

Colon cancer arises from the lining of the colon and rectum. It consists of polyps, which are benign cellular lumps (on the lining of rectum and colon). Some polyps with time may change to become cancerous. Some of the common symptoms for this form of cancer include change in bowel habit, rectal bleeding, sudden loss of weight and anaemia. Some may present with pain and abdominal distention. Some of the common risk factors for CRC include age, lifestyle, tobacco, obesity, red meat, processed meat, high fat diet, lack of dietary fibre and fruits, etc. Additional risk factors include inflammatory bowel diseases like Crohn's disease and ulcerative colitis; family history of cancer or polyps; familial adenomatous polyposis (FAP), a genetic syndrome; and Lynch syndrome, or an inherited condition that increase your risk of colon cancer.

While colonoscopy remains the gold standard for colon screening, diagnosis is done through histopathology of the sample of the growth. If diagnosed and treated early, CRC can be managed well.

One such case is of a patient, who



himself was a doctor. Hailing from Yemen the doctor showed history of change in bowel habits and per rectal bleeding. Investigations revealed that the patient had a very low rectal cancer involving the inside muscle of the back passage. After having undergone chemo-radiotherapy, he approached Apollo Hospitals for a restorative cancer surgery. He underwent a Robotic Intersphincteric rectal resection and a temporary Ileostomy. Since then, his recovery has been eventful, and he's scheduled for a reversal of Ileostomy soon. In the normal course of events or a non-specialised centre – this patient would have had a permanent stoma (Bag). But given the expertise and sub-speciality colorectal services – the patient underwent a successful restorative procedure.

“Once diagnosed, treatment depends on the stage, location and the overall health of the patient. In the case of this patient, an early diagnosis helped saved his life. As such it is important, that high risk groups with inflammatory bowel diseases, family history of cancers, familial syndrome families and patients prone for polyps adhere to early and regular screening. Symptomatic patients need colonoscopy as a gold standard,” added Dr Srinivasaiah.

Treatment options for CRC include surgery, chemotherapy, radiation, and targeted therapy. With advancement in medical science, precision medical oncology, targeted therapies and precision-based surgeries, which includes surgical robotics are also gaining momentum in treating CRC.

While CRC is not entirely preventable, risk reduction can be done by adopting a healthy lifestyle, regular exercise, balanced diet with fruit, vegetables, whole grains and foods containing fibre, staying aware of the symptoms and seeking help when concerned. A routine check after the age of 40 years can be useful in certain high-risk groups or when symptomatic. A colonoscopy done at that point can remove pre-cancerous polyps or identify cancers at a very early stage. MEH



CT in a Container increases access to diagnostic imaging

In a step forward in the fight against Covid-19, SEHA, GE Healthcare and ADI have delivered the first ‘CT in a Container’ in the UAE. This innovative solution featuring advanced Computed Tomography (CT) equipment by GE Healthcare helps in diagnosing viral pneumonia attributable to Covid-19.

The fully-insulated, self-contained modular containers are sited in temporary tactical areas so that those who are suspected of Covid-19 are tested without them having to enter hospital facilities. This, in turn, ensures better infection control and an additional level of protection for frontline healthcare workers in hospitals.

Four ‘CT in a Container’ were specially built and fully assembled in the UAE. The first two at Sheikh Khalifa Medical City and Al Ain Hospital will be operational this week. Two additional units at the special Covid-19 screening centre in Al Dhafra and Emirates Humanitarian City are expected to be operational in the

coming weeks.

A strong example of GE Healthcare delivering tailored solutions to aid UAE authorities in addressing this pandemic, the ‘CT in a Container’ allows physicians to complete patient lung screenings in under one minute and is expected to serve more than 100 visitors a day.

These modular CT ‘containers’ are fully insulated, self-contained with 90% HVAC filtration to assure ongoing decontamination of air, lead-line and equipped with UV functional lighting. It takes approximately 5 minutes to decontaminate the room between patients. MEH

Saudi German Hospitals Group opens hospital in Dammam

Saudi German Hospitals (SGH) Group has officially opened its newest hospital in Dammam, Saudi Arabia, in the presence of His Royal Highness Prince Saud Bin Nayef Bin Abdul Aziz Al Saud, Governor of the Eastern Province.

The new facility is SGH Group’s first



International Alliance, said: “Ensuring the optimal care of patients with diabetes who fast during Ramadan is crucial. For those patients, doctors need to carry an assessment and individualized plan which covers physical activity, meal planning, glucose monitoring, dosage and timing of medications. Our recommendations, which will be published in peer reviewed publication, summarise expert views and opinions on the current management of diabetes with SGLT2is during Ramadan and aim to enhance the current knowledge and understanding on the issue of diabetes management during Ramadan, thereby aiding the physicians in our region with appropriate decision-making for their patients during Ramadan.”

To avoid hypoglycemia, the predawn meal needs to be taken as late as possible before the start of the daily fast, with a strict control over oils, carbohydrates and sugar intake. Normal levels of physical activity must be maintained whenever possible.

However, the biggest concern remains that most people don't fully understand the complications associated with diabetes. The long-term goal of the steering committee is to bring about a progressive behaviour change among fasting patients and communities.

According to the 9th edition of the International Diabetes Federation Diabetes Atlas, prevalence of diabetes in adults in the MENA region is 12.2% and in Africa is 4.7%. Over the next 25 years, diabetes prevalence is expected to increase in all countries, with the greatest increase expected in middle-income countries, rising to 13.9% in MENA and 5.2% in Africa. The increased prevalence of type 2 diabetes in the region has made it a key priority to the region's governments' health agendas.

To further reiterate the importance of the proper diabetes management during Ramadan, Diabetes & Ramadan International Alliance hosted 'Diabetes and Ramadan Virtual Academy' on 8th April 2020, a scientific virtual webinar session for healthcare professionals with CME hours accredited by Dubai Health Authority. MEH

hospital in the Eastern Province and its 11th hospital in the region. This is in line with the group's strategic expansion plans which aim to extend the group's presence in the Kingdom and the region –providing world-class medical care.

Makarem Sobhi Batterjee, President, Saudi German Hospitals Group, said: “We are proud to announce the opening of our first hospital in the Eastern Province, which affirms our commitment to reach every patient in Saudi Arabia. We aim to provide patients with easy access to premium international healthcare close to home, so that they do not need to travel abroad for medical care.”

He added: “This newly-opened Saudi German Hospital in Dammam is part of a much bigger project, the Batterjee Medical City. It will include a medical college, housing and specialty hospitals where the highest medical services will be provided. This is of course in line with the developments of the healthcare sector as part of the 'Saudi Vision 2030'.”

The newly opened hospital is a state-of-the-art facility offering comfortable spaces for patients and visitors, equipped with the latest medical equipment and technology. The hospital has a capacity of 300 beds. MEH

Diabetes: 3rd Middle East and Africa Ramadan Expert Meeting held virtually

For the third consecutive year AstraZeneca partnered with leading diabetologists from the Middle East and Africa region to review recommendations on diabetes management during the Holy Month of Ramadan. During the virtual meeting, a key point of the discussion among 11 expert members of the steering committee was safety and efficacy of the use of sodium glucose co-transporter 2 inhibitors (SGLT2i) during Ramadan, based on the outcomes of the recent clinical trials with SGLT2i.

They further reviewed the latest diabetes management guidelines issued by international and local expert societies as well as best of religious and medical recommendations for fasting type 2 diabetes patients.

Dr. Mohamed Hassanein, Senior Consultant in Endocrinology and Diabetes at Dubai Hospital; the Chair of the Scientific Committee of the Arab Association for the Study of Diabetes and Chairman of Diabetes & Ramadan



Al Qassimi Hospital upgraded with UAE's first deployment of award-winning AIR Technology

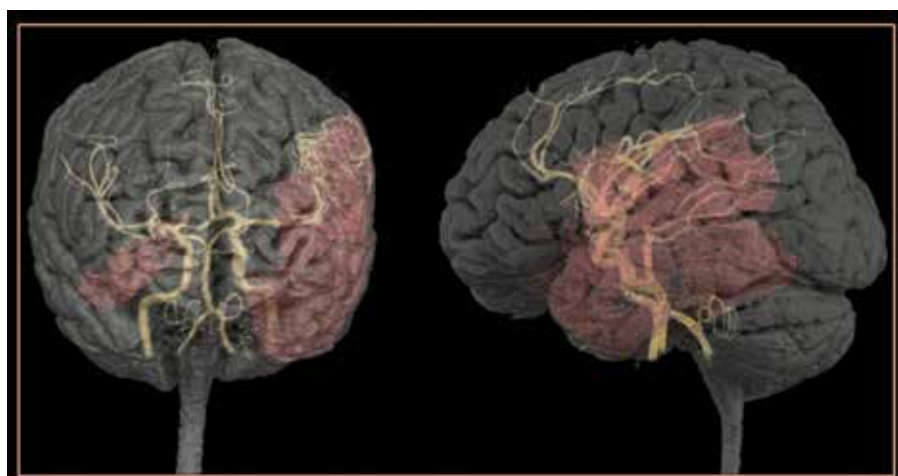
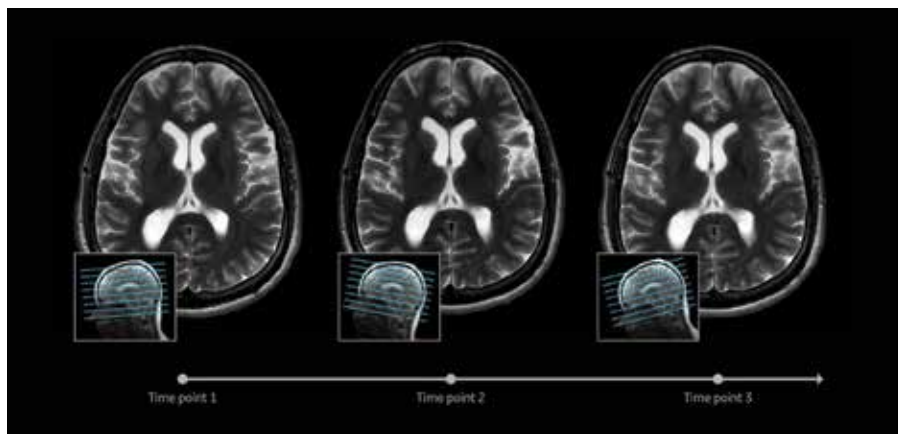
Al Qassimi Hospital in Sharjah, a UAE Ministry of Health & Prevention hospital, has upgraded its Magnetic Resonance Imaging (MRI) capabilities to assure the highest standards in diagnostic services and patient care, with the deployment of GE Healthcare's award-winning AIR technology and the latest SIGNATM Works PX28 software platform for 3T MRI systems.

As part of the upgrade, Al Qassimi Hospital has installed the latest SIGNATM WORKS AIR™ Edition. This software platform packs Artificial Intelligence based algorithms for better patient comfort, versatility, productivity, and industry-leading image quality.

The hospital will also be the first in the UAE to utilize AIR™ Technologies. AIR™ Coils, awarded Best New Radiology Device of 2019, serves as the foundation of a simply better MR experience. It has the industry's first truly lightweight and flexible design, making them comfortable for patients to wear and easy for technologists to handle. AIR™ coils enable scans in positions that were historically very challenging like lateral decubitus spine and foetal imaging.

Ehab Zawaideh, Commercial General Manager - Middle East, GE Healthcare, said: "AIR Technology empowers radiologists and technologists with the ability to position the patient in the most comfortable orientation. They have complete flexibility and the MRI signal does not degrade, meaning great image quality and the most comfortable patient experience. Al Qassimi Hospital is setting the standard for diagnostic patient care."

This was accomplished through Unison, the first company in the GCC to introduce the Public-Private Partnership along with the UAE Ministry of Health. The intention is to increase overall patient care in the UAE by decreasing waiting time, improving image quality and accuracy of reporting.




Dr. Hatem Abouelabbass Ghonim, Medical Director of Unison Capital Investment, said: "Since we formed Unison four years ago, we have worked towards enhancing the operational efficiency of radiology departments throughout the Ministry of Health and Prevention hospital network in the UAE. Strengthening radiology competencies is crucial to boost the speed, quality and reliability of diagnostic services in order to help deliver better patient outcomes. Through the upgrade of Al Qassimi Hospital in Sharjah, Unison once again delivers on its mission to bring the best-in-class technology for UAE's hospitals that help medical professionals better diagnose and treat disease in our communities."

Tamer Akl, General Manager, ADI, said: "The AIR™ advanced technologies of AIR™ is a game-changer in MR that strengthens clinical power and enables radiologists to

achieve improved workflow, enhanced patient comfort and reduced exam times. With the introduction of the advanced solutions, Al Qassimi Hospital becomes one of the leading centers in the region in offering world-class diagnostic services."

AIR Touch™ is part of the predictive and proactive patient recognition solutions. It automatically selects and optimizes element combinations for each patient over the precise area-of-interest. With the anatomical-based protocol optimization per patient, AIR Touch optimizes for anatomy, patient, and scan parameters with a single touch, delivering 59% productivity gain.

AIR™ Recon is GE's new reconstruction algorithms that can reduce background noise and out-of-FOV artifacts with improving Signal-to-Noise ratio (SNR). The result is crisper images and faster scan times. 

worldwide monitor

Update from around the globe



Global sleep survey reveals only 49% of people worldwide are satisfied with their sleep

People around the world are not sleeping well according to the results of a survey which shows global sleep satisfaction remains low with worry/stress, relationships and cell phone use reported as key sleep inhibitors.

The results are from Royal Philips's 5th annual sleep survey of more than 13,000 adults in 13 countries to capture attitudes, perceptions, and behaviours around sleep. The results are published in a report, "Wake Up Call: Global Sleep Satisfaction Trends."

Only 49% of people are satisfied with their sleep, with worry/stress reported as the most limiting factor to a good night's sleep (33%). Interestingly, fewer people in 2020 are taking action to improve sleep compared to 2019, with nearly all listed strategies to improve sleep lower or consistent in 2020 when compared to 2019 results. For example, reading before bed was the most popular strategy used to improve sleep in 2019 (39%), but only 28% of people report reading to improve sleep in 2020. Other notable distinctions in sleep-related behaviour appeared across age and gender differences.

"The decrease in people taking action to improve sleep is alarming, especially when it is clear people around the world deeply value sleep. Sleep deficit impacts people both mentally and physically, so we need to educate people on available

sleep resources and empower them with the confidence that their efforts will pay off," said Mark Aloia, PhD, Global Lead for Behavior Change, Sleep & Respiratory Care at Philips. "As we head into the next decade,

Philips is focused on designing a future where technology leveraged across the entire sleep ecosystem can help people get the most out of their lives."

Factors putting quality sleep at risk stem from both social and technology distractions. When it comes to relationships, 36% of people with a partner/spouse agree they sometimes sleep separately from their partner/spouse to improve their sleep, and 30% agree their or their partner/spouse's difficulty sleeping is impacting their relationship. While external factors can be altered to improve sleep, some sleep conditions are outside of a person's control.

This year, respondents report lower rates of insomnia, snoring, shift work disorder and chronic pain, but sleep apnea remains consistent (2019: 10% vs. 2020: 9%). Of those reporting to have sleep apnea, 51% said their sleep apnea is impacting their relationships. Yet, 48% of people with sleep apnea said they felt getting good sleep was out of their control – even though a variety of solutions exist to treat it. It's worth noting that 1 billion people have obstructive sleep apnea (OSA), but 80% of moderate and severe OSA cases go undiagnosed.

The desire for help is there, as 60% of people agree they are interested in new information or strategies to help them get better sleep. Watching TV remains the most common strategy people use to improve their sleep (2019: 37% vs. 2020: 33%), and new data this year shows 15% have tried or currently use either marijuana or CBD oil to better their sleep.

Despite experts' recommendations to the contrary, almost 4-in-ten report using their phones right before falling asleep (39%) or as soon as they wake up (39%).

The survey also revealed that 53% of people aged between 18 and 34 use phones for entertainment in bed compared to just 7% of those 65 years of age and above.

Philips' growing portfolio of sleep solutions seek to address 80% of the most common sleep issues with its 35 years of deep clinical expertise in sleep technology.



Wake Up Call: Global Sleep Satisfaction Trends

<https://www.philips.com/c-dam/corporate/newscenter/global/standard/resources/healthcare/2020/world-sleep-day/2020-Philips-WSD-Report.pdf>

Oxford University Imaging Lab and Zegami partnership focuses on cardiovascular disease

Zegami, the data visualisation company, has been appointed by Oxford University researchers at the Oxford Cardiovascular Clinical Research Facility to accelerate research into cardiovascular disease.

The team will do this by applying data visualisation techniques developed by Zegami to hundreds of thousands of images of the heart, making it easier to categorise them and identify new trends and patterns.

Cardiovascular imaging yields large data sets, both for image analysis as well as incorporation with other clinical data. Most medical images today are stored in digital formats as pixels or voxels describing a small area or volume. Millions of pixels or voxels form one image, and data visualisation techniques can help analyse this more effectively.

Zegami helps scientists, researchers and academics to make sense of their data with intuitive, engaging image-based software which converts spreadsheets and complicated datasets into a visual platform that is easy to navigate and interact with. Not only does this provide medical researchers with a unique way to study the cardiovascular health of thousands of different patients at the same time, the insights gen-

erated through data visualisation could support development of machine learning algorithms that identify and predict heart disease in patients.

Cristiana Monteiro, Head of the Oxford Research Echocardiography Core Laboratory, commented: “Heart and circulatory diseases cause more than a quarter of all deaths in the UK, and some 7.4 million people are living with cardiovascular conditions. We support and manage some of the largest cardiovascular trials and studies in the world, involving multiple different hospitals and countries, and millions of images. We believe data visualisation tools could address many of the problems we face trying to navigate and make sense of these large complex imaging datasets, allowing researchers to generate faster insights and results.”

Steve Taylor, Chief Scientific Officer at Zegami and Oxford University researcher, added: “Advances in technology means the medical profession can take more images relating to cardiovascular issues than ever before, and the information captured in these can help detect heart and circulatory problems in patients more quickly, improve treatment levels and the overall quality of life of millions of people. We are delighted to be working with the Oxford University researchers in this area. The medical industry is making much greater use of digital visualisation tools, and this is a huge growth market for us.”

NIH offers \$1 million prize in competition to target disease diagnostics

The National Institutes of Health has launched a \$1 million Technology Accelerator Challenge to spur the design and development of non-invasive, handheld, digital technologies to detect, diagnose and guide therapies for diseases with high global and public health impact. The challenge is focused on sickle cell disease, malaria and anemia and is led by NIH's National Institute of Biomedical Imaging

and Bioengineering (NIBIB). The Bill & Melinda Gates Foundation is cooperating with NIH to help accelerate the transformation of design concepts into products for low-resource settings.

NIH will award up to \$500,000 for a top finalist and smaller awards to approximately five semi-finalists. The Gates Foundation will separately review winners and honorable mentions and consider them for follow-on support. This may include a grant of up to \$500,000 and/or consultations, partnerships for clinical data collection, software development, scale-up, and manufacturing.

“Bioengineers are pioneering the development of cutting-edge, cost-effective, mobile and point-of-care technologies,” said NIBIB Director Bruce Tromberg, Ph.D. “This challenge is an exciting way to engage and inspire our community to address an urgent health care need.”

Accessible diagnostic tools are essential for providing treatments and cures for some of the world's highest-burden diseases. While diagnostics currently exist for sickle cell disease, malaria and anemia, they can be challenging to deliver in low-resource settings, particularly at the population level, due to cost, invasiveness and the expertise required to administer the tests. The current challenge is designed to stimulate the development of a platform technology that could be used to rapidly screen large populations as well as provide physicians with a practical tool for optimizing therapy in individual patients.

“While this challenge is not constrained to any specific technology, the inspiration for it comes from the widespread availability of mobile phones and the potential for mobile phone-linked sensor technologies to non-invasively detect changes in the blood and blood vessels associated with these treatable diseases,” Tromberg said.

For low-resource settings, diagnostics would ideally be portable, self-contained, low-cost, adaptable to multiple diseases, and able to integrate information about

the patient and the environment in interpreting the test result.

“New diagnostic tools could address a major burden of disease in low- and middle-income country settings,” said the Gates Foundation's Dan Wattendorf, Director of Innovative Technology Solutions, Global Health. “Handheld, low-cost tools can bring testing out of a laboratory and to the point of need. Digitally enabled tools can help provide objective guidance for those administering a test, reducing procedural errors and facilitating collection of more complete diagnostic information.”

The challenge will address three blood disorders that exact an enormous toll on populations around the globe.

1. Sickle cell disease is a group of inherited red blood cell disorders arising from a single genetic mutation that can cause severe pain and potentially lead to premature death. The condition affects millions of people worldwide, most often those of African ancestry. About 300,000 infants each year have sickle cell disease, 75% of whom reside in sub-Saharan Africa. Without newborn screening programs and early diagnosis, 50-90% of children with the disease in sub-Saharan Africa die before age 5.

2. Malaria is caused by a parasite that is spread to people through a bite from an infected mosquito. In 2018, approximately 228 million people contracted malaria, with the vast majority of those being in sub-Saharan Africa. The Gates Foundation is committed to implementing new surveillance tools linked to a digital infrastructure with the goal of eradicating malaria entirely.

3. Anaemia affects roughly a third of the world's population and occurs when the body makes too few red blood cells, destroys too many red blood cells, or loses blood. The most common causes of anaemia include iron and other nutritional deficiencies, hemoglobin abnormalities, and infectious diseases, such as malaria, tuberculosis, HIV and parasitic infections. Young children, pregnant women and all

women of childbearing age are particularly prone to the effects of anemia.

The challenge will accept applications through 2 June 2020. Register and submit and application through the challenge website:

www.nibib.nih.gov/NIH-Technology-Accelerator-Challenge.

Applicants are reminded to review the challenge guidelines.

Hearing health – a global priority

Debara L. Tucci, director of the National Institute on Deafness and Other Communication Disorders, US National Institutes of Health, issued the following statement for World Hearing Day on 3 March.

Approximately 466 million children and adults worldwide have disabling hearing loss, according to the World Health Organization (WHO). Unaddressed hearing loss costs an estimated US\$750 billion annually worldwide and potentially interferes greatly with an individual's physical, behavioural, and social functioning. Deafness and hearing loss affect people of all ages and in all segments of the population, including millions who live in countries with sparse resources and strategies to address ear and hearing problems.

The good news is that experts and organizations around the world are turning their attention toward making hearing health care a global priority. As part of World Hearing Day, I'd like to share with you some of these important international efforts, including several in which the National Institute on Deafness and Other Communication Disorders (NIDCD), participates.

Every year on March 3, WHO, the health agency of the United Nations, engages organizations in World Hearing Day public awareness activities. This year's theme, "Hearing for life: Don't let hearing loss limit you," highlights the importance of hearing loss prevention and timely and effective interventions for those who are deaf or hard-of-hearing.

The NIDCD is dedicated to supporting research and initiatives to prevent, detect, and treat hearing loss in the United States and beyond. We collaborate with other agencies and with researchers to encourage more effective and accessible hearing health services for babies, children, and adults. We also offer evidence-based information for the public on hearing screening and hearing loss (see fact sheets on Your Baby's Hearing Screening <<https://www.nidcd.nih.gov/health/your-babys-hearing-screening>>, Noise-Induced Hearing Loss <<https://www.nidcd.nih.gov/health/noise-induced-hearing-loss-0>>, and Age-Related Hearing Loss <<https://www.nidcd.nih.gov/health/age-related-hearing-loss>>).

A major catalyst for the increased interest in global hearing health care was the World Health Assembly (WHA) resolution on the prevention of deafness and hearing loss, issued in May 2017. <http://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_R13-en.pdf>

The WHA is the governing body of WHO. To facilitate implementation of the resolution, WHO established the World Hearing Forum <<https://www.who.int/deafness/world-hearing-forum/en/>>, a global network of stakeholders, in 2018. The NIDCD is one of 138 agencies and organizations that comprise the forum.


The WHA resolution calls for WHO to publish the first World Report on Hearing <<https://www.who.int/deafness/world-report-hearing/en/>>. This report will highlight evidence-based best practices and priorities for ear and hearing health care, and will reflect a variety of cultural contexts and approaches. The report was scheduled for release in May.

Finally, a complementary initiative, the Lancet Commission on Hearing Loss <<https://globalhearinglosscommission.com/>>, has been underway for a year now. As one of the co-chairs of this important effort, I am confident that the commission's work will extend the drive to reduce the immense burden of hearing loss worldwide. We will do so by seeking innovative solutions focused on prevention, policy, tech-

These efforts provide a collective voice from experts – across disciplines and in dozens of countries – to paint a robust global picture of the state of the science and clinical practice in ear and hearing health care.



nology, and protection, and on how these themes interact. We will share our findings next spring, 2021.

These efforts provide a collective voice from experts – across disciplines and in dozens of countries – to paint a robust global picture of the state of the science and clinical practice in ear and hearing health care. The forthcoming results and recommendations will help guide efforts to improve communication for millions of people around the world through advancements in practice, research, and policy at local, national, and international levels. 

the laboratory

Medical research news from around the world



Professor Colin McCoy and Dr Nicola Irwin

Researchers develop new coating to reduce pain and risk of infection for catheter users

Researchers from the School of Pharmacy at Queen's University Belfast have developed a new antimicrobial coating which can be applied to urinary catheters and other medical devices to significantly reduce pain and lower the risk of infection for its users. This unique coating has the potential to greatly improve the quality of life for the millions of catheter users worldwide.

The coating was created using a unique mix of polymers which ensures it is low friction to reduce the pain and discomfort of catheterisation, as well as containing antimicrobial properties which protects the user from harmful microbes that can cause disease and in some cases, even death.

Researchers at Queen's University Belfast in collaboration with the University of Leeds have published their findings 5 March 2020 in *ACS Applied Bio Materials*.

UTIs associated with catheter use are one of the most common types of infection that affect people staying in hospital. This risk is particularly high if the catheter is left in place continuously (an indwelling catheter) with approximately 50%

of all long-term catheterised patients experiencing recurrent episodes of catheter infections and blockages.

Dr Nicola Irwin, Lecturer in Pharmaceutical Materials Science and first author on the paper said: "Patients with poor control over their bladder function, for example those with urinary retention or drainage problems caused by neurological conditions such as spina bifida or spinal cord injuries may need catheterised up to eight times a day.

"Insertion and removal of poorly lubricated catheters causes friction between the urethral walls and the device surface, which is not only extremely painful for the patient, but upon regular use can lead to damage and narrowing of the urethra, bleeding and infection."

As well as being extremely painful, these low-level infections, overtime, can cause antibiotic resistance in these users.

Professor Colin McCoy, Chair in Biomaterials Chemistry and co-author of the research explains: "People who use medical devices such as catheters on a daily basis are at high risk of persistent low-level infections, which, overtime, can cause antibiotic resistance. Antibiotic

resistance is one the biggest global threats to society today and leads to longer hospital stays, higher medical costs and increased risk of infection and even death.

"It is vitally important we provide an alternative to the currently used devices, which have not changed much since their introduction almost 100 years ago despite their widespread clinical and many associated limitations."

- doi: 10.1021/acsabm.9b01042

Benefits of exercise on metabolism more profound than previously reported

The effects of exercise on metabolism are even greater than scientists believed. That's the finding of a unique study published 2 April 2020 in *Cardiovascular Research*, a journal of the European Society of Cardiology (ESC).

The study is the first to examine the metabolic effects of exercise while carefully controlling for differences between participants in diet, stress, sleep patterns, and work environment.

"These results show that metabolic adaptation to exercise is far more profound than previously reported," said senior author Dr. John F. O'Sullivan of the University of Sydney, Australia. "The results increase our knowledge of the widespread benefits of exercise on metabolism and reveal for the first time the true magnitude of these effects. This reinforces the mandate for exercise as a critical part of programmes to prevent cardiovascular disease."

One of the major challenges when studying the effects of exercise is controlling for factors that differ between participants and could influence the results. For example: age, gender, weight, baseline fitness, diet (some healthy, some very unhealthy), sleep patterns, jobs (physical work versus a desk job), alcohol, and smoking.

"Our motivation for this study was to overcome this limitation by studying exercise under controlled conditions, thereby revealing the true extent of



effects on the body,” said Dr. O’Sullivan. “Therefore, we used a cohort of newly-enlisted healthy male soldiers of similar age and baseline fitness who lived in the same domicile, had the same sleep patterns, ate the same food, and underwent the same exercise regimen.”

One of the major benefits of exercise is on metabolism, which is how the body converts food into energy and eliminates waste. Substances produced during metabolism are called metabolites. “Metabolites are the intermediates of the metabolic machinery in the body and can signal how metabolic health is changing in response to exercise,” explained Dr. O’Sullivan.

The researchers measured approximately 200 metabolites in the blood of 52 soldiers before and after an 80-day aerobic and strength exercise programme and related these to changes in fitness.

Compared to previous studies, the researchers found dramatic changes in many metabolites. Trained, energy-efficient muscle used far more fuel – for example fat – than shown ever before. The researchers also captured heretofore unseen, in terms of scale and scope, changes in levels of factors derived from the gut, factors involved in blood clotting, breakdown products of protein, and factors involved in opening up blood vessels to increase blood flow.

Participants who did not experience these metabolic benefits of exercise had higher levels of a metabolite called DMGV. “This is intriguing because a recent study also found that this metabolite predicted who did not benefit from exercise,” said Dr. O’Sullivan. “DMGV levels are influenced by genetics and diet, rising with sugary drinks and falling with vegetables and fibre. Measuring DMGV may identify people who need strategies other than exercise to reduce their cardiovascular risk.”

He concluded: “The power of exercise to boost metabolism is on top of its positive effects on blood pressure, heart rate, fitness, body fat, and body weight. Our findings cement the central role of exercise in preventing cardiovascular disease.”

- doi: 10.1093/cvr/cvaa051

Clinical trial of treatment for chronic kidney disease stopped early due to overwhelming efficacy

A Phase III clinical trial to test the efficacy of AstraZeneca’s *dapagliflozin*, a treatment for chronic kidney disease, will be stopped early because of overwhelmingly positive results, according to a statement from AstraZeneca on 4 May.

The early termination of the The Dapagliflozin And Prevention of Adverse Outcomes in Chronic Kidney Disease (DAPA-CKD) Phase III trial for *dapagliflozin* follows a recommendation from an independent Data Monitoring Committee (DMC) based on its determination of overwhelming efficacy. The decision was made following a routine assessment of efficacy and safety which showed *dapagliflozin*’s benefits earlier than originally anticipated. AstraZeneca will now initiate closure of the trial.

Commenting on the decision, Ahmed Soliman, AstraZeneca Medical Director, GCC, said: “Chronic kidney disease patients have limited treatment options, particularly those without type-2 diabetes. We are very pleased the Data Monitoring Committee concluded that patients experienced overwhelming benefit. This might potentially lead to a change in the management of chronic kidney disease for patients around the world.”

Dr Bassam Bernieh, Consultant Nephrologist and the Chairperson of the Emirates Medical Association of Nephrology (EMAN) Scientific Committee said: “As a nephrologist taking care of CKD patients, including both diabetic and non-diabetic, I consider these overwhelming benefits of *dapagliflozin*, demonstrated in the DAPA-CKD Trial, will open new avenues in the management of CKD patients, particularly for non-diabetic CKD patients, who have so far limited therapeutic tools to slow down their CKD progression to end stage renal disease.

The full results will be submitted for

presentation at a forthcoming medical meeting and AstraZeneca will now initiate discussions with global health authorities regarding early regulatory submissions.

DAPA-CKD is an international, multi-centre, randomised, double-blinded trial in 4,245 patients designed to evaluate the efficacy of *dapagliflozin*, compared with placebo, in patients with CKD stages 2–4 and elevated urinary albumin excretion, with and without T2D. *Dapagliflozin* is given once daily in addition to standard of care. The trial is being conducted in 21 countries.

New research gives further evidence that autoimmunity plays a role in Parkinson’s disease

A new study co-led by scientists at the La Jolla Institute for Immunology (LJI) adds increasing evidence that Parkinson’s disease is partly an autoimmune disease. In fact, the researchers report that signs of autoimmunity can appear in Parkinson’s disease patients years before their official diagnosis.

The research could make it possible to someday detect Parkinson’s disease before the onset of debilitating motor symptoms – and potentially intervene with therapies to slow the disease progression.

The study, published in the April 20, 2020, issue of *Nature Communications*, was co-led by LJI professor Alessandro Sette, Dr. Biol. Sci, and Professor David Sulzer, Ph.D., of the Columbia University Medical Center.

Scientists have long known that clumps of a damaged protein called alpha-synuclein build up in the dopamine-producing brain cells of patients with Parkinson’s disease. These clumps eventually lead to cell death, causing motor symptoms and cognitive decline.

“Once these cells are gone, they’re gone. So if you are able to diagnose the disease as early as possible, it could make a huge difference,” says LJI research assistant professor Cecilia



Lindestam Arlehamn, Ph.D., who served as first author of the new study.

A 2017 study led by Sette and Sulzer was the first to show that alpha-synuclein can act as a beacon for certain T cells, causing them to mistakenly attack brain cells and potentially contribute to the progression of Parkinson's. This was the first direct evidence that autoimmunity could play a role in Parkinson's disease.

The new findings shed light on the timeline of T cell reactivity and disease progression. The researchers looked at blood samples from a large group of Parkinson's disease patients and compared their T cells to a healthy, age-matched control group. They found that the T cells that react to alpha-synuclein are most abundant when patients are first diagnosed with the disease. These T cells tend to disappear as the disease progresses, and few patients still have them ten years after diagnosis.

The researchers also did an in-depth analysis of one Parkinson's disease patient who happened to have blood samples preserved going back long before his diagnosis. This case study showed that the patient had a strong T cell response to alpha-synuclein ten years before he was diagnosed with Parkinson's disease. Again, these T cells faded away in the years following diagnosis.

"This tells us that detection of T cell responses could help in the diagnosis of people at risk or in early stages of disease development, when many of the symptoms have not been detected yet," says Sette. "Importantly, we could dream of a scenario where early interference with T cell responses could prevent the disease from manifesting itself or progressing."

Sulzer added, "One of the most important findings is that the flavour of the T cells changes during the course of the disease, starting with more aggressive cells, moving to less aggressive cells that may inhibit the immune response, and after about 10 years, disappearing altogether. It is almost as if immune responses in Parkinson's disease are like those that occur during seasonal flu, except that the changes take place over ten years instead of a week."

In fact, already therapies exist to treat inflammation from autoreactive T cells, and these TNF therapies are associated with lower incidence of Parkinson's disease. Going forward, the researchers are especially interested in using a tool called a T cell-based assay to monitor patients already at risk for Parkinson's to see if they could benefit from TNF therapies. These patients include people with REM sleep disorders and certain genetic mutations.

The researchers hope to study more Parkinson's patients and follow them over longer time periods to better understand how T cell reactivity changes as the disease progresses.

- doi: 10.1038/s41467-020-15626-w

Ultrasound-assisted molecule delivery looks to preserve blood for years

Ensuring adequate preservation of the millions of units of blood that are donated every year presents a challenge for blood banks, as blood can typically be stored for only six weeks after donation. A potential solution to the problem attempts to dry blood by using a sugar-based preservative that organisms living in some of Earth's most extreme environments produce to weather long periods of dryness. New work in ultrasound technology looks to provide a path to inserting these sugars into human red blood cells, in an effort to help them last for years.

Researchers at the University of Louisville have demonstrated a new way to use ultrasound to create pores in blood cells, which allows the molecule trehalose to enter the cells and prevent their degradation when dried for preservation. Oscillating microscopic bubbles of inert gases with ultrasound provides the microfluidic system with the ability to increase the number of viable cells that can be rehydrated. The researchers discussed their work in *Biomicrofluidics*.

The approach could lead to ways of increasing the shelf life of blood donations from weeks to the order of years. Such advances

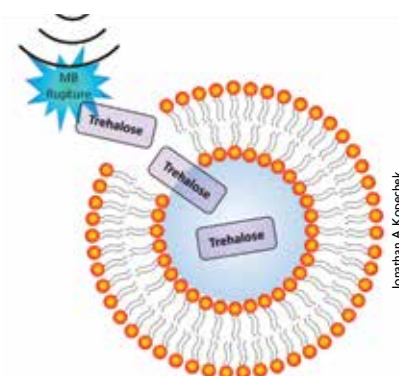


Illustration of ultrasound-induced microbubble rupture causing temporary pores in cell membranes, which enables entry of soluble molecules such as trehalose (not to scale).

would provide a boon to those needing blood in areas where access to donations is difficult, like on the battlefield or in space.

"What's unique about this is there are not many other studies that look at using acoustofluidics to place a molecule like this inside red blood cells," said author Jonathan Kopechek. "It's also interesting, because it allows us to store blood without keeping it cool."

When it's not helping these extremophiles survive, trehalose is a relatively cheap sugar that is so safe that it is used as a preservative for food items, like donut glaze.

The group constructed a spiral-shaped channel that exposed blood cells to trehalose while surrounded by microbubbles. They tuned ultrasonic vibrations using several parameters until the bubbles shook nanosized holes in the membranes of the blood cells, just large enough for trehalose or a closely related fluorescent molecule called fluorescein to enter and just briefly enough to maintain the integrity of the blood.

After confirming that fluorescein could enter cells on test samples, they added trehalose to a new batch of samples, dried the blood, rehydrated it, and performed tests to count how many of the blood cells were still viable after the process.

The ultrasound technique was able to preserve a significantly higher portion of cells by adding trehalose versus leaving the trehalose out.

The group looks to improve on the yield for their technique with the hopes of verifying the effectiveness of dry-preserved blood in patients.

- doi: 10.1063/1.5144617

Global leaders unite to ensure everyone everywhere can access new vaccines, tests and treatments for Covid-19

Heads of state and global health leaders have made an unprecedented commitment to work together to accelerate the development and production of new vaccines, tests and treatments for Covid-19 and assure equitable access worldwide.

The Covid-19 pandemic is taking a huge toll on families, societies, health systems and economies around the world, and for as long as this virus threatens any country, the entire world is at risk.

There is an urgent need, therefore, while following existing measures to keep people physically distanced and to test and track all contacts of people who test positive, for innovative Covid-19 vaccines, diagnostics and treatments.

“We will only halt Covid-19 through solidarity,” said Dr Tedros Adhanom Ghebreyesus, WHO Director-General. “Countries, health partners, manufacturers, and the private sector must act together and ensure that the fruits of science and research can benefit everybody.”

Work has already started. Since January, WHO has been working with researchers from hundreds of institutions to develop and test vaccines, standardize assays and standardize regulatory approaches on innovative trial designs and define criteria to prioritize vaccine candidates. The Organization has prequalified diagnostics that are being used all over the world, and more are in the pipeline. And it is coordinating a global trial to assess the safety and efficacy of four therapeutics against Covid-19.

The challenge is to speed up and harmonize processes to ensure that once products are deemed safe and effective, they can be brought to the billions of people in the world who need them. Past experience, in the early days of

HIV treatment, for example, and in the deployment of vaccines against the H1N1 outbreak in 2009, shows that even when tools are available, they have not been equally available to all.


So leaders came together at a virtual event, co-hosted by the World Health Organization, the President of France, the President of the European Commission, and the Bill & Melinda Gates Foundation. The event was joined by the UN Secretary General, the AU Commission Chairperson, the G20 President, heads of state of France, South Africa, Germany, Vietnam, Costa Rica, Italy, Rwanda, Norway, Spain, Malaysia and the UK.

Health leaders from the Coalition for Epidemic Preparedness Innovations (CEPI), GAVI-the Vaccine Alliance, the Global Fund, UNITAID, the Wellcome Trust, the International Red Cross and Red Crescent Movement (IFRC), the International Federation of Pharmaceutical Manufacturers (IFPMA), the Developing Countries Vaccine Manufacturers’ Network (DCVMN), and the International Generic and Biosimilar Medicines Association (IGBA) committed to come together, guided by a common vision of a planet protected from human suffering and the devastating social and economic consequences of Covid-19, to launch this groundbreaking collaboration. They are joined by two Special Envoys: Ngozi Okonjo-Iweala, Gavi Board Chair and Sir Andrew Witty, former CEO of GlaxoSmithKline.

They pledged to work towards equitable global access based on an unprecedented level of partnership. They agreed to create a strong unified voice, to build on past experience and to be accountable to the world, to communities and to one another.

Our shared commitment is to ensure all people have access to all the tools to prevent, detect, treat and defeat Covid-19. No country and no organization can do this alone.

“Our shared commitment is to ensure all people have access to all the tools to prevent, detect, treat and defeat Covid-19,” said Dr Tedros. “No country and no organization can do this alone. The Access to Covid-19 Tools Accelerator brings together the combined power of several organizations to work with speed and scale.”

Health leaders called on the global community and political leaders to support this landmark collaboration and for donors to provide the necessary resources to accelerate achievement of its objectives, capitalizing on the opportunity provided by a pledging initiative that started on 4 May 2020. This initiative, spearheaded by the European Union, aims to mobilize the significant resources needed to accelerate the work towards protecting the world from Covid-19. 

Covid-19 and heart disease – new guidelines for health professionals from the European Society of Cardiology

There have been worrying reports that Covid-19 patients may develop heart damage, which raises their chance of dying. As such it is useful to check the updated guidelines from European Society of Cardiology (ESC) and read a recent report – Covid-19 may spark cardiac trouble in multiple ways – published in *The Harvard Gazette* (link below).

Leading experts treating Covid-19 patients provide advice on managing cardiovascular disease during the pandemic in the updated ESC guidance published online here:

<https://www.escardio.org/Education/COVID-19-and-Cardiology>

This detailed document provides healthcare professionals the best available knowledge, based on practical experience, on how to diagnose and manage cardiovascular conditions in Covid-19 patients, treat the coronavirus infection, and organise and prioritise care. It will be updated as more evidence is gathered.

The novel coronavirus not only causes viral pneumonia but also has major

implications for the cardiovascular system.

Heart and stroke patients are more likely to have severe cases of Covid-19, as are people with other risk factors, including advanced age, diabetes, hypertension and obesity. In addition, Covid-19 patients may develop heart damage, which raises their chance of dying.

- See also: Covid-19 may spark cardiac trouble in multiple ways

– The Harvard Gazette (14 April 2020)

<https://news.harvard.edu/gazette/story/2020/04/covid-19s-consequences-for->

Slower clearance of Covid-19 infection may explain why men fare worse than women

Researchers at Montefiore Health System and Albert Einstein College of Medicine may have solved a mystery surrounding the novel coronavirus pandemic: Why men infected by the virus generally show more severe symptoms and are more likely than women to die from Covid-19. In collaboration with the Kasturba Hospital for Infectious Diseases in Mumbai, India, the scientists showed for the first time that men clear the virus from their bodies slower than women and found a possible explanation: a potential male-only “reservoir” for coronavirus.

Their study was uploaded 17 April to MedRxiv.org, a website created by Cold Spring Harbor Laboratory to make research quickly available to the scientific community before undergoing the usual peer review process. It has become widely used to share information quickly during the Covid-19 pandemic.

“Covid-19 studies worldwide have consistently shown a higher incidence and greater severity of the disease in men compared with women,” says Aditi Shastri, M.B.B.S., assistant professor of medicine at Einstein, a clinical oncologist at the Montefiore Einstein Center for Cancer Care, and lead

author of the Montefiore-Einstein study. “Our collaborative study found that men have more difficulty clearing coronavirus following infection, which could explain their more serious problems with Covid-19 disease.”

The viral-clearance analysis involved 68 people (48 men and 20 women) with symptoms of Covid-19 who were examined at India’s Kasturba Hospital for Infectious Diseases, in Mumbai. After undergoing initial nasal swab tests indicating active infection, individuals were re-tested with serial swabs until the tests turned negative, indicating the time taken to clear the coronavirus. The women cleared the virus significantly earlier than men: a median of four days for women vs. six days for men.

Next, three Mumbai families were identified in which men and women had tested positive for coronavirus infection on swab testing. Again, the women in all three families cleared the coronavirus earlier than male members of the same family.

Why do men have trouble shaking off their infections? Seeking a molecular explanation, the researchers focused on how coronavirus infection occurs. To infect cells, coronaviruses must first latch onto well-known proteins, called ACE2 receptors, that sprout like tiny antennae from the surfaces of cells. Cell types

expressing copious levels of ACE2 on their surfaces would theoretically be most susceptible to infection.

The researchers consulted three independent databases with information on ACE2 expression in different tissues. They saw that the testes, along with the lungs and kidneys, were among the areas of the body with the highest ACE2 expression. By contrast, ACE2 could not be detected in tissue of the ovaries, the female equivalent of the testes.

Dr. Shastri stresses that the novel coronavirus’ ability to infect and multiply in testicular tissue needs to be confirmed, but says it wouldn’t surprise her. A recent study from China compared the levels and ratios of sex hormones in male Covid-19 patients vs. healthy men of the same age. The results indicated that the Covid-19 patients had experienced impaired testicular function – evidence that the testes may be significantly affected when men develop Covid-19. Such a Covid-19 complication could have important medical and public health implications, she notes, and deserves to be investigated by clinical trials.

- doi: <https://doi.org/10.1101/2020.04.16.20060566>

Mental health expert urges people to accept grief and other feelings amid Covid-19 pandemic

Psychologist **Amy Sullivan** from Cleveland Clinic in the US offers four tips for navigating the emotions of a public health crisis

As the Covid-19 pandemic upends life as people know it, changing daily routines, limiting social interactions and shaking their sense of safety, a mental health experts from U.S. hospital Cleveland Clinic's Mellen Center is stressing that it is perfectly acceptable to feel sad about all of it.

She points out that grief is a natural response to loss – whether it is the loss of a loved one, or the loss of a sense of normalcy.

“We are experiencing a lot of disappointment right now – in both small and big ways – and grief is going to be a factor,” says clinical health psychologist Amy Sullivan, PsyD, ABPP.

“It’s really important that we process this and stay connected to other people in safe ways,” she adds.

Regarding how people should go about dealing with all of these difficult and unexpected feelings bubbling up, she says there is no right or wrong way. However, she offers four suggestions that can help people to cope with current events.

1. Look through the lens of grief and process emotions

She says that the stages of grief can provide a helpful framework for navigating these complex emotions. Experts recognize these stages as denial, anger, bargaining, despair, and acceptance. However, these experts also know that people do not step neatly from one stage to the next in this exact order, she says.

“Grief can come in waves and change on a very regular basis. Our feelings can change on a daily, or even an hourly, basis,” she explains.

Dr. Sullivan adds it is normal to go from feeling despair one day to anger the next.

“The first thing we need to do is to recognize that it is normal to have these waves of emotions that are happening on a regular basis,” Dr. Sullivan says.

Next, she says, acknowledge the loss

whether it is knowing or losing someone with Covid-19, losing jobs, missing friends or family.

“Those are all very sad, difficult things for people to manage,” Dr. Sullivan says.

“Feel what you are feeling – whether it is being overwhelmed, anxious, powerless or anything else, it can help to identify and name these emotions,” she advises.

“It can be quite powerful to sit with those feelings for a few moments – to really recognize those emotions and normalize them,” she says.

However, she advises people to set a time limit on this, suggesting they give themselves five minutes to feel that emotion, and then move on to something that they know is a positive coping skill for them.

“It is important for us to accept where our feelings are at the moment and process through them, and then move into a more positive position of acceptance,” she says.

She says this can be done by identifying their own best coping mechanisms

“This is a time when people need to become innovative and develop their own individual sense of coping that works for them during this time,” she says. Examples might include deep breathing, mindfulness exercises, journaling, talking with another person, or going for a walk.

“If it comes to a point where someone cannot handle these feelings on their own, they need to seek mental health help,” Dr. Sullivan says.

2. Fight the urge to disengage

Dr. Sullivan stresses that staying connected is a powerful tool for coping during hard times. Whether that comes in the form of video chatting or sending a good old-fashioned letter, staying in touch with family, friends, neighbours and coworkers can help people to keep a positive attitude, she says.

She adds that many trained mental



and behavioural health professionals are currently seeing patients through virtual visits, so that if people are having trouble coping, this could be a solution.

3. Focus on what can be controlled

Dr. Sullivan says that when there is so much uncertainty about the future, it is easy for people to get carried away, playing out the worst-case scenarios in their heads, for example worrying about themselves or someone else getting Covid-19, or wondering if things will ever get back to normal.

“Anticipating negative events can bring a sense of anxiety or fear,” Dr. Sullivan says.

She advises that, instead of agonizing over the things that cannot be known or controlled, people should be aware of what they do have control over. For example, they can choose how much news or social media they consume in a day, and they can decide what they eat. She recommends being mindful about these choices, and focusing on staying in the present.

4. Be open to joy

Lastly, Dr. Sullivan advises people to find joy and gratitude in the small things, like a video chat with family members, or the rush of fresh air when they open a window or step outside. She adds that if they are under a lockdown order, they can find ways to appreciate the opportunity to step back from the hustle and bustle of everyday life and being home. MEH

Researchers use live virus to identify 30 existing drugs that could treat Covid-19

Scientists at Sanford Burnham Prebys Medical Discovery Institute, the University of Hong Kong, Scripps Research, UC San Diego School of Medicine, the Icahn School of Medicine at Mount Sinai and UCLA have identified 30 existing drugs that stop the replication of SARS-CoV-2, the virus that causes Covid-19. Almost all of the drugs are entirely different from those currently being tested in clinical trials, and weren't previously known to hold promise for Covid-19 treatment. The new candidates expand the number of "shots on goal" for a potential Covid-19 treatment and could reach patients faster than drugs that are created from scratch. The study was placed on bioRxiv.org (pronounced "bio-Archive"), an open-access distribution service for preprints of life science research.

"We believe this is one of the first comprehensive drug screens using the live SARS-CoV-2 virus, and our hope is that one or more of these drugs will save lives while we wait for a vaccine for Covid-19," says Sumit Chanda, Ph.D., director of the Immunity and Pathogenesis Program at Sanford Burnham Prebys and senior author of the study. "Many drugs identified in this study – most of which are new to the Covid-19 research community – can begin clinical trials immediately or in a few months after additional testing."

Screening a library of known drugs

The drugs were identified by screening more than 12,000 drugs from the ReFRAME drug repurposing collection – a library of existing drugs that have been approved by the FDA for other diseases or have been tested extensively for human safety. ReFRAME was created by Scripps

Research with support from the Bill & Melinda Gates Foundation to accelerate efforts to fight deadly diseases. Every compound was tested against the live SARS-CoV-2 virus, isolated from patients in Washington State and China, and the final 30 drugs were selected based on their ability to stop the virus's growth.

"For us, the starting point for finding any new antiviral drug is to measure its ability to block viral replication in the lab," says Chanda. "Since the drugs we identified in this study have already been tested in humans and proven safe, we can leapfrog over the more than half decade of studies normally required to get approval for human use."

Early access to live SARS-CoV-2 virus

Chanda's team partnered with the scientist who discovered the first SARS virus, Kwok-Yung Yuen, M.D., chair of Infectious Diseases at the University of Hong Kong; and Shuofeng Yuan, Ph.D., assistant research professor in the Department of Microbiology at the University of Hong Kong, who had access to the live SARS-CoV-2 virus in February 2020. Together, the labs re-created Chanda's automated high-throughput drug screen in Yuen's lab, where it was used to identify 300 drugs from the ReFRAME library that could keep cells alive despite infection with SARS-CoV-2. These 300 drugs advanced to a second round of testing in Chanda's lab in La Jolla, Calif., where the researchers used molecular tools such as polymerase chain reaction (PCR) and immunofluorescence microscopy to pinpoint 30 compounds that were the most effective at stopping viral replication.

New drugs emerge as promising candidates for Covid-19 treatment

Highlights of the scientists' discoveries follow. Each drug or experimental compound requires further evaluation in clinical trials to prove its effectiveness in treating people with Covid-19 before it can be used broadly.

- 27 drugs that are not currently under evaluation for Covid-19 were effective at halting viral replication. 17 of these drugs have an extensive record of human safety from clinical studies in non-Covid-19 diseases, including four – clofazimine, acitretin, tretinoin and astemizole – that were previously approved by the FDA for other indications.

- Thus far, six of the 17 were shown to be effective at concentrations, or doses, likely to be effective and tolerable in humans. Four of these six drugs – apilimod, MLN-3897, VBY-828 and ONO 5334 – have been tested clinically for diseases including rheumatoid arthritis, Crohn's disease, osteoporosis and cancer.

- In addition to the 27 drug candidates, three drugs currently in clinical trials for Covid-19, including remdesivir and chloroquine derivatives, were also shown to be effective at stopping the growth of SARS-CoV-2. These results reaffirm their promise as potential Covid-19 treatments and support the continuation of ongoing clinical trials to prove their effectiveness in patients.

- Depending on regulatory guidance, the newly identified drug candidates may proceed directly to Covid-19 clinical trials or undergo further testing for efficacy in animal models.

"Based on the extensive data in this study, we believe the four drugs described

above – apilimod, MLN-3897, VBY-825 and ONO 5334 – represent the best new approaches for a near-term Covid-19 treatment,” says Chanda. “However, we believe that all 30 drug candidates should be fully explored, as they were clearly active and effective at halting viral replication in our tests.”

Chanda’s team was able to work with the live virus because his laboratory is certified as biosafety level 3, or BSL-3, which means it’s equipped with safeguards to protect lab personnel – as well as the surrounding environment and community

– from pathogens that can cause serious or potentially lethal disease. The facility was established in 2016 to support Chanda’s research on broad-spectrum antivirals – rugs that work against many viruses – for HIV, influenza, Dengue fever and West Nile virus.

Support for the research

“We were only able to generate these rapid results thanks to many years of support from the National Institutes of Health (NIH) and the Department of Defense (DoD), both funded by taxpayers, and the generosity of philanthropists,” says

Chanda, “This support enabled us to build the infrastructure and teams that were fully trained and ready to go when it was time to do this important work.

“We have chosen to release these findings to the scientific and medical community now to help address the current global health emergency,” Chanda continues. “The data from this drug screen is a treasure trove; and we will continue to mine the data from this analysis, with a goal to find additional candidate therapies – and combinations of drugs – as they are identified.” [M24](#)

Covid-19: Evidence-based advice for health workers having difficult conversations about end of life

A Loughborough University academic is providing guidance to clinicians who are likely to be having – and training people who will have – difficult conversations with patients suffering from Covid-19 or those closest to them.

Professor Ruth Parry, an expert in healthcare communication and interaction, has outlined a series of evidence-based principles with the help of her Loughborough colleague Becky Whittaker, Sharan Watson, of the University of Derby, and Dr Ruth England, of Royal Derby Hospital.

The team shared the recommendations with NHS Health Education England and these have been used to develop a series of open access resources that aim to support healthcare staff who will be having difficult conversations in relation to the coronavirus.

The principles, which have also been added to the International Association for Hospice and Palliative Care’s Covid-19 resources list, are based on research by Professor Parry and other communication scientists worldwide who have recorded and analysed thousands of difficult

conversations across various health and social care settings in the UK, Australia, Japan, and the US.

Professor Parry, who receives funding from the National Institute for Health Research (NIHR), says her guidance steers away from providing recommended phrases or scripts as it is important to equip health workers with the tools to communicate flexibly according to individual circumstances.

Having a conversation by phone, conversations where the staff member who is to do the talking is wearing PPE (Personal Protection Equipment), and conversations with people who have varying degrees of knowledge and distress are all examples of circumstances that can impact how a conversation should be constructed.

What’s more, Professor Parry says giving difficult news over the phone or when wearing Personal Protection Equipment are circumstances that staff would normally want to avoid – in normal circumstances, the health services strive to ensure that these difficult conversations are led by highly experienced professionals, face-to-face, and in calm environments.

Professor Parry has divided her advice

into key areas. They include:

- **Prepare yourself and the environment as best you can**

Health workers should clarify in their mind what they want to say and why, and find a comfortable and private setting, as best they can.

- **Start the conversation with ‘signposting’**

Conversations should be started by giving the person on the receiving end an outline of what will follow – for instance, if it is an update, and/or that there is a decision to be made.

- **How to show compassion and empathy throughout**

This can be portrayed through tone of voice, phrases that attend to emotion, and showing understanding without claiming one can possibly fully understand how the person on the receiving end is feeling.

- **What does the person you are talking to know, expect, and feel?**

Health workers should find out what the person they are talking to already knows and how they feel about it as this will help them fit what they go on to say to the individual person they are talking to.

Elsevier sets up Novel Coronavirus Information Center

For the benefit of healthcare professionals, medical researchers and the public, Elsevier, a global information analytics business specializing in science and health, has created a Novel Coronavirus Information Center with free information in English and Mandarin on the novel coronavirus 2019-nCoV.

The information centre on Elsevier Connect, the company's public news and information website, brings together relevant content from Elsevier's medical journals, textbooks, clinical experts and information solutions, along with resources from other information providers and major health organizations. Also available is

information typically used by practicing nurses and doctors, plus resources designed specifically for patients and their families.

"As a member of the research and health community, we want to support healthcare professionals, clinical researchers and policy makers in understanding how this new virus works, and so we have brought together the best available information in this free, one-stop information center," said John Danaher, MD, President, Global Clinical Solutions, Elsevier. "This site aligns with Elsevier's commitment to provide free access to key medical and scientific research and information for patients and their caregivers."

Elsevier's Novel Coronavirus Information

Center is curated by a group of clinicians and other experts at Elsevier, and will be updated frequently with the most current research and evidence-based information available.

The information centre on Elsevier Connect will be updated continuously. The site also links to other authoritative resources, including the US Centers for Disease Control and Prevention (CDC) and the WHO. Sites for health authorities in other affected countries are also listed.

- Visit Elsevier's Novel Coronavirus Information Center

www.elsevier.com/connect/coronavirus-information-center

- **Are they with someone, can they talk to someone afterwards?**

If this is a phone call, finding out who is with a person or who they could talk to afterwards is important, says Professor Parry, but this question should not be asked right at the start of a conversation as it could easily be heard as very bad news. Even when there is very bad news to come, building towards it gradually is better than clearly signalling it from the start; a gradual move towards the news reduces the risk of sending the person on the receiving end into severe shock.

- **Bring the person (further) towards an understanding of the situation – how things are, what has happened or is likely to happen**

Professor Parry's advice is to describe some of the things that are wrong with the unwell person, in such a way that the person speaking is forecasting that bad news is going to come. The point is to bring about gradual recognition, rather than shock.

- **Dealing with crying**

Deliveries should be modified to be softer and more lilting if this happens. Speakers should allow silence, repeat brief further

sympathy – 'I'm so sorry', and acknowledge the distress before moving on and giving more information

- **Moving towards the end of the conversation with 'screening' – 'are there things you would like to ask, that I have not said, or explained enough?'**

Phrases like 'anything else' should be avoided because, in some circumstances, this can be interpreted as the speaker not expecting there to be anything else. Offering 'Are there things I have not covered or explained enough?' removes the implication that the person has not understood things.

- **Moving towards the end of the conversation with words of comfort and attention to what happens next**

If possible, health workers should try to deliver something that is of comfort and that they can say truthfully, says Professor Parry. They should also explain what happens next, advise who the person they are talking to can contact for support and, if necessary, explain how pain or other symptoms will be controlled.

Professor Parry has also provided advice to help somewhat reduce the emotional

burden on the healthcare worker – for example, she recommends they find someone to debrief with before and after a difficult conversation.

Of the importance of the guidance and what she hopes it will achieve, Professor Parry said: "Healthcare workers are now having to have break bad news and have difficult conversations on an unprecedented scale.

"The kind of research I do makes it possible to pin down, to articulate, precisely how skilled, compassionate healthcare staff communicate, and pass this on to others.

"I hope that our guidance will help all staff having to break bad Covid-19 news to patients or their loved ones, to feel confident and able to communicate well, whilst looking after their own wellbeing."

The full guidance document has been shared on the Real Talk website – a platform for communication training resource designed to use in face-to-face training events for health and social care staff – and can be downloaded as a PDF here.

<https://www.realtalktraining.co.uk/app/uploads/2020/03/COVID-19-Evidence-based-advice-for-difficult-conversations-2.pdf>

Pandemic: Conflict-hit countries face health catastrophe



Conflict-hit countries need urgent support to stem the spread of Covid-19 and prepare for a potentially devastating aftermath. **Fabrizio Carboni**, the Director of the International Committee of the Red Cross' Near and Middle East issues the following statement.

response. Authorities and local responders must be supported now to ensure people's lives, livelihoods and food security are protected later.

Much-needed public health measures like lockdowns and curfews already make it difficult or impossible for many people to provide for themselves and their families.

Small shops are shuttered. Cafes sit empty. Street vendors have lost their passing trade. The switch to online working could see many left behind. Over time, levels of hunger, malnutrition and chronic illness and stress linked to economic problems could soar.

Across the Middle East, many people are

16 April 2020

The Middle East is today facing the twin threats of potential mass virus outbreaks in conflict zones and looming socio-economic upheaval. Both crises could have severe humanitarian consequences.

The Covid-19 pandemic threatens to be a global socio-economic earthquake. It will be felt acutely in the region's conflict zones, where millions are already coping with little or no health care, food, water and electricity, lost livelihoods, rising prices and destroyed infrastructure.

Deep humanitarian needs will worsen and new ones will emerge if the international community doesn't factor socio-economic aftershocks into our

Examples of the ICRC's Covid-19 response in the Middle East

■ **Syria:** Donating hygiene kits for detainees, as well as preventative equipment and materials like disinfectant, gloves, goggles and gowns to central prisons under the Ministry of Interior; preventative measures in the ICRC-Syrian Arab Red Crescent field hospital in Al Hol camp; hygiene kits to reach 750,000 internally displaced people over next three months.

■ **Iraq:** Donating protective equipment and materials like disinfectant, gloves, goggles, gowns to health facilities and places of detention across the country. To date, donated to 18 primary health care centres, two hospitals

We will increase our assistance to the people who need it most, working with our Red Cross Red Crescent partners and the tens of thousands of volunteers who go out every day to help their communities across the Middle East, through the pandemic and beyond it.

already living a hand-to-mouth existence, struggling to survive and rebuild their lives against vast odds. In Syria, seeing children the same age as my own playing in camps is a humbling experience. They are some of the millions of people we help access clean water every day. In Iraq, mothers and widows told me what our support for their small businesses meant to their families. Such support will be more important than ever in the coming months as we face this pandemic together.

With our Red Cross Red Crescent partners, we are doing our best to help the region's most vulnerable people and bolster efforts to prevent the spread of the virus. In Yemen, our life-saving support to hospitals, clinics and dialysis centres now includes help with their Covid-19 prevention preparations. In Syria and Iraq, we are helping prisons with their anti-infection measures. Water trucking support to camps, displacement shelters and places of detention ensures people have clean water to wash in. Hygiene kits for displaced people and detainees include soap and shampoo.

More broadly, our water and sanitation services, energy provision, food and household distributions and micro-economic initiatives need to continue and increase where possible, reinforcing support to fragile systems and serving basic needs that may be overshadowed in the pandemic. Right now in Yemen, we have teams out on field trips registering people who need aid. Across the region, we want to increase our support in coming months, especially to people who may be particularly affected like low-income workers, women heading households, farmers and people with disabilities.

We've changed the way we work to keep staff and the people we help safe, using physical distancing during distributions, wearing protective equipment and

and 15 physical rehabilitation centres, as well as 27 places of detention housing more than 45,000 detainees.

■ **Yemen:** Training, preventive information and material distributed to supported hospitals, primary health care centres and dialysis centers, alongside ongoing support to these facilities; public information campaign including audio spots on Covid prevention measures.

■ **Gaza:** Donated 20,000 masks and other protective materials to Palestinian Red Crescent Society; supporting authorities' quarantine efforts with donations of blankets, mattresses and hygiene kits. Supplying infrared thermometers to screen suspected cases and other medical equipment.

■ **Lebanon:** Supporting the main Covid-19 testing and treatment facility in the country, Rafic Hariri University Hospital, to boost response and bed capacity; working with detaining authorities in Roumieh prison to upgrade facilities and set up isolation block for suspected and confirmed cases.


■ **Jordan:** Provided hygiene and protective equipment for places of detention and correctional facilities; cash transfer programmes for Syrian refugees continues with preventative measures.

■ **Iran:** The ICRC has donated CHF 500,000 to the Iranian Red Crescent Society, which is leading the response to and providing services in several areas including disinfection of prisons, screening and treatment of patients, public information campaigns and livelihood support to affected vulnerable people.

Existing humanitarian needs and the ICRC response in Middle East

- Half of all medical facilities in Syria and Yemen are not functioning.
- Three of ICRC's five biggest humanitarian operations in 2019 were in Middle East – Syria, Yemen and Iraq
- In these three countries alone, almost 40 million people need humanitarian aid
- ICRC provides water and sanitation support to authorities across the region – Syria, Yemen, Iraq, Jordan, Gaza and the West Bank and Lebanon
- ICRC's provided food assistance to two million people in the Middle East in 2019.

changing how certain aid and cash transfers are delivered, for example. We will continue to adapt and to innovate. We will increase our assistance to the people who need it most, working with

our Red Cross Red Crescent partners and the tens of thousands of volunteers who go out every day to help their communities across the Middle East, through the pandemic and beyond it. 



Yemen: Millions prepare for Ramadan amid floods, conflict and coronavirus threat

People across Yemen will mark Islam's holy month this year amid ongoing conflict, seasonal diseases, floods and rising prices, in a country where the economic situation doesn't allow two thirds of the population to access or afford enough food.

The novel coronavirus – Covid-19 – threat is also on people's minds, with one confirmed case in the country of almost 29 million. Yemen's health system is fragile and under strain: half of all health facilities are not functioning and just this week 500 cholera cases were reported in 24 hours in one ICRC-supported hospital in the capital Sana'a.

"Yemenis cope with so much hardship every day. Ongoing fighting in parts of the country causes daily despair, seasonal infectious diseases claim thousands of lives each year and high inflation is affecting the price of food, medicine and other basic goods. Covid-19 is one more worry for people who are already so vulnerable," said Franz Rauchenstein, head of the International Committee of the Red Cross delegation in Sana'a.

The start of the rainy season has already brought misery to thousands. Sana'a, Ibb, Hajjah and the southern port city of Aden experienced torrential rainfall and deadly floods over two weeks, affecting thousands of people and partially destroying houses and businesses.

Yemen Red Crescent Society volunteers have been responding to the floods, rescuing people and evacuating families while providing emergency household items like blankets in Sana'a. With the support of the ICRC and other Movement partners, the

YRCS is currently assessing needs in Aden in order to help people there.


Meanwhile, in Marib governorate, floods destroyed tents belonging to thousands of people living in displacement camps. Many of the people there who received aid from the ICRC last month find themselves again in need of urgent assistance. Floods also affected many other people in Marib city.

The threat of Covid-19 is also looming over Ramadan celebrations, which are a time when families and friends traditionally gather to pray, break their fast and pay social visits.

"Yemen's hospitals are already under significant pressure, even without the threat of coronavirus. They regularly treat war-wounded patients and the beginning of Ramadan this year coincides with the onset of the rainy season and the associated seasonal increase in infectious diseases, including cholera, diphtheria and dengue. With the looming threat of Covid-19, it's

more important than ever to continue to support health facilities and places of detention to put mitigating measures in place with the aim to maintain vital health services in Yemen," said Avril Patterson, ICRC health coordinator for Yemen.

The ICRC is supporting authorities with preventative measures in places of detention, water and sanitation services to boost hygiene standards and access to clean water, and helping supported medical facilities like hospitals, primary health care and dialysis centers with donations of disinfectant materials and training.

Together with our Red Cross Red Crescent partners, the ICRC is supporting the Yemen Red Crescent in its hygiene, household and kitchen distributions to quarantine facilities set up by local authorities. This comes with information campaigns, including audio recordings with practical Covid-19 prevention measures and community awareness. 

The ICRC in Yemen

The ICRC assisted with food aid to more than 650,000 people in Yemen last year and provided more than 5 million people with clean water through water and sanitation programmes.

The ICRC treated more than 25,000 war-wounded patients and provided health services to more than 89,000 disabled persons last year. It supplies hospital materials and in some cases medicine to 55 hospitals, 14 dialysis centers and 26 primary healthcare clinics across the country, including in Sana'a, Aden and Bajil.

The ICRC's Covid-19 response in Yemen has also included training and preventive information and material distributed to supported health facilities and detention centers as well as to communities affected by conflict.

Breaking new ground with Covid-19 clinical trials

Baylor St. Luke's Medical Center in conjunction with Baylor College of Medicine, its research and educational partner, are participating in multiple clinical trials sponsored by the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health (NIH). These clinical trials seek to find an effective treatment for the Covid-19 infection caused by the novel Coronavirus.

In early April, 2020, Baylor College of Medicine and the Gulf Coast Regional Blood Center have teamed up to procure Covid-19 Convalescent Plasma from appropriate donors and provide it to the most critically ill patients with Covid-19 infection as part of a transfusion study. The process involves blood plasma transfusion from recovered coronavirus patients to those who are struggling to survive the disease.

To be eligible to participate with Baylor College of Medicine's transfusion study:

- Covid-19 convalescent plasma must only be collected from recovered individuals if they are eligible to donate blood.
- Individuals must have had a prior diagnosis of Covid-19 documented by a laboratory test.
- Individuals must have fully recovered from Covid-19, with complete resolution of symptoms for at least 14 days before donation of convalescent plasma.
- Baylor College of Medicine will provide a second test after at least 14 days of recovery if one has not been done.
- Potential donors would complete Baylor's [online questionnaire](#) to assess eligibility.

When a donor has been approved, Baylor College of Medicine will turn the donor's information over to Gulf Coast Regional Blood Center, which will then work to schedule the donation. Gulf Coast Regional Blood Center would collect the donor's blood and the receiving hospital would transfuse it.

Similar blood transfusions have been done in Houston on an Emergency IND (Investigational New Drug) application from the FDA. Baylor St. Luke's Medical Center has performed several under the Emergency IND, which must be secured separately for treatment of each patient.

The new process would be done with an

IRB protocol under an Expanded Access program, which will make it easier for the donors and recipients to be organized. Gulf Coast Regional Blood Center is integral to this study partnership with their plasma collection expertise.

"Our intention is to provide an option for the most seriously ill Covid-19 patients," said Dr. Ashok Balasubramanyam, vice president for academic integration and senior associate dean for academic affairs at Baylor College of Medicine. "This effort would help patients in Houston, and aggregation of data would provide a much better look at whether this therapy is working and what adjustments could be made."

Dr. Meredith Reyes, associate professor of pathology and medical director of the transfusion service at Baylor St. Luke's, is eager to get started under a new system of matching donors.

"I am very excited to be working on this project which is providing a valuable resource for the entire Houston community, she said. "People who have recovered from Covid-19 are anxious for a way to help others affected, and donation provides them such an opportunity. I am thrilled to be connecting these donors to patients in need."

Remdesivir

Baylor College of Medicine is also enrolling participants in a treatment trial for adult patients with a Covid-19 diagnosis who are hospitalized at Baylor St. Luke's Medical Center. The trial is sponsored by the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health.

The study will evaluate the safety and efficacy of novel therapeutic agents, the first of which is the experimental antiviral drug remdesivir.

Participants in the trial must have laboratory-confirmed SARS-CoV-2 infection and evidence of pneumonia, such as abnormal chest X-rays, rattling sounds when breathing and a need for supplemental oxygen or illness requiring mechanical ventilation. Individuals with confirmed infection who have mild, cold-like symptoms or no apparent symptoms will not be included in the study.

Over the course of the study, the

experimental treatment will initially be compared to a placebo. There will be interim monitoring of results so researchers can determine if the treatment is effective, if it is safe or if other experimental treatments should be added as they become available. If one therapy proves to have positive results, then this treatment will then become the standard for comparisons with new experimental treatments.


Dr. Hana El-Sahly, who is an associate professor of molecular virology & microbiology and medicine and the principal investigator for the Vaccine and Treatment Evaluation Unit at Baylor College of Medicine, is the principal investigator for the Baylor site.

Participants will receive placebo or remdesivir intravenously for up to 10 days total. The placebo is given in equal volume in a solution that resembles remdesivir but contains only inactive ingredients.

Clinicians will regularly monitor participants and will assign them daily scores based on a predefined scale of clinical outcomes that considers factors such as temperature, blood pressure and use of supplemental oxygen, among others. Participants also will be asked to provide blood samples and throat swabs. Researchers will test these specimens for SARS-CoV-2 and for the body's response to the infection.

Initially, investigators will compare participant outcomes on day 15 in both the remdesivir group and the placebo group to see if the investigational drug increased clinical benefit compared to placebo. Outcomes are scored on an eight-point scale ranging from fully recovered to death. Investigators will reevaluate this scale after reviewing data from the first 100 participants.

An independent Data and Safety Monitoring Board (DSMB) will monitor ongoing results to ensure patient well-being and safety as well as study integrity. The DSMB will recommend that the study be halted if there is clear and substantial evidence of a treatment difference between drug and placebo.

The co-investigators of the trial at Baylor include Drs. Robert Atmar, Jennifer Whitaker, Wendy Keitel, and Marion Hemmersbach Miller. 



Innovative single-use geko™ device, provides Covid-19 blood clot prevention without infection transmission

Requires no sterilization and re-use between patients



Clinicians treating critically ill Covid-19 patients are seeing widespread blood clotting throughout the body, an increased bleed risk and an immune system gone haywire. The blood clots can lead to life threatening multi-organ failure in sedated Covid-19 patients with a limited ability to move as they heal.

Pathology results show that clots are forming in the small vessels and capillaries in all organs (the lungs, the heart, the liver, and the kidneys) in critically ill Covid-19 patients and impede the flow of oxygenated blood from reaching the tissue on the other side of the clot. Without oxygen, the tissue dies. If enough tissue dies, organs begin to fail. They are also forming in the deep veins of the calf, due to patient immobility, creating the additional risk of life-threatening pulmonary embolism (PE), caused when a clot breaks away and travels to the lung.

With venous thrombosis (blood clots) recognised as a major contributor to Covid-19 multi-organ failure, anticoagulation is critical. Anticoagulant drugs are the cornerstone for Covid-19 blood clot prevention, however, drugs carry an unpredictable bleed risk. If contraindicated, drug dose may be adjusted and/or mechanical compression may be warranted, such as intermittent pneumatic compression (IPC) or the geko™ device, if IPC is contraindicated, impractical or inaccessible.

All completely immobilised patients can benefit from mechanical prophylaxis, which can be used in addition to drugs and used alone if bleed risk is high. IPC devices enclose the leg in a cuff which fills with air. The cuff inflates and deflates in a repeating cycle moving blood through the veins towards the heart. The increased blood circulation helps prevent the blood from clotting.

Whilst IPC devices do not cause the same bleed complications as drug therapy, IPC is not suitable for all patients, due to fragile skin, a recent wound, leg ulcer or

allergy to cuff materials. They are also a re-usable device, requiring decontamination between patient use and therefore a potential source of virus transmission if not sterilized fully.

Conversely, the geko™ is a daily disposable, single-use (single patient) device with no decontamination or re-use between patients. As it takes just 60 seconds to apply, the geko™ device minimizes nurse to patient contact time and the risk of infection transmission.

The geko™ device is clinically proven to decrease D-dimer and fibrinogen levels.

- Barnes, et al. <<https://www.gekodevices.com/clinical-study/paper-12/>> (Blood Coagulation and Fibrinolysis

About the geko™ device

The geko™ device is recommended by NICE¹ and cleared by the US FDA for blood clot prevention in combination with drugs or when drugs and other methods of mechanical prophylaxis are impractical or contraindicated.

Easy to use, the geko™ is a battery powered, disposable, neuromuscular electro-stimulation device designed to increase blood flow in the deep veins of the leg.

The geko™ device gently stimulates the common peroneal nerve activating the calf and foot muscle pumps resulting in increased blood flow, at a rate equal to 60%² of walking, without a patient having to move.

Highly portable, the geko™ device is:

- Disposable – no need to sterilise after single-patient use.
- Small size – no decontamination required (not the case with other mechanical devices).
- Easy to fit – takes just 60 seconds. Minimal training.
- No tripping hazard – no wires or leads.

2015), showed that the geko™ device decreased plasminogen activator inhibitor 1 (PAI-1) levels in patients, augmenting fibrinolysis and therefore reducing the risk of thrombotic events.

- Jingwei et al. <<https://www.gekodevices.com/clinical-study/clinical-observation-of-neuromuscular-electrical-stimulation-in-prevention-of-deep-venous-thrombosis-after-total-hip-replacement-2/>> (Chin J Bone Joint Injury, Jun 2017, Vol. 32, No. 6), showed that the geko™ device significantly reduced the D-dimer content of blood, an indicator reflecting the bloods hypercoagulability.

- Other studies; (Lavi, Xie) <<https://www.gekodevices.com/clinical-study/paper-2/>>, <<https://www.gekodevices.com/clinical-study/daily-use-of-a-muscle-pump-activator-device-reduces-hospitalization-and-improves-graft-function-post-transplantation-a-randomized-controlled-trial/>> have also shown that using the geko™ to stimulate the muscle pumps of the lower leg has a beneficial vascular systemic effect.

- The geko™ is also clinically proven to prevent VTE in immobile acute stroke patients: Williams et al. <<https://www.gekodevices.com/clinical-study/the-use-of-the-geko-device-and-the-activation-of-the-foot-and-calf-pumps-for-prevention-of-venous-thromboembolism-in-patients-with-acute-stroke/>> The use of the geko™ device and the activation of the foot and calf pumps for prevention of venous thromboembolism in patients with acute stroke.

- For more information, visit: www.gekodevices.com

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2. Tucker A, Maass A, Bain D, Chen LH, Azzam M, Dawson H, et al. Augmentation of venous, arterial and microvascular blood supply in the leg by isometric neuromuscular stimulation via the peroneal nerve. The International journal of angiology: official publication of the International College of Angiology, Inc. 2010 Spring; 19(1): e31-7.

Coronavirus brings dawn of digital healthcare

In light of the highly-infectious COVID-19 pandemic, healthcare systems across the world have had to adapt rapidly to the evolving situation for three reasons:

1. The need to triage and treat large numbers of patients with respiratory problems
2. The need to protect healthcare workers to ensure they can treat the sick
3. The need to protect the elderly and most vulnerable in society from being infected

In the editorial, 'Covid-19: A new digital dawn?', published in the journal *Digital Health*, researchers from the Institute of Digital Healthcare at WMG, University of Warwick (together with colleagues from Warwick Medical School, University Hospitals Coventry & Warwickshire NHS Trust and Bristol Heart Institute, United Hospitals Bristol NHS Foundation Trust) provide insight into how these three reasons have led to an increase in digital healthcare.

Professor Theodoros Arvanitis, from the Institute of Digital Healthcare at WMG, University of Warwick comments: "Covid-19 will unfortunately have a human cost that will be remembered for many years to come. Its impact on healthcare, the economy and society, as a whole, will be rather significant. However, it could also be the start of more digitised healthcare, as new ways of remote and digital health working have had to evolve so rapidly. We can learn from this time and take it further to make one positive come out of coronavirus, a more digital healthcare practice.

"A more digital healthcare practice could help slow further spreads of

infections, as if you have an infection and go to the doctors, you could pass it to people in the waiting area. It can also help GPs communicate more quickly and internationally, sharing advice more freely in the future.

"It can also improve the economy of the healthcare system by managing better the clinical load of frontline staff, while provide flexibility in the way citizens access healthcare services."

Innovative digital healthcare responses come into various aspects of coronavirus, from communication, to education and patient management.

In terms of communication, clinical groups are using messaging services such as slack and WhatsApp to manage rotas as high levels of staff may be off sick or in self-isolation. They are also using social media, such as Facebook to make groups such as the 'COVID Doctors Forum (UK)', which on the 6 April 2020 had 14,813 members.

The group covers a range of topics, from PPE to procedures of self-isolation and lessons from colleagues internationally, as well as a number of blog posts.

Online education

Education wise, many conferences, training courses, and post-graduate exams have been cancelled, however the need for rapid education of the healthcare workforce to deal with respiratory problems must now be carried out virtually.

Doctors in training have had their Annual Review of Clinical Progression assessments virtually, e-learning packages have also been set up much more rapidly than previously. For example, University Hospitals Coventry and Warwickshire



Professor Theo Arvanitis,
Institute of Digital Healthcare,
WMG, University of Warwick

produced a training package in just 72 hours to help staff train to deal with viral respiratory diseases.

One of the most significant changes is to patient management, in order to protect the elderly and vulnerable telemedicine consultations have taken place rather than in person.

There's also been a rapid reaction in the MedTech industry to roll out digital tools and packages, such as EMIS, (Egton Medical Information Systems), the largest supplier of electronic health records, introducing a range of interventions, including modifying coding, alert tracking and all EMIS web GPs in the UK being able to host vide consultations for free.

Many GP practices in the United Kingdom are now offering appointments over the phone, video call or via an app.

• doi: <https://journals.sagepub.com/doi/full/10.1177/2055207620920083>



WHO, ITU unleash information technology to combat Covid-19

The World Health Organization (WHO), the International Telecommunication Union (ITU), with support from the United Nations Children's Fund (UNICEF), are set to work with telecommunication companies to text people directly on their mobile phones with vital health messaging to help protect them from COVID-19. These text messages will reach billions of people that aren't able to connect to the internet for information.

Coronavirus disease (COVID-19) is the first pandemic in human history where technology and social media are being used on a massive scale to keep people safe, productive and connected while being physically apart. However, an estimated 3.6 billion people remain offline, with most people who are unconnected living in low-income countries, where an average of just two out of every ten people are online.

Now more than ever, technology must ensure that everyone can access the information they need. The collaboration will start in the Asia Pacific region and

then roll out globally. The goal is to reach everyone with vital health messages, whatever their connectivity level.

Join the initiative


ITU and WHO call on all telecommunication companies worldwide to join this initiative to help unleash the power of communication technology to save lives from COVID-19. This initiative builds on current efforts to disseminate health messages through the joint WHO-ITU BeHe@lthy BeMobile initiative.

Health workers are utilizing telemedicine to diagnose patients and hospitals rely on being connected to coordinate and triage them. Resilient and trustworthy telecommunication networks and services are essential, as more countries, companies and individuals turn to digital technologies to respond to and cope with the impact of COVID-19.

Building on their longstanding collaboration, ITU and WHO are committed to identifying and scaling best

evidence-based digital health solutions and to leveraging frontier technologies such as artificial intelligence and big data to diagnose, contain and predict outbreaks better and faster.

International Telecommunication Union

The International Telecommunication Union is the specialised United Nations agency for information and communication technologies (ICTs), driving innovation in ICTs together with 193 Member States and a membership of over 900 companies, universities, and international and regional organizations. Established over 150 years ago in 1865, ITU is the intergovernmental body responsible for coordinating the shared global use of the radio spectrum, promoting international cooperation in assigning satellite orbits, improving communication infrastructure in the developing world, and establishing the worldwide standards that foster seamless interconnection of a vast range of communications systems. 

Guide for Covid-19 remote consultation by primary carers

Primary care health workers now have a guide for conducting remote consultation of suspected COVID-19 patients, developed by a team of researchers from Singapore and the UK.

During the COVID-19 pandemic, face-to-face examination of patients has been restricted in many countries as people self-isolate at home, leading to an increasing demand for telemedicine.

To help doctors adapt to the need for more remote assessments, a team comprising Associate Professor Josip Car at the Nanyang Technological University, Singapore (NTU Singapore), Professor Trisha Greenhalgh from the University of Oxford and Professor Gerald Koh at the National University of Singapore collaborated to develop a guide.

The work was published in peer-reviewed medical journal *The BMJ* in March, and has since been incorporated in the UK-based National Institute for Health and Care Excellence (NICE) rapid guideline on COVID-19, on managing suspected or confirmed pneumonia in adults in the community.

NICE provides authoritative guidance for appropriate treatment and care of patients within the National Health Service in England and Wales. Its resources are widely referred to by clinicians around the world, including Singapore.

The guide is expected to be a helpful tool for primary care health workers, as doctors, clinics and hospitals embrace telemedicine during the pandemic.

In Singapore, the usage of telemedicine has picked up, with the government encouraging the use of video consultations for several chronic conditions, to promote safe distancing and to reduce the risk of

transmission of the coronavirus.

Assoc Prof Car who is with NTU's Lee Kong Chian School of Medicine said: "We can expect to see an increasing shift from in-person consultation to telemedicine in the future. It is therefore important for clinicians to have clarity on good practice and our guideline addresses the urgent need by providing a broad orientation to a COVID-19 consultation, including safety net advice for patients."

Trisha Greenhalgh, who is Professor of Primary Care Health Sciences at Oxford University, said: "We've long known that telemedicine can help doctors save money and time. Yet face-to-face consultations have remained standard operating procedure and the 'go-to' option. Now, COVID-19 has dramatically altered the risk-benefit balance in video versus face-to-face consultations. Suddenly, doctors need to become confident at consulting patients via video. Our work offers evidence-based advice from an international team which we hope can provide some clarity for those in the primary care service."

The guide advises on how to conduct a 'query COVID-19' consultation remotely, how to choose between telephone and video appointments, questions to ask, considerations when arranging follow-up, and next steps.

For instance, the guide spells out how doctors should ask a patient to try to talk in full sentences in order to check on their respiratory function, since the inability to speak in complete sentences is common in severe illness.

It also highlights the need for doctors to look out for the general demeanour of a patient over video. Decisions and actions are also detailed, which includes




An increasing shift from in-person consultation to telemedicine is expected in the future, and hence important for clinicians to have clarity on good practice, said Associate Professor Josip Car from the NTU Lee Kong Chian School of Medicine.

instructions to arrange for immediate medical help when red flags for COVID-19 like severe shortness of breath at rest, or pain or pressure in the chest is reported by patients.

The guide was written based on a mix of COVID-19 published and unpublished research findings – the majority of which are from China and from the World Health Organization (WHO) guidance.

The team also conducted a poll of 50 medical professionals from countries including United Kingdom and Singapore, and leveraged findings from earlier related literature.

 Covid-19: a remote assessment in primary care
<https://doi.org/10.1136/bmj.m1182>

Covid-19: Protecting staff, protecting patients



■ By Ben Kanter, MD, FCCP, Chief Medical Information Officer, Vocera



Physicians and nurses contend with infectious diseases every day. The Covid-19 pandemic is highlighting this stressful aspect of care, partly because it's highly contagious, and also because it's creating unprecedented demand to protect hospital staff coupled with the need to optimise patient flow.

Caregivers shouldn't risk contamination for communication

Without effective communication, patients cannot be moved through a hospital. And, yet, with a highly infectious virus, the simple act of communicating using conventional tools puts caregivers at risk.

If you are a nurse wearing personal protective equipment (PPE) while treating a patient behind closed doors and must urgently contact someone for assistance, you're faced with a problem.

You may have to interrupt caring for your patient to communicate using the intercom. If there is no intercom, you will need to leave the patient's bedside and remove your PPE, risking self-contamination and delaying your ability to have the necessary discussion. The less you need to temporarily remove PPE,

the safer you are. Additionally, by not removing PPE to communicate, you will preserve your valuable, but limited, supply of protective gear. Here is where Vocera® technology can provide you with an ideal solution: our wearable, hands-free devices.

Communication technology is an integral component of PPE

Worn under PPE, our classic Vocera Badge and the new Smartbadge give you and your staff access to a clear, secure, hands-free communication channel that will keep everyone safer – whether they are working in a triage tent, ICU, an isolation room, or elsewhere in the hospital. And it enables care teams to provide safer, high-quality patient care.

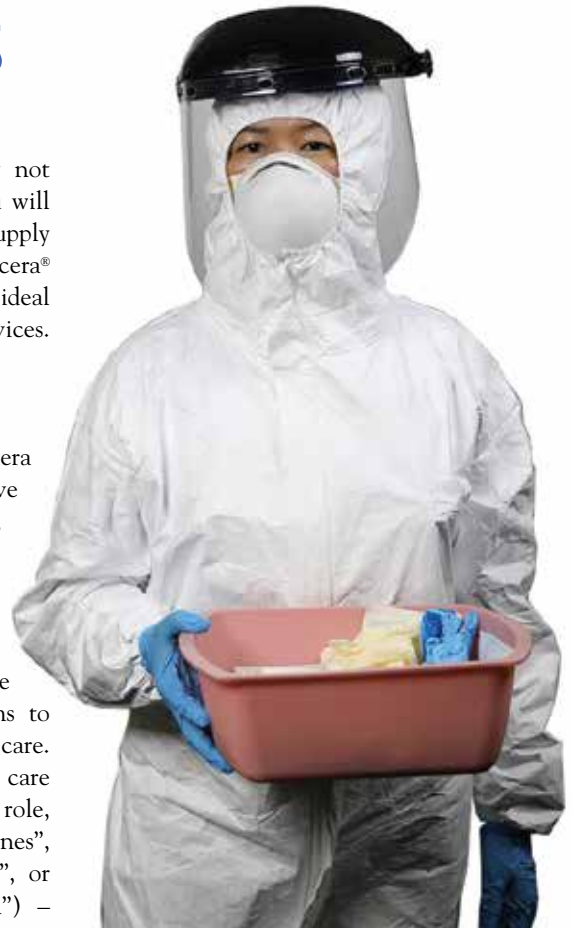
Using a voice interface to connect care team members – either by name, role, location or group (“Call Robert Jones”, “Call room 101 nurse”, “Call lab”, or “Broadcast to rapid response team”) – eliminates the need to remove PPE or touch a device, and allows for unfettered, efficient communication.

Optimising throughput and capacity

Effective communication is essential for optimising throughput and capacity, which are key to managing patient surges anticipated during a pandemic of this scale. A hospital must be able to move patients through the continuum of care quickly and safely.

As an example: whether a patient tests positive or negative for COVID-19, it's vital that care teams are notified immediately. Patients who test negative can be moved out of isolation rooms, freeing them up – and potentially other resources – for other patients.


When a hospital's communication and clinical systems are integrated, processes can be automated, reducing the risk of communication delays or errors and shortening the time to react. Automatic alerts sent when



certain triggers occur means caregivers don't need to constantly monitor the EHR for status updates. Critical lab results, as an example, can be sent directly to the right care team member in real time. Patient care is expedited, throughput is improved, and clinicians have less to remember, alleviating cognitive burden. Deploying notifications intelligently reduces the toil and stress on care teams.

In this challenging time, it has never been more critical to keep staff and patients safe and in touch with each other. By taking advantage of systems integrations, intelligent workflows, and hands-free communication devices, hospitals can advance their protection efforts now.

Vocera is here to take care of you as you continue to take care of your staff and patients.

• Visit our COVID-19 resource page, www.vocera.com/covid, for more helpful resources and information. 

In times of uncertainty, go beyond Alexa to support your patients

By Freddie Feldman

Healthcare delivery goes beyond the hospital walls. When patients are misinformed, not well prepared for procedures, or simply get educational information that diverges from what their doctors say, care suffers.

To provide top-quality patient-centred care while optimizing resources, healthcare institutions need to adopt evidence-based technologies for patient education and engagement that are reliable, kept current with new evidence, and vetted by clinicians.

Patients trust their doctors the most for their care. They know they can rely on the information they get from them and are thus more likely to adopt healthy behaviours. This need for reliable health information has never been as essential as it is today, in times of global uncertainty.

To affect change in their patients, care teams need to also forge personal connections and be able to focus on people who need the most support.

Being healthy is a lifelong endeavour. Diabetes, for example, requires people to make lifestyle changes: eating better, exercising regularly, monitoring blood levels, etc. In 2019, one in eleven adults had diabetes and one in two adults were undiagnosed. (IDF Diabetes Atlas, 9th edition.) Think about the potential impact if all these people managed their diabetes without needing acute clinical services? Interactive multimedia solutions for patient engagement help scale this outreach and meet people where they are.

Interactive Voice Response

You also need solutions that are designed for people and their specific healthcare needs. When done right, they can prove very effective. Take smart Interactive Voice Response calls (IVR), for example. These automated calls can extend the reach of care teams who need to find out from patients how they're progressing in their recovery.

Even better, these calls give patients a chance to check in with caregivers using the most natural, familiar technology there is: the telephone and the human voice. From pre-procedure to post-discharge, voice technology can help reduce costs while achieving better outcomes.

My team designs the interactions for IVR programs that are used to reach thousands of patients during their care journey in many health systems. Our approach is to think about emotionally intelligent design. IVR is not voice assistants. In many ways, it goes beyond.

I try to meet with patients and caregivers on a regular basis. That's how I learned about one patient's story. The patient had just been discharged and was back home after a heart attack. His follow-up plan included an IVR program. On the second call in the program series, he was asked about depression and anxiety. Answers to such questions can trigger red flags in the daily report that goes to a care team member for personal outreach.

In this case the patient triggered such an alert, and a clinical social worker called him back to provide support.

Discharge is one of the most critical handoffs in health care. Traditionally hospitals have employed nurses to make phone calls to recently discharged patients. But this comes at a high cost for nurses and




Freddie Feldman speaks at TEDx Vienna, 2018

hospitals, who see clinical work time being taken over by administrative work.

IVR programs that are developed by behavioural and design experts using real human voices can reduce the burden on nursing staff while increasing the level of constructive interaction with patients.

I remember our team once worked with a hospital in the U.S. that used two nurses to call as many patients post-discharge as they could. They were getting ready to roll out our IVR program, so we agreed to do a pre- and post-study. In one month, the nurses made 1,932 calls to patients – and very few of those calls actually required their clinical knowledge. When they used the IVR program for one month, the nurses reached four times as many patients.

With IVR, these nurses were able to connect with far more at-home patients and make targeted phone calls to only those who truly needed clinical support. The net result? More time for clinical work, less time on administrative calls. Meanwhile, clinical and quality leaders at the hospital understood the health status of their recently discharged patients far better. 

Clinical Effectiveness, Wolters Kluwer, Health

Freddie Feldman is Voice Design Director at Clinical Effectiveness, Wolters Kluwer, Health. He leads a team of four voice user interface designers who focus on the Emmi® patient engagement programs <<https://www.emmisolutions.com/>>.

Wolters Kluwer provides trusted clinical technology and evidence-based solutions that engage clinicians, patients, researchers, students, and the next generation of healthcare providers. With a focus on clinical effectiveness, lifelong learning, and clinical intelligence, our proven solutions drive effective decision-making and consistent outcomes across the continuum of care. For more information, visit: <http://wolterskluwerhealth.com/>



Researchers warn against use of cosmetics with parabens when pregnant

Parabens are used as preservatives in cosmetics. If pregnant women use cosmetics containing parabens that remain on the skin for protracted periods, this may have consequences for their child's subsequent weight development. This is demonstrated in a recent study published in the journal *Nature Communications* by researchers from the Helmholtz Centre for Environmental Research (UFZ) in collaboration with colleagues from Leipzig University, Charité University Hospital in Berlin and the Berlin Institute of Health (BIH).

Methylparaben, propylparaben, butylparaben – commonly used as preservatives – are used in creams and body lotions to combat microbes, but they can have an undesirably side-effect.

“If pregnant women absorb parabens through the skin, this can lead to overweight in their children,” says Dr Tobias Polte, UFZ environmental immunologist.

The starting point for the investigations was the LINA <https://www.ufz.de/index.php?de=37715> mother-child cohort study, a long-term study conducted by the UFZ to examine the significance of environmental factors in sensitive periods of childhood development for the later occurrence of aller-

gies and respiratory diseases or overweight.

“We initially wanted to find out whether the parabens detected in urine from expectant mothers from the mother-child cohort had an impact on the development of their children's weight,” explains Prof. Irina Lehmann, former UFZ researcher, currently at the Berlin Institute of Health (BIH) and at Charité – Berlin University Hospital. “In doing so, we discovered a positive correlation between the concentrations of butylparaben in the mothers' urine and a higher body-mass index of their children – particularly of the daughters – until their eighth birthday.”

In order to find out where the butylparabens in the pregnant women's urine

came from in the first place, the researchers combed through the questionnaires completed by the participants in the LINA study for details of the cosmetics used during pregnancy. “Using the ToxFox <https://www.bund.net/themen/chemie/toxfox/> app developed by BUND enabled us to easily and quickly check whether parabens were among the ingredients of the respective cosmetics products,” Polte explains. “And high concentrations of parabens in the mothers' urine were indeed associated with the use of cosmetics containing parabens – particularly those that remained on the skin for a protracted period of time, such as creams or body lotions.”

The underlying mechanism

But how does the use of creams containing parabens by expectant mothers tie in with the child's future overweight? To track down the underlying mechanisms, the team of researchers firstly used cell cultures to examine whether fat cells themselves react to high concentrations of butylparaben.

"Butylparaben did not bring about an increase in the size of the fat cells, nor did the fat cells store more fat than otherwise," Lehmann reports. "It was evident that the differentiation of fat cells was not impacted by the parabens." Something else had to be behind the children's weight gain.

In collaboration with colleagues from the Medical Faculty at Leipzig University, the researchers used a mouse model to simulate exposure to parabens during pregnancy. In this model, mice absorbed butylparabens through the skin. "Just as in the LINA study, the female offspring here also demonstrated increased weight gain," says Polte. "And they ate significantly more than the offspring of mice from the control group." Consequently, the researchers suspected

that parabens might exert an influence on how hunger is regulated in the brain, and performed a closer examination of key genes in the hypothalamus of the mouse offspring.

Satiety

It became apparent that a gene by the name of proopiomelanocortin (POMC) that is decisive in controlling the feeling of hunger was down-regulated in the brains of the young mice. Further investigations at a genetic level revealed that an epigenetic modification was responsible for this by preventing the corresponding POMC gene from being read. "The influence of parabens during gestation obviously gives rise to epigenetic modifications in the offspring that permanently disrupt the regulation of the natural feeling of satiety. This means that they have a higher food intake," Polte explains. Therefore, parabens seem to constitute as a risk factor during pregnancy for the occurrence of overweight. However, other factors also play an important role in weight gain, such as a hypercaloric diet and lack of exercise.

So far, the researchers have not been able

to come to any conclusions on how stable the epigenetic modifications are or whether they can be passed on to the next generation. However, they are already able to make an unambiguous recommendation based on the findings so far: "Bearing in mind the future health of their children, expectant mothers really should use paraben-free products during the sensitive periods of pregnancy and breastfeeding," says Lehmann. Many cosmetics products are already declared to be paraben-free; otherwise, this information can be obtained from the list of ingredients or using the ToxFox app, for instance."

The researchers will continue to search for further potential effects of parabens in future investigations. "Epigenetic modifications that relate to the regulation of satiety are only one possible end point," says Polte. "Intergenerational effects of environmental factors have often been underestimated to date. We hope that our research will help to focus greater attention on such factors in future."

• doi: <https://doi.org/10.1038/s41467-019-14202-1>

Physical activity contributes to positive mental well-being in middle-aged women despite their menopausal status

A recent study has found that late menopausal status is associated with an elevated level of depressive symptoms that indicate the negative dimension of mental well-being. However, menopause was not linked to positive dimensions of mental well-being in women aged 47 to 55. The results also suggest that a high level of physical activity was linked to fewer depressive symptoms, higher satisfaction with life and higher positive affectivity in menopausal women.

"According to our research, post-menopausal women had more depressive symptoms than peri- or premenopausal women," says doctoral student Dmitriy Bondarev from the Gerontology Research Center and Faculty of Sport and Health Sciences, University of Jyväskylä, Finland. "At the same time menopause was not related to positive mental well-being."

The menopausal transition is divided into three stages. Pre-menopause begins five to ten years before the menopause with gradual irregularity in menstrual cycles. Perimenopause is the time prior to last menstruation, when the function of the ovaries noticeably fades away. Post-menopause is the time after the last menstruation.

Menopause occurs on average between the ages of 46 and 52 and signifies the aging of a woman's reproductive system, which has a far-reaching effect on many bodily functions. However, the link between menopause and psychological functioning in middle-aged women has been investigated less.

The findings of the study indicate that irrespective of the menopausal status, physical activity was beneficial for mental well-being in middle-aged women.

"Physically active women had lower depressive symptoms, had higher positive affectivity scores and were more satisfied with life in comparison to inactive women," Bondarev explains. "Thus, being physically active during the menopausal transition may help to withstand the negative influence of menopause on depressive symptomatology and spare positive mental well-being."

The study is a part of the Estrogenic Regulation of Muscle Apoptosis (ERMA) study involving over 1,000 women aged 47 to 55 living in Jyväskylä, Finland. In the present study, the menopausal stage was determined by the serum hormone concentrations and menstrual diaries. Mental well-being and physical activity were self-reported by the participants.

• doi: 10.1097/GME.0000000000001490

Blindness is a gender issue

Women are 1.3 times more likely to be blind than men

This is the first in a series of articles on avoidable blindness produced by the Fred Hollows Foundation and published by *Middle East Health*.

Globally, more than 20 million women are blind and 120 million women live with some form of vision impairment. And that means 55% of the world's blind are women.

Almost 90% of women who are blind live in low and middle-income countries.

Women who are blind or vision impaired in low and middle-income countries face unique challenges. Living with vision impairment can cause lasting damage to psychological and physical health, and wellbeing. It can also negatively affect a woman's ability to achieve financial independence, access education, and secure opportunities to lead a more social life.

Preventable blindness

Four out of five of women who are blind don't need to be, as their eye conditions and diseases can be easily prevented, treated or managed. Nonetheless, women with vision problems are often unable to obtain needed basic healthcare services due treatment cost, transportation cost, cultural and gender discrimination barriers, and shortage of female healthcare workforce.

Women living with eye conditions and diseases often face greater barriers to access effective and affordable eye care services that may save their sight and improve their wellbeing.

The Fred Hollows Foundation concentrates on developing solutions with local communities to include women are at the centre of all we do. The Foundation designs all its programs to consider their gender impact and influencing partners to close the gender gap in blindness around the world.

She Sees

In 2018, the Foundation launched She Sees, a global initiative to become a leader in affordable, accessible eye care with the aim to end gendered discrimination in eye health and to empower women with sight. The initiative is designed to reduce the gender imbalance by focusing on five key areas:

1. capacity building of female health workers
2. improve access by reducing geographical barriers and out of pocket expenses
3. integrating eye care in maternal and reproductive health facilities
4. reaching out to women in remote and rural areas, and
5. implementing focused-industry programming.

In 2019, the Foundation piloted several activities to improve access to eye care for women and girls in Pakistan, Bangladesh, Nepal, Kenya, Cambodia, Laos and China.

In Pakistan, the Foundation developed the Comprehensive Eye Care for Female Agriculture & Cottage Industry Workers program in 2017. The women represent more than 74% of this industry work force. It is expected that the project will benefit 500,000 female workers in Punjab and Sindh provinces by the end of 2020.

While in Bangladesh and Vietnam, the Foundation has continued to provide eye care services in garment factories where they have established eye centres at factories, and trained women to help identify eye conditions and diseases among their colleagues.

Blindness should not be a gender issue in the 21st Century. No woman or girl should experience vision loss as there are established, comprehensive, low-cost eye healthcare solutions.



Three-year-old Jenin from Gaza needed a complex eye surgery, and only the surgeons at St John's Eye Hospital children's ward in Jerusalem could install a secondary intraocular lens, a procedure that will restore her sight. Jenin's grandmother, Layla accompanied her on the arduous journey from Gaza and praised the doctors after the success of the surgery. "We are so grateful for them and the organisation who helped us, and every person in need."



Shamsun Nahar, 50, has bilateral cataract. She had her right eye operated on to restore sight.

"The international community must urgently address the systemic barriers and unmet needs to achieve gender equity in eye health. We need to ensure better funding and access to affordable and effective eye care services for women. We know that the number of people who are blind is expected to triple by 2050 without greater action. It is important we focus on ensuring women are not left behind in eye care services," said a spokesperson for The Fred Hollows Foundation. [MEH](#)

The Fred Hollows Foundation

Founded in 1992, The Fred Hollows Foundation is an international development organisation working to eliminate avoidable blindness in more than 25 countries. In 2018, the Foundation performed 929,106 eye operations and treatments, screened 5,306,365 people, trained 59,207 people and equipped 1,017 facilities. Visit: www.hollows.org

Understanding endometriosis



Prof. Dr. Human Fatemi and **Dr. Laura Melado** of the IVI Middle East Fertility Clinic, Abu Dhabi, throw light on endometriosis and how it affects women's fertility.

Endometriosis is a medical condition affecting millions of women around the globe today. It is a debilitating and often painful disease that is commonly underdiagnosed in women who are in their reproductive age. Further compounding the situation, the disease has an average diagnosis period of about seven and a half years.

All these aspects make it harder for experts to fully establish the exact number of women suffering from endometriosis or, more importantly, diagnose it at its early stages. Estimates put forth by an international body show that 10 percent of women worldwide have this condition.

Fertility expert Dr. Laura Melado, IVF Specialist, IVI Middle East Fertility Clinic, Abu Dhabi explains that endometriosis is a condition in which the cells in the lining of the uterus grow in other parts of the body, including ovaries, fallopian tubes, and other parts of the pelvic area, rather than its intended place in the womb. These cells mimic the menstrual process in that they break down and bleed every month. But, unlike in a regular period, the blood doesn't leave the body properly, until it eventually becomes embedded in the organs of the pelvis. In the field of medicine, this condition is referred to as retrograde menstruation.

Retrograde menstruation is widely used by doctors to explain why endometriosis happens, but it might be other factors. As such, Prof. Dr. Human Fatemi, Medical Director IVI Fertility Clinics stated, "there is no clear-cut explanation of why endometriosis occurs in the first place. Genetics, along with a weak immune system, environmental factors, and metaplasia are among the other causes considered by the medical community".

Symptoms

Menstrual pain is the most common symptom apart from pain in the abdomen, pelvis, or lower back; pain between the hips and the top of the legs; painful intercourse; and bleeding between periods. Gastrointestinal and urinary symptoms may occur as well if the endometrial tissue begins to occupy the intestine, the bladder, the rectum, or other structures. Some patients may also experience persistent fatigue, discomfort when going to the toilet, bleeding from the rectum, or coughing blood.

The symptoms may vary for different women, with some not even experiencing any of the signs at all.

"Of all its impact, infertility remains the most serious. In fact, 30-50 percent of women unable to conceive suffer from this disease," Prof. Dr. Fatemi added.

The difficulty in conception generally occurs due to the anatomical distortion and adhesions that result from the condition. These adhesions, depending on the severity, may even prevent the egg from moving towards the fallopian tube.

The chance of natural conception in spite of the endometriosis diagnosis depends on whether the disease is classified as minimal, mild, moderate, or severe based on the American Fertility Society Revised Classification of Endometriosis (AFS) score.

For women with severe cases, the chance is significantly lower because of a scar tissue that generally forms in this condition. Moreover, endometriosis also damages the fallopian tubes and ovaries sometimes.

Prof. Dr. Fatemi said that there is no known cure for endometriosis to date. The available treatments of the disease, including surgery, hormone medications, contraceptives, and anti-inflammatory painkillers are all meant to manage the symptoms only.

Pregnancy

Women, however, should keep in mind that getting pregnant is still not completely off the table, though, it would be challenging. Under the circumstances, it is always best to talk to a fertility expert as soon as possible. IVI Fertility recommends visiting a fertility specialist to women who are in their 20s and 30s and are suffering from endometriosis, regardless if they are trying to get pregnant or not.

"Consulting with an expert empowers them by giving them insights into their ability to conceive and the best treatment options available if the pregnancy is indeed going to be challenging. In-vitro fertilization (IVF) and fertility preservation through egg freezing are part of the options," added Prof. Dr. Fatemi.

Getting pregnant is quite easy for some while for others, especially those with health conditions such as endometriosis, it is not always straightforward. With the advancements in Reproductive Medicine, many couples are still being given an opportunity to start their parenthood journey no matter the challenges; and there lies the hope that having a baby is still within their grasp. [MESH](#)

IVI Fertility Middle East

IVI Fertility is a leading institution of infertility treatments in the Middle East and has three clinics in Abu Dhabi, Dubai and Muscat. IVI has one of the highest success rates in the region of over 70% with leading fertility professionals with global experience who work together to deliver success for couples.

Half of women with heart failure not treated correctly

As many as 50 per cent of women suffering from cardiac arrest are given insufficient treatment, because the heart failure was not caused by a heart attack.



Photo: Kim E. Andreassen, University of Bergen.

Professor Eva Gerdts has done research on difference in heart disease between men and women.

More women than men die of heart failure. The reason is that only 50 per cent of the heart failure cases among women are caused by having a heart attack, which can be treated with modern methods.

For the other 50 per cent of women experiencing heart failure the cause is generally related to having untreated high blood pressure levels over time, which leads to progressive stiffening of the heart. There is currently no effective treatment for this kind of heart failure.

“Men and women have different biologies and this results in different types of the same heart diseases. It is time to recognise these differences,” says Professor Eva Gerdts, Department of Clinical Science, University of Bergen.

“Heart disease remains among the most common cause of death and reduced quality of life in women. Medically speaking, we

still do not know what the best treatment for heart attack or heart failure is in many women. It is an unacceptable situation,” Gerdts says.

Gerdts has recently published an invited review paper in *Nature* together with Professor Vera Regitz-Zagrosek of Charité Universitätsmedizin.

The researchers compared common risk factors for heart disease and how these affect men and women differently. They have, among other things, focused on the sex differences in the effect of obesity, high blood pressure and diabetes.

Women gain more weight

According to The World Health Organization (WHO) 11% women and 15% men are obese (BMI over 30 kg/m²) globally.

“If we see this from a life span perspective, we can see that obesity increases with age, and that this trend is greater for women than men. Obesity increases the risk of having high blood pressure by a factor of three. This, in turn, increases the risk of heart disease,” Gerdts points out.

According to Gerdts, obesity also increases the risk of diabetes 2. A woman with diabetes has a much higher relative risk of heart complications and death than a man.

“We know that women with diabetes 2 are usually obese and some of this fat is stored in the heart, which makes it more vulnerable for disease.”

Oestrogen influences heart disease risk

Gerdts explains that many of the differences between woman and men when it

Men and women have different biologies and this results in different types of the same heart diseases. It is time to recognise these differences.

comes to heart disease are connected to the sex hormone, oestrogen. The hormone prevents the formation of connective tissue in the heart, which makes it harder for the heart to pump. In men the effects are the opposite.

“We see that obese men store oestrogen in their fat cells in the abdomen, which has a bad effect on the heart.”

After menopause, women lose the oestrogen advantage. Their arteries become stiffer and more vulnerable for disease. We see this in the fact that for persons under 60, high blood pressure is most common amongst men. For persons over 60, it is the opposite.

“We think that this is part of the explanation for why high blood pressure seems to indicate higher risk of heart disease amongst women.”

• doi: <https://doi.org/10.1038/s41591-019-0643-8>

Women most affected by vascular complications of diabetes

Women are most affected by the vascular complications of diabetes – a situation likely to escalate in the coming decades, reports a paper published in the *European Journal of Preventive Cardiology*, a journal of the European Society of Cardiology (ESC).

Cardiovascular disease occurs 15 years earlier in patients with diabetes and is their main cause of morbidity and mortality. In women, the links between diabetes and cardiovascular disease are particularly potent.

Globally, there are more deaths due to diabetes in women than in men (2.1 versus 1.8 million annually) – this excess risk is mainly due to the higher risk of cardiovascular death in women.

Cardiovascular disease

Coronary heart disease is the most frequently reported form of cardiovascular disease and the most lethal one. Women with diabetes are at a 1.81-fold risk of death from coronary heart disease compared to women without diabetes. Men with diabetes have a 1.48-fold risk of death from coronary heart disease compared to men without diabetes.

Peripheral artery disease – which can ultimately lead to foot amputation – is the most common initial manifestation of cardiovascular disease in patients with type 2 diabetes. Its prevalence is 1.8-fold higher in women compared to men.

Heart failure is the second most common initial manifestation of cardiovascular disease in type 2 diabetes. Women with diabetes are five times more likely to get heart failure than women without diabetes. Men with diabetes are two times more likely to get heart failure than men without diabetes.

Research is ongoing to explain these differences between women and men. One possible reason for the higher heart failure risk could be that a specific form is more common in women generally and is the type most likely to affect patients with diabetes. This form is called heart failure with preserved ejection fraction, where the heart maintains its pump function but has



increased stiffness causing impaired relaxation after contraction.

In both women and men, a healthy lifestyle is the cornerstone to preventing diabetes; once people have diabetes, it is fundamental to stopping the cardiovascular complications.

Senior author Professor Joline Beulens, of Amsterdam University Medical Centre, the Netherlands said: “With the increased levels of obesity in our society we have seen an enormous rise in the prevalence of diabetes. We know that type 2 diabetes is a lifestyle-related disease, so we can halt the trajectory with better behaviours.”

“Lifestyle management is the first line of treatment for patients with diabetes,” continued Professor Beulens. “If lifestyle doesn’t sufficiently control glucose levels and the risk of complications, then glucose-lowering treatment should be initiated as the second line of therapy.”

Guidelines

ESC diabetes guidelines advise patients with diabetes and pre-diabetes to:

- Quit smoking.
- Reduce calorie intake to lower excessive body weight.
- Adopt a Mediterranean diet supplemented with olive oil and/or nuts to lower the risk of cardiovascular events.
- Avoid alcohol.

Women with diabetes are at a 1.81-fold risk of death from coronary heart disease compared to women without diabetes.

- Do moderate-to-vigorous physical activity (a combination of aerobic and resistance exercise) at least 150 minutes per week to prevent/control diabetes – unless contraindicated, such as in patients with severe comorbidities or limited life expectancy.

Professor Beulens said: “Patients with diabetes remain at significantly higher cardiovascular risk compared to people without diabetes. There is an urgent need to better identify, monitor, and control diabetes to prevent the devastating cardiovascular complications.”

The paper is part of a special supplement on diabetes in the *European Journal of Preventive Cardiology*. The issue was organised by the European Association of Preventive Cardiology (EAPC) as part of the Diabetes and CVD Programme.

<https://www.escardio.org/Education/Diabetes-and-CVD>

Mediclinic City Hospital provides pioneering kidney transplant programme

World Kidney Day provided an opportunity to reflect on the success of kidney transplantation as a therapy for end-stage renal disease. The global burden of chronic kidney disease is increasing and is projected to become the fifth most common cause of years of lives lost globally by 2040.

Dubai's Mediclinic City Hospital's transplant programme offers patients suffering from end-stage renal disease an alternative to dialysis. The transplant team provides comprehensive, multidisciplinary care for potential transplant recipients and donors, from initial consultation through to the procedure of donation or transplant, and ongoing treatment.

The programme enjoys a strong and supportive partnership with Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU) in propelling organ transplant to the forefront of healthcare, in the process helping to transform the UAE's laws on organ donation and transplant and making the service available to the UAE's citizens and residents.

This year Mediclinic City Hospital also signed a three-party agreement with Al Jalila Children's Specialty Hospital and MBRU to collaborate on activities related to organ transplant services. The collaboration will ensure that the three entities work closely with the National Transplant Program led by MOHAP as well as other health authorities, government and non-government entities to support transplant efforts in the UAE and the region. This form of collaboration has been highlighted by H.E. Dr. Amin Hussain Al Amiri, Assistant Undersecretary of the UAE Minister of Health and Prevention, as a

sought after and valued asset in the present and future healthcare in the UAE.

Deceased donor transplant

In June 2016 Mediclinic City Hospital was the first hospital in Dubai to perform a deceased donor kidney transplant. The programme covers all residents of the UAE, citizens and expatriates alike, and is considered the best option for residents of the Northern Emirates considering a transplant. The programme has been accredited by the Saudi Center for Organ Transplantation (SCOT), the reference centre for organ donation and transplant for the GCC; Dubai Healthcare City Authority (DHCA) and the UAE Ministry of Health and Prevention (MOHAP). Furthermore, the programme has been assessed against the Joint Commission International standards and is fully accredited.

Dr. Ramzi Ayache, Consultant Nephrologist at Mediclinic City Hospital, says: "We offer both living-related and deceased donor transplant options to patients suffering from end-stage renal disease. Our ethos is to provide the transplant option to any patient who chooses to explore transplant in an equitable, transparent and just manner. All our post renal transplant patients are alive and healthy; maintain excellent renal function and a graft survival of 100%. None of the patients have required dialysis post-surgery as they had an immediate graft function."

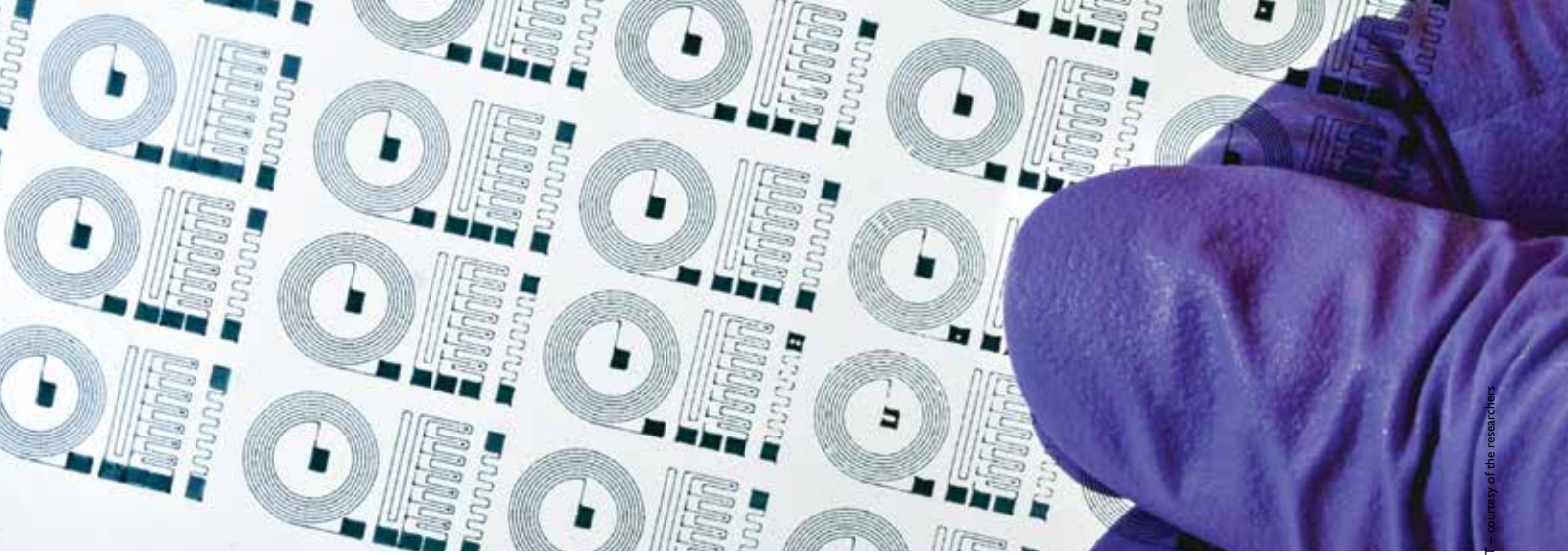
The transplant committee at Mediclinic City Hospital provides clinical oversight by assessing the suitability of every patient



and formally agrees on the most appropriate treatment plan for all cases before proceeding to donation or placing a patient on a wait list with the National Transplant Committee.

Vinay B. Pokale, a recent renal transplant patient at Mediclinic City Hospital, said: "Each passing week after my surgery, I have seen improvement and with each improvement I feel hopeful. I don't know who my donor was, but because of the selfless actions done by the family members of the deceased to make a donation like this, I have been blessed with a second chance in life. I will be forever grateful."

Dr. Farhad Janahi, Assistant Professor of Surgery, MBRU, Consultant Urologist and part of the Mediclinic City Hospital Transplant Team, summed up the efforts that go into this program: "Our entire community has embraced this endeavour. We are extremely grateful to all who made this possible especially the UAE Government, SCOT, MOHAP, Dubai Airports, General Directorate of Residency and Foreigner Affairs, Dubai Customs, Dubai Police, Dubai Ambulance and all our hospital staff for their tireless work. Last but not the least, our donor families, who in their time of grief thought of giving life to another human. They not only brought joy to our recipients but their entire families." MBH



MIT — courtesy of the researchers

MIT researchers have 3-D-printed soft electronically active polymers into a number of devices, including a pliable neural electrode, and (shown here) a flexible circuit.

Engineers 3D print soft, rubbery brain implants

The brain is one of our most vulnerable organs, as soft as the softest tofu. Brain implants, on the other hand, are typically made from metal and other rigid materials that over time can cause inflammation and the build-up of scar tissue.

MIT engineers are working on developing soft, flexible neural implants that can gently conform to the brain's contours and monitor activity over longer periods, without aggravating surrounding tissue. Such flexible electronics could be softer alternatives to existing metal-based electrodes designed to monitor brain activity, and may also be useful in brain implants that stimulate neural regions to ease symptoms of epilepsy, Parkinson's disease, and severe depression.

Led by Xuanhe Zhao, a professor of mechanical engineering and of civil and environmental engineering, the research team has now developed a way to 3D print neural probes and other electronic devices that are as soft and flexible as rubber.

The devices are made from a type of polymer, or soft plastic, that is electrically conductive. The team transformed this normally liquid-like conducting polymer

solution into a substance more like viscous toothpaste – which they could then feed through a conventional 3D printer to make stable, electrically conductive patterns.

The team printed several soft electronic devices, including a small, rubbery electrode, which they implanted in the brain of a mouse. As the mouse moved freely in a controlled environment, the neural probe was able to pick up on the activity from a single neuron. Monitoring this activity can give scientists a higher-resolution picture of the brain's activity, and can help in tailoring therapies and long-term brain implants for a variety of neurological disorders.

“We hope by demonstrating this proof of concept, people can use this technology to make different devices, quickly,” says Hyunwoo Yuk, a graduate student in Zhao's group at MIT. “They can change the design, run the printing code, and generate a new design in 30 minutes. Hopefully this will streamline the development of neural interfaces, fully made of soft materials.”

Yuk and Zhao have published their results in the journal *Nature Communications*. Their co-authors include Baoyang Lu and Jingkun Xu of the Jiangxi Science and Technology Normal University, along with Shen Lin and Jianhong Luo of Zhejiang University's School of Medicine.

Implants on demand

As a proof of concept, the researchers used a

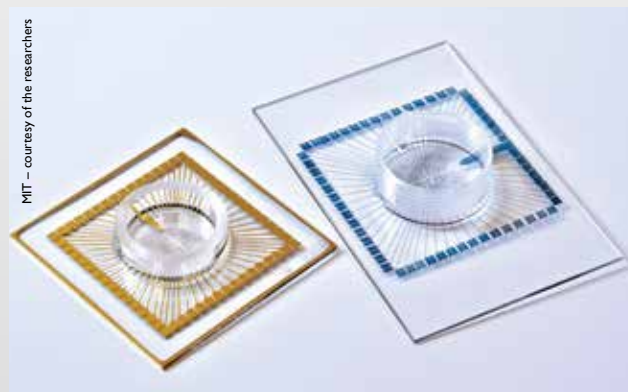
conducting polymer solution with which they 3D-print a small, rubbery electrode, about the size of a piece of confetti. The electrode consists of a layer of flexible, transparent polymer, over which they then printed the conducting polymer, in thin, parallel lines that converged at a tip, measuring about 10 microns wide – small enough to pick up electrical signals from a single neuron.

The team implanted the electrode in the brain of a mouse and found it could pick up electrical signals from a single neuron.

“Traditionally, electrodes are rigid metal wires, and once there are vibrations, these metal electrodes could damage tissue,” Zhao says. “We've shown now that you could insert a gel probe instead of a needle.”

In principle, such soft, hydrogel-based electrodes might even be more sensitive than conventional metal electrodes. That's because most metal electrodes conduct electricity in the form of electrons, whereas neurons in the brain produce electrical signals in the form of ions. Any ionic current produced by the brain needs to be converted into an electrical signal that a metal electrode can register – a conversion that can result in some part of the signal getting lost in translation. What's more, ions can only interact with a metal electrode at its surface, which can limit the concentration of ions that the electrode can detect at any given time.

“The beauty of a conducting polymer hydrogel is, on top of its soft mechanical properties, it is made of hydrogel, which is ionically conductive, and also a porous sponge of nanofibers, which the ions can flow in and out of,” Lu says. “Because the electrode's whole volume is active, its sensitivity is enhanced.” **MEH**



MIT — courtesy of the researchers

With their new 3-D-printing technique, the team has also printed soft multi-electrode arrays that can be used to monitor the activity of individual neurons.