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Severe anemia in pregnancy doubles the risk of maternal death

Anemia in pregnancy is one of the most common medical problems pregnant women encounter in both low and high income countries. It affects some 32 million pregnant women worldwide each year and is characterized by a lack of red blood cells. Women with severe anemia will have a blood count of less than 70 grams of hemoglobin per litre of blood. It is a dangerous condition and if not prevented or treated correctly can lead to maternal death.

Highlighting the danger, an international study published in May this year, shows that women with severe anemia during pregnancy or up to seven days after delivery have double the risk of dying compared to those who don’t suffer from the condition.

Previous studies had suggested that anemia was strongly associated with maternal death, but they were not clear due to the influence of other clinical factors. This study – the largest of its kind – is the first to control factors that can influence the development of anemia in pregnancy (such as blood loss or malaria infection) and which may have skewed the results of previous studies.

The researchers emphasize that clinicians, policy makers and healthcare professionals should now focus their attention on preventing anemia, using a multifaceted approach, and not just hope that iron tablets will solve the problem. Although anemia is a readily treatable condition, the existing approaches have so far not been able to tackle the problem, say the researchers who published their study in the MAY/JUNE 2018 issue of The Lancet Global Health.

For the study they looked at World Health Organization data on 312,281 pregnancies in 29 countries around the world. The study results show that, when all known contributing factors are controlled for, the odds of maternal death are doubled in mothers with severe anemia.

Importantly, the relationship between severe anemia and the increased risk of maternal death is seen in different geographical areas and, by using different statistical approaches, the researchers are able to show an independent relationship between severe anemia and maternal death does exist.

Prior to this research, the absence of robust data showing evidence of the relationship between severe anemia and maternal mortality has led to a relatively low prioritization of anemia as an important condition in its own right. This new research will hopefully motivate health policy makers to sharpen their focus on the prevention of anemia during pregnancy when they shape new policy on the condition.

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Molecular basis for increased cardiovascular disease in older women

Researchers have discovered the molecular basis for the increased incidence of cardiovascular diseases in older women. The study found that older women had mitochondrial dysfunction, reduced antioxidant proteins, and increased inflammation.

Previous studies have shown sex differences in the age at which cardiovascular diseases occur. Ischemic heart disease, for example, develops on average seven to ten years later in women compared with men. It occurs three to four times more often in men than in women below the age of 60 years, but after the age of 75, most patients are women.

It is not clear why many women are protected from cardiovascular disease at a young age but are more susceptible after menopause. Estrogen levels may play a role but the mechanism is unknown. This study looked at molecular changes in the cells of the heart that happen with aging, and how they differ between men and women.

Specifically, the researchers looked at healthy hearts to see if there are sex differences in mitochondrial function and inflammation during aging. Heart tissue was obtained from seven women and seven men aged 17 to 40 years, and from eight women and nine men aged 50 to 68 years. The researchers measured levels of proteins involved in inflammation and in the function of the mitochondria.

The researchers found that the levels of Sirt1, a protein that is important for the function of the mitochondria, are higher in young women compared to young men. In the older hearts, Sirt1 levels had decreased in women but not in men. Expression of superoxide dismutase 2, an antioxidant protein in the mitochondria, was higher in young females than males but the difference was no longer present with age.

In addition, the expression of catalase, an enzyme that protects cells from oxidative damage, was higher in young females than males but again the difference was lost with age.

With age, female hearts shifted from an anti-inflammatory to a pro-inflammatory environment. Compared to young men, young women had higher levels of anti-inflammatory cytokines such as interleukin 10 – but this difference was lost with age. Levels of macrophages, which promote inflammation, increased with age in women but not in men.

Dr Maria Luisa Barcena De Arellano, scientific researcher, Institute of Gender Medicine, Charité University Medicine Berlin, Germany, said: “Our study provides a molecular explanation for the increased incidence of cardiovascular diseases in older women.”

European Society of Cardiology
https://tinyurl.com/yd39ybak

Heart disease may only be a matter of time for those with healthy obesity

People who are 30 pounds (circa 15kg) or more overweight may want to slim down a bit even if they don’t have high blood pressure or any other heart disease risk, according to scientists at Wake Forest Baptist Medical Center.

In a study published, the researchers found that slightly less than half of the people who were considered obese – 30 pounds or more overweight – developed metabolic syndrome within 10 years, putting them at a much higher risk for cardiovascular disease and diabetes.

“Common medical wisdom has been that some people who are obese seemed to be pretty healthy and free from heart disease risks, so they haven’t been advised to lose weight or take other steps to prevent future heart disease,” said Morgana Mongraw-Chaffin, Ph.D., assistant professor of public health sciences at Wake Forest Baptist and lead author of the study.

“The big question has been whether these people who are metabolically healthy will stay that way or whether they will progress to metabolic syndrome over time.”

Metabolic syndrome includes those risk factors – high blood pressure, high blood sugar, unhealthy cholesterol levels and abdominal fat – which double the risk of cardiovascular disease that can lead to heart attacks and strokes. In addition, these risk factors increase the risk of diabetes by five times.

The Wake Forest Baptist study included 6,809 participants from the Multi-Ethnic Study of Atherosclerosis who were recruited from six sites in the United States. Participants with cardiovascular disease were excluded.

The study was conducted to determine if metabolically healthy obesity (MHO) at baseline remained stable or led to metabolic syndrome and increased the risk of heart and vascular disease. Participants were followed for 12 years with clinical evaluation repeated every two years. MHO was defined as a body mass index of more than 30 and two or fewer risk factors.

The researchers found that compared to normal weight, baseline MHO was not significantly associated with incident cardiovascular disease, the first occurrence of a potentially life-threatening condition. However, almost half of the participants developed metabolic syndrome over the course of the study and had increased odds of cardiovascular disease compared to those with stable MHO and normal weight.

“In this paper, we specifically looked to see whether that progression was associated with a higher risk for heart disease and we found that it was,” Mongraw-Chaffin said. “Metabolically healthy obesity is not a stable or reliable indicator of future risk for cardiovascular disease. Right now, there isn’t any way to know which 50 percent will progress and which won’t.”

Wake Forest Baptist Medical Center
https://tinyurl.com/yd39ybak

In Huntington’s disease, heart problems shed light on disease process

Researchers investigating a key signalling protein in Huntington’s disease describe deleterious effects on heart function, going beyond the disease’s devastating neurological impact. By adjusting protein levels affecting an important biological pathway, the researchers improved heart function in
experimental animals, shedding light on the biology of this fatal disease.

“Heart disease is the second leading cause of death in Huntington’s disease patients, but its biology remains poorly understood,” said study leader Beverly L. Davidson, PhD, Director of the Raymond G. Perelman Center for Cellular and Molecular Therapeutics at Children’s Hospital of Philadelphia (CHOP), where she is an expert on gene therapy for inherited brain disorders. “Better knowledge of the underlying biology of Huntington’s disease will improve the development of effective therapies.”

Huntington’s disease (HD) is an incurable, inherited disease with progressive loss of brain cells and motor function, usually beginning in midlife. A defective gene produces repeated copies of a protein called huntingtin, or HTT. The mutant HTT protein (mHTT) particularly damages a brain region called the striatum, resulting in involuntary movements and severe cognitive and emotional disturbances.

Because mHTT disrupts multiple fundamental processes in cells throughout the body, it impairs multiple organ systems. The current study focused on heart function in mouse models of HD. The mutant protein mHTT disrupts functioning along the mTORC1 pathway, named for the signalling protein complex mTORC1 that promotes cellular growth and metabolism. Researchers already knew that mTORC1 function plays a key role in the neurology of HD. The current study showed that mTORC1 activity was lower in HD mice than in healthy mice. The HD mice also had smaller-than-normal hearts. Crucially, the study team found that HD mice were less able to adapt to stress on their hearts, and had higher mortality from that stress.

When the researchers restored mTORC1 activation in the HD mice by using genetic techniques to knock down the mutant HTT protein, the mice were better able to adapt to cardiac stress and had higher survival over the course of the study.

“If the mHTT protein has a similar effect on human hearts as in the mice, it may explain the heart-related mortality seen in HD patients,” said Davidson, adding that future studies in HT should investigate that question. Given that there are currently clinical trials of HTT-lowering therapy in Huntington’s disease patients, it is important to better understand how HD affects organs outside the central nervous system.

In addition, some researchers propose using mTORC1 inhibitors to treat HD, but the new study suggests that this approach could cause unintended effects on cardiac function. “We know from our previous studies that improving mTORC1 functioning may have a protective effect in HD, but this would require carefully adjusting the pathway to restore normal mTORC1 levels,” said Davidson.

New cell therapy aids heart recovery — without implanting cells

Heart disease is a major global health problem — myocardial infarction annually affects more than one million people in the U.S. alone, and there is still no effective treatment. The adult human heart cannot regenerate itself after injury, and the death of cardiac muscle cells, known as cardiomyocytes, irreversibly weakens the heart and limits its ability to pump blood.

Researchers have turned their focus to stem cell transplantation for cardiomyocyte replacement and recovery of heart function, but studies have shown that implanted stem cells have difficulty surviving and differentiating into cardiomyocytes to repair the damaged muscle. When stem cells were differentiated into cardiomyocytes before implantation, heart function improved, but with a complication: the implanted cardiomyocytes did not contract synchronously with the heart, thus causing potentially lethal arrhythmias (abnormal heart rhythm).

A team of Columbia University investigators, led by Biomedical Engineering Professor Gordana Vunjak-Novakovic, has designed a creative new approach to help injured hearts regenerate by applying extracellular vesicles secreted by cardiomyocytes rather than implanting the cells. The study shows that the cardiomyocytes derived from human pluripotent stem cells (derived in turn from a small sample of blood) could be a powerful, untapped source of therapeutic microvesicles that could lead to safe and effective treatments of damaged hearts.

Cell-secreted microvesicles are easy to isolate and can be frozen and stored over long periods of time. Such an “off-the-shelf” product has several major advantages over cell therapy — 1) it can be used immediately in an acute-care setting, unlike cells that can take months to isolate and grow; 2) it does not cause arrhythmia (which often occurs when cells are transplanted); and 3) the regulatory path towards clinical application is much simpler than for a cell-based therapy.

It is well known from numerous clinical studies that most of the implanted stem cells are washed away within hours of the treatment, but there still are beneficial effects. This has led to the informal “hit-and-run” hypothesis, meaning that the cells deliver their cargo of regulatory molecules before leaving the site of injury. “Consistent with this hypothesis, we postulated that the benefits of cell therapy of the injured heart could be coming from the secreted bioactive molecules (such as micro RNAs), rather than the cells themselves,” says Vunjak-Novakovic, the study’s senior author, University Professor, The Mikati Foundation Professor at Columbia Engineering, and professor of medicine at Columbia University Vagelos College of Physicians and Surgeons.

“So we explored whether the benefits of cell therapy of the injured heart could be achieved without using the cells. This way, we would largely simplify the translation into the clinic, and avoid the burden of arrhythmia associated with implantation of contractile cells.”

Nearly all cells secrete and uptake tiny extracellular vesicles that are filled with genetic messages that can influence recipient cells. These extracellular vesicles are like letters that cells use naturally to communicate with their neighbours, both near and far, within the body.

“We reasoned that the cardiomyocytes would be the best source of molecules driving the recovery of injured heart, as it is well known that these cells can build muscle when used in tissue-engineering models,” says Bohao Liu, the paper’s co-lead author and MD/PhD candidate in Columbia Engineering’s department of biomedical engineering. “I’m very excited about our promising results, and I believe that the cell-free therapy represents a step in the right direction for developing safe and effective treatments of the infarcted heart.”
secrete extracellular vesicles. The vesicles secreted by undifferentiated stem cells were used for comparison. The researchers then used next-generation sequencing to read their messages and instructions. They found that the extracellular vesicles from cardiomyocytes—but not from stem cells—contained cardiogenic and vascular microRNAs that are very powerful regulatory molecules. Building on the expertise of Vunjak-Novakovic’s lab in biomaterials and hydrogels, the team encapsulated the vesicles in a collagen-based patch that slowly released them over the course of four weeks when implanted onto the injured heart in rat models of myocardial infarction. The researchers monitored the heart to measure blood-pumping function and look for any signs of arrhythmia. “We were really excited to find that not only did the hearts treated with cardiomyocyte extracellular vesicles experienced much fewer arrhythmias, but they also recovered cardiac function most effectively and most completely,” says Vunjak-Novakovic. “In fact, by four weeks after treatment, the hearts treated with extracellular vesicles had similar cardiac function as those that were never injured.”

Columbia University School of Engineering and Applied Science
https://tinyurl.com/y9vbj6q

New blood pressure guidelines could put lives at risk

A new report by University of Sydney and Bond University scholars weighs the risks and benefits of a recent change to blood pressure guidelines in the US. Recommendations from the American College of Cardiology and American Heart Association to lower thresholds defining hypertension and the treatment of higher risk patients are sparking debate, the report reveals.

The recommendations from American College of Cardiology and the American Heart Association are as follows:

- Lowering the threshold for diagnosis of hypertension in adults from 140/80 mmHg to 130/80 mmHg
- Lowering the threshold for drug treatment of ‘high risk’ adults with hypertension who have existing CVD from 140/80 mmHg to 130/80 mmHg

lowering the threshold for drug treatment of adults with a calculated 10-year CVD risk ≥10 percent, or otherwise high risk, for example, people with diabetes or renal disease, from 140/80 mmHg to 130/80 mmHg.

Changing the diagnostic and treatment thresholds for hypertension could put people at risk in three ways, say the University of Sydney and Bond University authors of the report.

“First, wider disease definitions mean more people are labelled as unwell, even if they have low risk of a disease,” said the report’s lead author, Dr Katy Bell of the University of Sydney. “Labelling a person as having hypertension increases their risk of anxiety and depression, as compared to the risk for people with the same blood pressure who aren’t labelled as hypertensive.

“Second, it means more people may experience serious adverse effects from treatments.

Third, in countries without universal health coverage, such as the United States, people newly diagnosed with hypertension may face difficulties gaining insurance coverage for a ‘pre-existing’ condition.”

Report co-author, Bond University Professor Paul Glasziou said: “The ACC/AHA guideline follow an established pattern in the medical specialties, where disease definitions are more often widened than narrowed. “Systolic blood pressure has poor reproducibility, with a 10mmHg standard deviation for repeat measurements between clinics,” he added.

“Since a large proportion of all adults have a ‘true’ systolic blood pressure near the threshold of 130 mm Hg, the inherent variability of blood pressure increases the potential that hypertension will be diagnosed.”

The report says 80 percent of people with newly diagnosed hypertension under the ACC/AHA guideline would get no expected benefit in terms of cardiovascular disease risk reduction by lowering their blood pressure. Eleven per cent would get a marginal benefit and nine per cent would get a larger benefit.

However, the 2017 ACC/AHA guideline would classify an additional 13.7 percent of all adults as having hypertension – 31 million additional people in the United States as having hypertension, and around 2.4 million additional Australians.

For the majority of these people, who are at low risk and not recommended for drug treatment (about 25 million), the authors say doctors should not label them as having hypertension.

“Doctors should continue to support healthy choices with regard to diet and physical activity regardless of whether a patient’s systolic blood pressure is above or below 130 mmHg,” said Bond University co-author, Professor Jenny Doust. “When there is a question of starting blood pressure medication, the risk of cardiovascular disease should be estimated using a reliable risk calculator and the potential benefits and harms discussed with the patient”.

University of Sydney
https://tinyurl.com/yb6benfj

New cardiac catheter combines light and ultrasound to measure plaques

To win the battle against heart disease, cardiologists need better ways to identify the composition of plaque most likely to rupture and cause a heart attack. Angiography allows them to examine blood vessels for constricted regions by injecting them with a contrast agent before X-ray them. But because plaque does not always result in constricted vessels, angiography can miss dangerous buildups of plaque. Intravascular ultrasound can penetrate the buildup to identify depth, but lacks the ability to identify some of the finer details about risk of plaque rupture. This new catheter probe combines intravascular ultrasound (IVUS) with fluorescence lifetime imaging (FLIm) to image the tiny arteries of a living heart.

Professor Laura Marcus’s lab in the Department of Biomedical Engineering at UC Davis has now combined intravascular ultrasound with fluorescence lifetime imaging (FLIm) in a single catheter probe that can image the tiny arteries of a living heart. The new catheter can simultaneously retrieve structural and biochemical information about arterial plaque that could more reliably predict heart attacks. An optical fibre in the catheter sends short laser pulses into surrounding tissue, which fluoresces with tiny flashes of light in return. Different kinds of tissue (collagen, proteins, lipids) emit different amounts of fluorescence.

At the same time, an ultrasound probe in
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Heart disease is the leading cause of death for both men and women, according to the Centers for Disease Control and Prevention (CDC). In the U.S., one in every four deaths is a result of heart disease, which includes a range of conditions from arrhythmias, or abnormal heart rhythms, to defects, as well as blood vessel diseases, more commonly known as cardiovascular diseases.

Predicting and monitoring cardiovascular disease is often expensive and tenuous, involving high-tech equipment and intrusive procedures. However, a new method developed by researchers at USC Viterbi School of Engineering offers a better way. By coupling a machine learning model with a patient's pulse data, they are able to measure a key risk factor for cardiovascular diseases and arterial stiffness, using just a smart phone.

Arterial stiffening, in which arteries become less elastic and more rigid, can result in increased blood and pulse pressure. In addition to being a known risk factor for cardiovascular diseases, it is also associated with diseases like diabetes and renal failure.

"If the aorta is stiff, then when it transfers the pulse energy all the way to the peripheral vasculature – to small vessels – it can cause end organ damage. So, if the kidneys are sitting at the end, the kidneys get hurt; if the brain is sitting at the end, the brain gets hurt," said Niema Pahlevan, assistant professor of aerospace and mechanical engineering and medicine. By measuring pulse wave velocity, which is the speed that the arterial pulse propagates through the circulatory system, clinicians are able to determine arterial stiffness. Current measurement methods include MRI, which is expensive and often not feasible, or tonometry, which requires two pressure measurements and an electrocardiogram to match the phases of the two pressure waves.

The novel method developed by Pahlevan, Marianne Razavi and Peyman Tavallali uses a single, uncalibrated carotid pressure wave that can be captured with a smart phone's camera. In a previous study, the team used the same technology to develop an iPhone app that can detect heart failure using the slight perturbations of your pulse beneath your skin to record a pulse wave. In the same fashion, they are able to determine arterial stiffness.

"An uncalibrated, single waveform – that means that you eliminated two steps. That's how you go from an $18,000 (€15,000) tonometry device and intrusive procedure to an iPhone app," Pahlevan said.

"It's very easy to operate," added Razavi, who is the director of biostatistics for Avcena LLC, the startup company developing the app. "I actually taught my kid to do it."

Instead of a detailed waveform required with tonometry, their method needs just the shape of a patient's pulse wave for the mathematical model, called intrinsic frequency, to calculate key variables related to the phases of the patient's heartbeat. These variables are then used in a machine learning model that determines pulse wave velocity (PWV) and, therefore, arterial stiffness.

To validate their method, they used existing tonometry data collected from the Framingham Heart Study, a long-term epidemiological cohort analysis. Using 5,012 patients, they calculated their own PWV measurements and compared them with the tonometry measurements from the study, finding an 85 percent correlation between the two. But more importantly, they needed to determine whether their method could be used to predict cardiovascular disease.

"What the clinician wants to know is whether or not you're helping them to improve outcome," Pahlevan said. "And we showed that it is as predictive as the actual tonometry."

Through a prospective study using 4,798 patients, they showed that their PWV measurement was significantly associated with the onset of cardiovascular diseases over a ten-year follow up period. Their study was published in Nature Scientific Reports in January.

"A lot of people have tried to bring machine learning to medical devices, but pure AI by itself doesn't work," Pahlevan said. "When you get a high correlation, you can be missing all of the diseased patients because, in medicine, the outliers are the cases you want to capture – they're the important ones."

The reason their machine learning method is able to capture clinically significant outcomes is due to their intrinsic frequency algorithm, which is the mathematical analysis used to calculate physically relevant variables relating to the patient's heart and vascular function. The main variables represent the heart's performance during the contraction phase (systole) and the vasculature's performance during the relaxed phase (diastole).

The method was developed just three years ago during Pahlevan's postdoctoral work. The team plans on expanding on the intrinsic frequency algorithm so that it can be applied to a number of other applications, such as detecting silent heart attacks.

USC Viterbi School of Engineering
https://tinyurl.com/y74uolb2

Heart can terminate atrial fibrillation itself after local gene therapy

The heart is capable of terminating arrhythmias itself after local gene therapy, potentially avoiding the need for patients to undergo painful electric shocks, according to a proof-of-concept study.

Atrial fibrillation is the most common heart rhythm disorder (arrhythmia). Treatment aims to restore the heart's
normal rhythm and includes drugs, which are not effective in all patients, ablation, for which efficiency remains suboptimal in the long-term, and electric shocks, which are effective but painful and require hospitalization. This leaves a large and growing group of patients without optimal treatment options.

That is why study author Dr Emile Nyns, a physician and PhD candidate in the laboratory of Daniël Pijnappels at the Leiden University Medical Centre, Leiden, the Netherlands, took a completely different approach. He said: “As the heart itself is already electrically active, we tested whether and how it could generate the electrical current needed for arrhythmia termination.”

The researchers used a technique called optogenetics, which uses light to control functioning of cells that have been genetically modified to express light-sensitive ion channels. First they genetically modified the right atrium in eight adult rats using a process called gene painting, which involves a small thoracic incision and actually painting the atrium with vectors coding for these ion channels.

The researchers waited four to six weeks for the light-sensitive ion channels to be expressed, then made a small incision in the thorax of each rat and induced atrial fibrillation. Next they shone a light on the atrium for one second. This terminated 94% of atrial fibrillation.

Dr Nyns said: “Shining light on the atrium opened the light-sensitive ion channels. This led to depolarization of the atrium, which terminated atrial fibrillation and restored the heart’s normal rhythm. We only needed a single light pulse of one second to terminate nearly all arrhythmias.”

“The heart itself generated the electrical current needed to stop the arrhythmias,” he continued. “It is completely pain free, unlike electric shocks.”

He said: “Our study provides proof-of-concept that the heart can be enabled to terminate atrial fibrillation by itself after optogenetic gene therapy.”

In future Dr Nyns envisages that the technique could be used in atrial fibrillation patients together with an implantable light-emitting diode (LED) device. “The result would be continuous, ambulatory and pain-free maintenance of the heart’s normal rhythm, something that cannot be achieved today,” he said. “The quality of life and prognosis of AF patients could be significantly increased, especially for patients with frequent episodes of drug refractory, symptomatic atrial fibrillation, despite ablation therapy.”

The researchers did not observe adverse effects from the method, but Dr Nyns said: “Further research is certainly needed before this technique can be used in patients. However, the results are promising and we believe that the time has come to develop the next generation of therapy for cardiac arrhythmias, which do not rely on pills or electronics, but on biology instead.”

ScienceDaily
https://tinyurl.com/yc40kg8

Ultrasound imaging needle to transform heart surgery

Heart tissue can be imaged in real-time during keyhole procedures using a new optical ultrasound needle developed by researchers at UCL and Queen Mary University of London (QMUL).

The revolutionary technology has been successfully used for minimally invasive heart surgery in pigs, giving an unprecedented, high-resolution view of soft tissues up to 2.5 cm in front of the instrument, inside the body.

Doctors currently rely on external ultrasound probes combined with pre-operative imaging scans to visualize soft tissue and organs during keyhole procedures as the miniature surgical instruments used do not support internal ultrasound imaging.

For the study the team of surgeons, engineers, physicists and material chemists designed and built the optical ultrasound technology to fit into existing single-use medical devices, such as a needle.

“The optical ultrasound needle is perfect for procedures where there is a small tissue target that is hard to see during keyhole surgery using current methods and missing it could have disastrous consequences,” said Dr Malcolm Finlay, study co-lead and consultant cardiologist at QMUL and Barts Heart Centre.

“We now have real-time imaging that allows us to differentiate between tissues at a remarkable depth, helping to guide the highest risk moments of these procedures. This will reduce the chances of complications occurring during routine but skilled procedures such as ablation procedures in the heart. The technology has been designed to be completely compatible with MRI and other current methods, so it could also be used during brain or fetal surgery, or with guiding epidural needles.”

The team developed the all-optical ultrasound imaging technology for use in a clinical setting over four years. They made sure it was sensitive enough to image centimetre-scale depths of tissues when moving; it fitted into the existing clinical workflow and worked inside the body.

“This is the first demonstration of all-optical ultrasound imaging in a clinically realistic environment. Using inexpensive optical fibres, we have been able to achieve high-resolution ultrasound imaging using needle tips of just 1 millimeter. We now hope to replicate this success across a number of other clinical applications where minimally invasive surgical techniques are being used,” explained study co-lead, Dr Adrien Desjardins (Wellcome EPSRC Centre for Interventional and Surgical Sciences at UCL).

The technology uses a miniature optical fibre ensased within a customized clinical needle to deliver a brief pulse of light which generates ultrasonic pulses. Reflections of these ultrasonic pulses from tissue are detected by a sensor on a second optical fibre, giving real-time ultrasound imaging to guide surgery.

One of the key innovations was the development of a black flexible material that included a mesh of carbon nanotubes enclosed within clinical grade silicon precisely applied to an optical fibre. The carbon nanotubes absorb pulsed laser light, and this absorption leads to an ultrasound wave via the photoacoustic effect.

A second innovation was the development of highly sensitive optical fibre sensors based on polymer optical microresonators for detecting the ultrasound waves. This work was undertaken in a related UCL study led by Dr James Guggenheim (UCL Medical Physics & Biomedical Engineering).

“The whole process happens extremely quickly, giving an unprecedented real-time view of soft tissue. It provides doctors with a live image with a resolution of 64 microns, which is the equivalent of only nine red blood cells, and its fantastic sensitivity allows us to readily differentiate soft tissues,” said study co-author, Dr Richard Colchester (UCL Medical Physics & Biomedical Engineering).

UCL
https://tinyurl.com/yc9lv4aw
Remote monitoring - a new frontier in the fight against cardiovascular disease

The growth in the use of modern, implantable cardiovascular devices has been accompanied by efforts to have them monitored by professionals at a distance. The principal driver for this has been convenience. However, over recent years, remote monitoring (RM) of cardiovascular devices is emerging not only as an alternative to the clinic, but in some cases as a source for enhancements to quality of care. Several professional societies have issued authoritative guidelines recommending RM for all eligible patients.

Device complexity and data transfer
Formally known as cardiovascular implantable electronic devices (CIEDs), equipment such as pacemakers, cardioverter defibrillators, loop recorders and hemodynamic monitors are technologically complex and equipped with an array of microelectronics, high computational capability and onboard firmware. In turn, this allows for assessment, storage and remote transfer of a range of data via a transmitter placed in proximity to the patient. Examples of such data include device function, diagnostics and fault codes, to therapy delivery and intracardiac hemodynamics, as well as reports on patient clinical status and alerts on cardiovascular events.

Developments in remote monitoring technology
On their part, remote monitoring techniques too have undergone their own evolution – from the original telephonic check-up of pacemaker battery levels and wand-based systems with patient-driven downloads, to current generation products which transmit data through stationary or mobile transmitters by either analogue/digital wired or wireless communication. Once transmitted, medical staff can check the information via a secure Website. Both the type and volume of transmitted data is similar to that obtained from direct interrogation.

Technically, it is important to differentiate between ‘remote interrogation’ and ‘remote monitoring’. The former involves periodic device interrogation performed manually at home by the patient or automatically at predefined points by the monitoring system. RM involves continuous device monitoring, one of whose key features is to trigger transmissions in case of alerts.

Convenience and workflow bottlenecks
Remote monitoring eliminates the need for routine, periodic visits to a clinic after CIED implantation. Most international guidelines specify that patients fitted with CIEDs should be followed up routinely, with the frequency depending on the device type and model - for instance, at Months 1 and 3 for implantable cardioverter defibrillators (ICDs). Key checks include those on battery, lead impedance, sensing amplitude, pacing threshold and arrhythmic events.

One of the most perceptible advantages of RM is of course convenience. Before it became available, patients with CIEDs had to visit clinics for periodic checks. This was a problem for several categories of patients – above all, those living in rural areas and those needing to be escorted by families due to frailty. These factors assume additional significance since the number of CIED patients has not only been increasing due to maturing technology and expanded indications, but also because an ageing society means that more people are in need of the devices. As a result, it is becoming ever-tougher to make appointments for CIED checks, and many patients who do not have RM can spend several hours waiting at a hospital for their turn.

Remote monitoring eliminates such bottlenecks and choke points. Analysis of RM data before a patient visit can shorten the time required for direct interrogation and intervention, especially should a need arise to determine the cause and management of a problem. If such a problem is only detected during a clinic visit, a patient would have to wait for the results to be verified, while the problem is detected, analysed and resolved. According to some estimates, time required by physician to review RM data is approximately 10 minutes compared to a half-hour to complete CIED follow-up visits in a clinic.

Apart from routine transmission, special real-time protocols exist in RM for alerts, such as data anomalies, inappropriate therapy or other abnormalities. In such cases, the transmitter is usually linked to a central secure server to back up or distribute the results to a larger number of experts for further analysis and opinion.

RM data essentials
Typical data reported by RM include arrhythmic events (real-time intra-cardiac electrocardiogram, to determine if the event is supra-ventricular or ventricular),
remote monitoring. This study, on 1,339 patients, confirmed that the burden of visiting a clinic was greatly reduced by using RM, and that it saved valuable time and resources. The study found that in-hospital evaluation numbers dropped by 45% without affecting morbidity. The TRUST trial also established that RM facilitated early detection of clinical events, in some cases dramatically. For example, the median period from onset to physician evaluation of combined first atrial fibrillation (AF), ventricular tachycardia (VT), and ventricular fibrillation (VF) events with RM was 1 day. By comparison, conventional care reported a median period of 35.5 days. System-related problems (such as lead out-of-range impedance) occurred over four times less frequently with the RM group, although the incidence in either setting was far too low to make meaningful comparisons.

The Finnish ICD study

Meanwhile, rigorous observational and randomized studies have demonstrated a variety of clinical benefits, along with a high degree of patient satisfaction as well as cost effectiveness. One of the first major studies on remote monitoring of ICDs was carried out in 2005-2006 at the Oulu University Hospital, Finland. The system consisted of a portable patient monitor, a secure database and website, at which clinicians could view and analyse data. The study's goal was to provide comprehensive information on the safety, ease of use, satisfaction and data acceptance by both clinicians and patients, and the cost-effectiveness of remote monitoring in a location characterized by long travel distances to the clinic. The outcomes were satisfactory. There were, first of all, no device-related adverse events. 80% of the remote-monitoring sessions were performed by the patients without any assistance. Indeed, ease of use and satisfaction by both patients and clinicians made an especially strong case. Most patients found the instructions 'clear' or 'very clear', with monitor set up 'easy' or 'very easy'. What was equally significant was the lack of any major difference in patient feedback from the first test, at 3 and 6 months, and even during unscheduled visits. On their side, clinicians too drew similar conclusions on ease of use and satisfaction, with the majority finding data comparable to traditional device interrogation. Just two of 137 physicians felt an in-office visit would have provided more detailed information on device function, as it was not possible to measure the pacing threshold remotely.

Early detection of clinical events

Since then, other studies have reconfirmed the immense promise of RM. In 2010 'Circulation' published results of a trial on automated remote monitoring of implantable cardioverter-defibrillator called TRUST (Lumos-T Safely Reduces Routine Office Device Follow-up). This study, on 1,339 patients, confirmed that the burden of visiting a clinic was greatly reduced by using RM, and that it saved valuable time and resources. The study found that in-hospital evaluation numbers dropped by 45% without affecting morbidity. The TRUST trial also established that RM facilitated early detection of clinical events, in some cases dramatically. For example, the median period from onset to physician evaluation of combined first atrial fibrillation (AF), ventricular tachycardia (VT), and ventricular fibrillation (VF) events with RM was 1 day. By comparison, conventional care reported a median period of 35.5 days. System-related problems (such as lead out-of-range impedance) occurred over four times less frequently with the RM group, although the incidence in either setting was far too low to make meaningful comparisons.

Wireless RM and cardiac hospitalization stays

The utility of wireless remote monitoring with automatic clinician alerts was the subject of another trial called CONNECT (Clinical Evaluation of Remote Notification to Reduce Time to Clinical Decision). This multicentre, prospective, randomized study of almost 2,000 patients with high-energy CIEDs lasted for 15 months. Its results were published in 'The Journal of the American College of Cardiology' in 2011, and reported a decrease in mean length of stay per cardiovascular hospitalization visit from 4 days in an in-office setting to 3.3 days with RM. The CONNECT study also found a dramatic reduction in the median time to a clinical decision in response to events, from 22 days at a clinic to 4.6 days using RM.

Other benefits of RM

RM has also established some other dramatic benefits. In 2013, 'The European Heart Journal' reported on ECOST, a randomized study on remote follow-up of ICDs. ECOST found that patients with RM had a 52% reduction in inappropriate shocks, fewer hospital admissions after such events and 76% fewer capacitor charges, leading to longer battery life.

In December 2014, a report in 'The Journal of Arrhythmia' noted that in prophylactic ICD recipients, the recommended 3-month in-office follow-up interval could be extended to 12 months with automatic daily RM, and that this reduced the ICD follow-up burden over a 27-month period after implantation. The 12-month interval resulted in more than halving the total number of in-clinic ICD follow-ups. In addition, no significant difference was found between the two groups (3-month in-clinic follow-up versus 12-month RM) in mortality, hospitalization rate, or hospitalization length over the observation period.

Mortality reduction with RM

Indeed, some experts propose that RM may reduce mortality in patients with CIEDs. One study called ALTITUDE assessed long-term outcomes after ICD and cardiac resynchronization therapy (CRT) implantation and the impact of RM on almost 70,000 ICD and CRT-plus-defibrillator (CRT-D) patients. It found that one- and 5-year survival rates were 50% higher in comparison to about 115,000 patients who received CIED follow-up in office visits.

The future: patients generally satisfied with RM

As technology continues to evolve, both new possibilities and questions are emerging. In the years to come, remote monitoring holds forth considerable promise for future research, given that massive amounts of data have already been collected from patients. In spite of some typical first-mover tech concerns, RM has proven to be easy to use and well accepted, even by the elderly people and patients with low education levels. There are some patients, however, who do not accept RM. This is mainly due to suspicions about technology and the risk of losing human contact with nurses and physicians. In such cases, patient education is critical. The other challenge involves keeping track of a flood of data and alerts from a fast-growing pool of patients. As described previously, RM detects cardiovascular events much earlier than conventional follow-up. As a result, it is becoming essential to assess whether this translates into clinical benefits for patients, or whether earlier detection of events due to RM excessively increases clinic visits; the latter might well reduce clinical benefits. On their part, patients continue to be satisfied with RM in terms of ease of use. One Italian study at San Filippo Neri Hospital in Rome has reported a more favourable change in quality of life over a 16-month period in RM patients, compared to those lacking access to RM. Benefits which have been specifically highlighted include the patients' peace of mind, psychological well-being, and safety.
Smartphones - new apps fight cardiovascular disease, drive mHealth

Smartphones are turning out to be an exciting weapon against the scourge of cardiovascular disease, which is considered by the World Health Organization (WHO) to be the most common cause of death worldwide.

Reasons for such a development are varied. Smartphones bristle with sensors like cameras and accelerometers which can be used for making, storing and transmitting diagnostic measurements. Smartphones are also small, mobile and capable of being paired with wearable devices such as wristbands, watches, skin patches etc.

Real-time and continuous measurement
The concept of always-on continuity, enabled by smartphones, makes sense in several cardiovascular health-related contexts. To date, most authoritative studies in this field are based on questionnaires, and focused on variables like diet, exercise, sleep etc. They have also relied almost wholly on participant recall.

By contrast, the sensors in mobile smartphones allow for real-time and continuous measurement of a range of factors. This can make a major difference. For instance, high blood pressure (hypertension) is known to be a leading cause of strokes and heart attacks. However, blood pressure is very difficult to measure precisely. It can vary widely over just one day, and increase if one simply dangling one’s feet off a table, or for that matter becomes stressed by the exam itself.

In this case, a wearable which monitors blood pressure through the day and night, and provides an average over time to compare with those from previous days or weeks, has clear advantages over the spot metric offered by blood pressure measurement at a physician’s clinic.

Applications in atrial fibrillation
Elsewhere, smartphone apps are now targeting the diagnosis of irregular heart rhythms, which can indicate atrial fibrillation (AF), another major cardiovascular risk. Such irregularities need not be symptomatic, but can be all the more dangerous because of that.

In 2014, the US Food and Drug Administration (FDA) approved the AliveCor Heart Monitor, which consists of a smartphone app plus a phone case fitted on its back with special sensors. Touching the sensors allows visualization of cardiac electrical activity on the phone screen.

Currently, a host of other smartphone apps alert users about potential AF without requiring any special sensor-equipped case. Though yet to be cleared by the FDA, reports suggest they might be similar in accuracy to AliveCor.

Migration from fitness to the medical
Another approach to arrhythmia has been taken by the Media Lab at the Massachusetts Institute of Technology (MIT). The latter’s Cardiio spin-off also illustrates the potential for migrating smartphone apps from fitness monitoring to the medical. In 2012, Cardiio launched an eponymous fitness app to measure heart rate based on facial light reflection, given that a beating heart pumps and increases blood volume in the vessels. On its part, blood hemoglobin absorbs light, and this decreases the amount of light reflected by the skin. Though such tiny changes in reflection are invisible to the human eye, they can be sensed by smartphone cameras and interpreted by apps.

Cardiio recently deployed its light-reflection system in another app, which detects the irregular heartbeat patterns of atrial fibrillation.

An electrocardiogram (ECG), which involves the attachment of electrodes to the chest to measure electrical impulses in a heartbeat and detect irregularities, remains the standard for AF-detection. However, as in the case of the blood pressure variations mentioned above, clinicians are aware that an ECG might not pick up an AF, should the heart rhythm irregularity be sporadic. Indeed, in some cases, irregularities are discovered only after patients suffer a stroke. One of the most common of these is known as paroxysmal AF, which causes spontaneous irregular heartbeats that are not straightforward to diagnose.

Supplementing traditions, new frontiers
In general, no one believes that smartphones will replace diagnosis by traditional medical devices. However, they have begun to supplement the latter, and are expected to continue doing so. Such a process is taking smartphones into ever-newer frontiers.

For example, engineers at the California Institute of Technology (Caltech) have demonstrated a smartphone app which measures ‘left ventricular ejection fraction’ (LVEF). LVEF is the volume of blood pumped by the heart per beat as the arteries expand and contract, and is
one of the principal measures of heart health. It is typically assessed by ultrasound, which can take hours and be performed only by technicians. The Caltech app requires patients to hold a smartphone camera against the carotid artery in their neck. This feeds directly into the heart and provides especially accurate information. The procedure, which lasts under two minutes, involves the camera measuring the expansion and contraction of the carotid artery’s walls. An algorithm in the app uses this data to calculate blood flow from the heart. According to some reports, the app provides LVEF data which is as accurate as an ultrasound.

Many industry experts foresee that next generation wearables will have ECG and pulse oximetry capabilities, with some going as far as predicting that wearables, supported by sensors embedded discretely in clothing, could be used for continuous blood glucose and blood pressure monitoring.

Part of wider mHealth drive
As smartphones begin to be seen as a strategy to fight cardiovascular disease, many manufacturers and app developers have sought to commercially capitalize on the wider mobile personal health (mHealth) movement. Indeed, it is now becoming accepted that mobile devices and apps can provide data to make meaningful and informed clinical decisions. For some cardiovascular conditions, mHealth is also seen as enhancing the ability for pre-emptive intervention by giving patients more accessible diagnostic tools and information.

Indeed, CVD prevention represents an ideal zone for propagating and popularizing mHealth. Cost efficient and scalable approaches can yield large scale insights into behaviours shaping/ adversely impacting on cardiovascular health. Such solutions, in turn, can provide the raison d’être for interventions which seek to change risky behaviour. To make this work in the long term, however, providers, payers and professional societies concerned with cardiovascular health need to closely partner with mHealth developers. So too should regulators, especially given the emergence of a growing body of evidence about the benefits of smartphone-driven mHealth – not least in areas such as cardiovascular health.

Universities join industry in research
Until now, the gap in conclusive evidence has largely been on the clinical side, and there have been calls for more research to see how viable - and valuable - such solutions really are. In January 2017, the authoritative ‘Journal of the American Medical Association’ published the results of a smartphone-centric cardiovascular study in the US, with physical activity patterns tracked and identified through cluster analysis and correlated with self-reported disease. The study found that a pattern of lower overall activity with more frequent transitions between active and inactive states was associated with the prevalence of equivalent self-reported cardiovascular disease as a function of higher overall activity with fewer transitions. The JAMA study also drew several other conclusions. The first was confirmation of the existence of a sufficiently large smartphone-using population, who could be engaged to demonstrate cardiovascular health status using smartphones. Secondly, it showed that large-scale, real-time data could be gathered from mobile devices, stored, transferred and shared securely. The authors also noted that more data than any previous collected about the standard six-minute walk test could be generated in weeks.

Industry is enthusiastically upporting these efforts. The Apple Watch app Cardiogram, for example, has presented results saying that it could diagnose atrial fibrillation with 97 percent accuracy. Cardiogram had collaborated with the University of California San Francisco as part of Heart eHealth, the largest study to date on mHealth and heart disease. Apple recently announced it would be partnering with Stanford University researchers to run a study targeted at investigating AF.

Europe launches apps aimed at patients and professionals
In Europe, the European Society of Cardiology (ESC) has funded the creation of two AF apps targeted at patients, and at healthcare professionals. The patient app provides education on AF, including sections on pathology, symptoms, prognosis, associated comorbidities, management strategies and practical self-care tips. It is also designed to present information on individual stroke risk and provide a personal health record and symptom diary. On their part, patients fill in sections about their relevant health histories, which can facilitate consultation when shared with their healthcare professionals. The professional app is designed as an interactive management tool incorporating new ESC Practice Guidelines on AF, and allows both conventional viewing of guideline text and recommendations, as well as interactive treatment algorithms. It is also aimed at improving consultation efficiency, via the provision of a patient register, pre-filled with data supplied by the patient app mentioned above.

Need for caution remains
In spite of all the buzz around smartphones and cardiovascular health, several experts have also been urging caution. Major issues include a lack of representativeness. The bulk of smartphone users, not least those willing to experiment with new apps, are young, while cardiovascular disease risks rise in older age groups. In the US, for example, only 12% of adults aged over 65 years are estimated to own a smartphone.

Some studies in Europe have found such trends to be reversing. For example, a survey by consultants Deloitte in the UK last year indicates that 71% of 55-to-75 year olds now own an app-capable handset, and this age group has seen a faster adoption rate than any other over the past five years. However, members of the demographic tended to use their smartphones less than younger people. Finally, younger users can also be fickle, with a steep drop-off in engagement over time. One survey found that only 80% of consumers continued to use their wearables regularly after three months. Such factors can produce major risks for data integrity in a study.

The limits of mass consumer technology
Another problem is technology. In spite of dramatic progress in recent years, an Apple Watch is easy to cheat. Accuracy is another drawback. One smartphone app to measure blood pressure required users to place a smartphone against their chest and a finger over the camera. However, it was discovered to have missed high blood pressure in as many as eight of 10 patients. This was also the problem with a phone case which sought to measure blood pressure at the fingertip, but studies were inconclusive about whether the case was good enough for use in a home environment. Healthcare professionals point to some more serious limitations. Devices checking heart rates infer rhythms from the pulse, and it is possible to have a normal pulse with an abnormal heart rhythm.
Reforming the Norwegian Healthcare System through the Norwegian Patient Safety Program

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ABSTRACT:
The Norwegian Patient Safety Program was launched in 2011 with the aim of reducing preventable patient harm, establishing lasting structures for patient safety and improve patient safety culture in the health and care services. Eight years later, the Program is well known in the entire health and care services in Norway. Risk areas have been targeted especially, and both hospitals and primary care work on specific measures. All Norwegian health trusts and hospitals report that they have implemented or are underway with implementation of all relevant target areas, and 300 of Norway’s 426 municipalities have implemented one or more relevant target areas in one or more of its nursing homes and home care services. About 60 percent of the healthcare professionals experience that the Patient Safety Program has contributed to high levels of patient safety in their unit.

InfoKids: a transversal and longitudinal solution enhancing patients and caregivers experience in emergency departments by disrupting the care process paradigm

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ABSTRACT:
Nowadays, citizens are little supported to decide whether they should consult in Emergency Departments (ED) in case of illness or trauma. Moreover, once in ED, they often must deal with overcrowding, long waiting times, the acute nature of the visits, administrative data management, and a lack of follow-up after the visit. This situation could be improved by delivering a more patients-centered experience.

In order to address these problems, we have developed an e-health solution connecting patients, caregivers and administrative clerks through an integrated solution comprising a web and mobile application. This innovative system is intended to support the whole emergency care process, facilitating the caregiver and administrative work and supporting patients before, during, and after their ED consultations.

In this article, we describe this solution, currently used by a tertiary hospital in a catchment area of over 1 million people, in the context of growing public expectations for user-centered care.
Improving maternal health perceptions and outcomes through multiple interventions: Using the complex adaptive systems approach

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ABSTRACT:
The Maternal Obstetric Monitoring (MOM) program was envisaged as a public-private partnership in a high priority district in the southern State of Karnataka, India. Lack of specialists, infrastructure and real-time identification and monitoring of high risk pregnancies had impacted maternal morbidity and mortality indices. The program placed emphasis on first referral unit strengthening along with high risk pregnancy identification focusing on introduction of software, diagnostics, workflow innovations and capacity building. While software solutions allowed for identification and remote viewing of patient data, simple documentation measures allowed for gains in understanding spectrum of high risk conditions in pregnancy. Among the results obtained, communitization activities led to a 40% increase in awareness of high risk pregnancy symptoms among pregnant women and increase in awareness of maternal government health schemes from 58% to 100%. Multiple linked interventions in terms of revised workflows, technology interface, engagement with frontline healthcare workers and community, communication across multiple stakeholder’s led to sustained gains in the program.

The 30/30/30 Solution: Reaching New Frontiers of Quality and Safety through an Innovative Lean Six Sigma Approach

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ABSTRACT
Health care in the United States is at a critical inflection point, with payer reforms demanding higher levels of access, outcome, and value ever before. This paper describes an innovative approach for integrating lean six sigma process improvement into health system operations that has transformed our performance and service culture. Known as “The 30/30/30 Solution”, the approach requires annually training 30% more lean six sigma experts (“belts”), completing 30% more projects, and achieving 30% or more improvement for any project undertaken. Seven years and over 400 projects later, the solution has produced “top box” performance in quality, safety, and patient satisfaction while returning over $40 million in positive financial value. Keys to successful program implementation, and next frontiers for program expansion, are discussed.

Initiating and sustaining Lean Management in healthcare: The King Hussein Cancer Center experience

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ABSTRACT
The concept of lean management was first introduced by the car manufacturing industry. From that time on, lean principles were innovatively employed and invested by different industries including the health care sectors evidenced by the rich body of literature and evidences of improvement. In this work we describe the experience of a tertiary care center specialized in oncology, King Hussein Cancer Center (KHCC) with initiating and sustaining the lean culture. KHCC management incorporated the lean principles into the center’s strategy, carrying out the necessary training and orientation to lean principles and launching a hospital wide award for distinguished lean project in a cyclic fashion. KHCC started the journey with 30 projects submitted for the first cycle of projects, building momentum in the second cycle with 60 proposed projects. Key factors for success are leadership facilitation, support, involvement of stakeholders and the competitive drive to win the distinguished lean project award.

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**Shared Governance: Transforming the Nursing Workforce through Collective Decision Making**

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**ABSTRACT**  
This article describes a shared governance program introduced to facilitate collective decision-making within the division of nursing and concludes with strategies to achieve sustainability. The migration of nursing talent in a landscape of increasing healthcare demands affects the capacity and capability of the nursing workforce. This called for an innovative model of staff engagement to inspire and motivate our staff, leading to better retention, patient and staff satisfaction. Shared Governance (SG) was introduced into nursing division at the organization to transform how decisions are made. The goal is to flatten the traditional hierarchical decision-making structure and give direct-care nurses a voice in defining their practice, standards and quality of care. Since the transformation, patient care outcomes including falls and patient satisfaction rates and staff satisfaction scores in empowerment, communication and work relationships have trended positively from year-to-year. There is also a sequential reduction in sick leave rates since implementation.

**The Eleven Year Journey of Manila Doctors Hospital in Institutionalizing Climate Change Mitigation Actions**

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**ABSTRACT:**  
Total wellness cannot be achieved without recognizing the importance of responsible environment stewardship. Tertiary hospitals are an energy intensive sector therefore it has an obligation to set an example on how to manage its energy consumption and wastes in a manner that can greatly decrease carbon footprint. Manila Doctors Hospital for the past eleven years have followed a model that not only reduces waste thereby supporting the infection prevention program and cost saving initiatives of the management of the hospital but at the same time is able to earn from its recyclables program. Proceeds from the recyclables program are utilized by the Corporate Social Responsibility Office for communities affected by climate change and in the provision of healthcare services in underserved areas.

**Achieving High Reliability Through Care Coordination for Patients Who Require Emergency Surgery**

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**ABSTRACT:**  
Ruptured abdominal aortic aneurysms (AAA) are associated with a 90% overall mortality and $150,000 cost of care. Despite major improvements in intensive care and surgical technology, morbidity and mortality remain unchanged over the past 20 years. The most significant predictor of survival is time from the door of the hospital to the operating room. To streamline operational efficiency, our team utilized lean six sigma methodologies, team training, and intentional clinical process design to institute changes in our clinical processes, enhance care coordination, and improve communication. These changes have led to a $1.8 million profit on operations, 10-day reduction in length of stay, and 89% survival rate among ruptured AAA patients.
Introducing a Multifaceted Approach to Improving Regional Diabetes Care

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ABSTRACT:
Optimal control of diabetes mellitus (DM) remains challenging globally. This is particularly pertinent in developing countries where the burden of infectious diseases like HIV and TB and non-communicable diseases like DM weigh heavily on both the fiscal and on human suffering alike. Approaches to improving diabetes control in developing countries are highly sought after. This article describes the implementation of one such approach into a resource-limited diabetes clinic in Pietermaritzburg, South Africa. Studies that have been conducted in this clinic post-implementation of this multifaceted approach to diabetes care have demonstrated improved diabetes control within this setting. This blueprint can be used in other such clinics in developing world countries.

Consorti Sanitari del Garraf (CSG) – Our way to efficiency

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ABSTRACT:
The economic crisis in our country caused a 10% decrease in incomes in CSG; our strategic objective was to increase the efficiency of the processes by rethinking the activities we carried out. The CSG envisage the Lean Management Project as an opportunity for improving patient care whilst increasing professional’s engagement. Process improvement was conducted under a PDCA philosophy and through the use of Lean tools. Under this method, each process to be improved is considered a project itself and follows the same steps: Understanding what is happening (what is the problem?) standardizing and stabilizing the process and ensuring the sustainability. The A3 is the tool guide used throughout the project. Developing people’s Lean capabilities was one of the key factors. Working on self-contained projects helped the rapid implementation of the proposed improvements ‘learning by doing’ and results such as increased 13.1% surgical interventions or 7.3% increase in activity in Diagnostic Imaging.

Also in this issue:
- Nationwide Student Health Physical Examination in Tuvalu, S-C. Wang, M-C. Tsai and C-N. Huang
- The critical care quality in patient safety can be improved by 17-year innovative continuous quality improvement program, W-C. Huang, S-R. Wann, C-P. Liu

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IT and patient safety - demands for a change in culture

Two studies on information technology and patient safety were released in the US in April 2018.

The first, by ECRI Institute and its Partnership for Health IT Patient Safety stakeholder collaborative, takes a searching look at the hidden risks of healthcare IT (information technology) systems. The second report, by Pew Charitable Trusts, focuses on electronic health records (EHRs), and is based on its long-standing view that in spite of more than 30 billion dollars (£25 billion) of federal health IT investment over the past decade, the transition from paper to electronic records has yet to reach its potential to enhance healthcare coordination and improve patient safety.

Both studies call for a much greater degree of proactivity to anticipate problems before they run out of control. Interestingly, there also seem to be several parallels in their respective analyses of the challenges.

A broad-based look at patient safety

One of the first priorities for healthcare organizations is to tie health IT into existing patient safety initiatives. The challenges that exist whenever older systems are updated or replaced, or integrated with successor technologies, can ideally become learning opportunities. However, this requires the organization to have a collaborative management culture that makes initiatives such as IT safety and other best practices part of their daily workflow.

Both the ECRI and Pew are emphatic about the need for collaboration. ECRI lays down specific recommendations on obtaining feedback from stakeholders (patients, payers, cybersecurity experts, regulators, providers and others). The Pew report also maintains that collaboratively gathering inputs from across the healthcare stakeholder spectrum is critical to improve patient care and reduce provider burden in the context of EHR use.

Tip of the iceberg

The ECRI Safe Practice Recommendations begin with an ominous warning - that the known universe of IT-related safety problems are likely to be just the tip of the proverbial iceberg. The net risk from such issues is that a variety of bugs are lurking beneath the surface, and, in the ECRI’s view, pose permanent dangers to patients. Such risks, in turn, are compounded by the sharp growth in recent years of ransomware and other cybersecurity threats which seek to exploit loopholes in codes. For ECRI, this is a key reason why both providers and vendors need to make health IT safety an integral part of their overall patient safety program.

The ‘over’-customization quandary

In general, the roots of healthcare IT problems stretch back to the 1980s and 1990s when demands for customization led to ad-hoc rewriting of legacy programs, so as to avoid loss of functionalities. So-called patches, as part of platform updates, also sought to retain some of these functionalities, many of which had been proven – or otherwise become indispensable - over the years. During this process, poor documentation of code changes was commonplace. In addition, since legacy systems faced many problems communicating with one another across their proverbial silos, layers of integrative middleware were added in sequence until they became cluttered and unmanageable.

Many such concerns are reflected by Pew. Over customization, auto-refresh mix-ups and unclear default settings with EHRs, as well as alert fatigue, can all result in patient harm.

An earlier Pew report in December 2017 had explained that safety problems could be caused by the very design of an EHR system (e.g. complex interfaces and guidance terminology) or by its customization during implementation and adaptation. Like the middleware in an IT system, Pew explains that an EHR “interface that is cluttered may cause confusion or an inability to locate key information, whereas an overly bare display may force the clinician to search for information in multiple places.”

Indeed, some of the reasons for risky over-customization of EHRs directly reflect those made during program rewrites to legacy IT systems in the 1980s and 1990s. As the Pew study observes, healthcare facilities often work with vendors to customize certain aspects of their EHR system which fit their workflow, for example by displaying data which is critical for specific clinicians at a particular facility. However, it
Some of the most frequent EHR problems include confusion of patients with the same name, problems due to the simultaneous open-numbering of a fixed dose of a particular drug, and an incorrect alerting of a fixed dose of a particular drug, while what they enter instead is multiplied by the patient’s weight, potentially contributing to overdoses. Pew notes that another problem consists of incomplete laboratory results, which can result in erroneous medical decisions since a provider lacks complete information on a particular patient. In effect, physicians may fail to realize that not all lab results are displayed on a screen, or that results may have been delayed – among other reasons, because samples might still be undergoing testing.

In its recommendation to integrate health IT safety into a broader safety program, the ECRI report also pointed explicitly to the rise in duplicate medication errors after a new EHR implementation. Contributing factors include the design of the EHR as well as the occurrence of task-related changes (such as multiple persons entering orders for the same patient at the same time). Other EHR-related problems mentioned as cases by ECRI included data entry of a pediatric patient’s weight in pounds rather than kilograms - followed by erroneous medication dose, incorrect alert responses due to the simultaneous opening of multiple patient charts, the inability to account for problems such as a pending swallow evaluation before a dietary order, and an allergy to eggs which contraindicate propofol.

Some of the frequent EHR problems concerned mix-ups of patients, in one instance due to two having the same name!

New safety approaches: collaboration and workflow integration

Beyond EHRs, as the hitherto-unknown problems in the health IT iceberg become more apparent with time, users are advised by the ECRI to collaborate in order to integrate and embed new safety practices into their daily workflow. Suggestions include the provision of inc enitives for actively working together on safety-related efforts, and to learn and share analysis of near-misses and other hazards, as well as workaround strategies.

Pew too had stressed the importance of collaboration for improved EHR use, in its December 2017 report. One way towards this is to bring stakeholders together to share data on patient safety incidents and to do this in a “nonpunitive environment.” After this, stakeholders can be encouraged to “develop solutions for common and significant usability issues.” Pew also suggests that safety tests on functionality and usability are conducted by entities throughout the entire EHR lifecycle – from development and after implementation. Such a process should bring together developers, IT professionals, clinicians, nurses and pharmacists – in essence, every one using the EHR system. Pew cautions that one specific area for attention is alert fatigue (due to too many unnecessary or false alerts). This can result in genuine life-saving warnings being missed. One concrete means to avoid such conundrums is by designing EHR systems to specifically verify and red flag certain potential problems (e.g. dangerous drug interactions with different medications).

The need for encouraging a collaborative culture to enhance healthcare IT safety has also been identified in Europe. In 2015, a team led by Solveig Kristensen at Denmark’s Aalborg University studied the association of quality management systems with teamwork and safety from seven European countries. Although they found different approaches to quality management systems and to perceptions of teamwork and safety climate, they noted the importance of organizations investing in leadership, time, capital and technical expertise to attain continuous quality improvement and enhance patient safety. Indeed, at whichever facet of the healthcare technology spectrum one looks at, proactive, meaningfully structured collaboration may be the only way to achieve a unified vision of safe health IT and a wider culture of safety in the health enterprise.

As healthcare IT becomes increasingly pervasive, such concerns are bound to demand increasing attention.

The National Patient Safety Foundation and IHI

Many of these issues – in terms of both challenge and response - were the subject of a set of eight recommendations made in 2015 in a report from the National Patient Safety Foundation (NPSF) in the US to ensure “that technology is safe and optimized to improve patient safety”. The recommendations are as follows:

1. Ensure that leaders establish and sustain a safety culture
2. Create centralized and coordinated oversight of patient safety
3. Create a common set of safety metrics that reflect meaningful outcomes
4. Increase funding for research in patient safety and implementation science
5. Address safety across the entire care continuum
6. Support the healthcare workforce
7. Partner with patients and families for the safest care
8. Ensure that technology is safe and optimized to improve patient safety

European initiatives

In 2016, the NPSF added that it was also important to make health IT-related patient safety an organizational priority by securing management commitment, and to develop an environment which was “conducive to detecting, fixing and learning from system vulnerabilities.” The NPSF was merged with the Institute for Healthcare Improvement (IHI) last year, and some of its initiatives are likely to be transferred to Europe via the IHI Health Improvement Alliance Europe (HIAE), which aims to improve work processes and create new delivery models relevant to European health systems. The HIAE has already established connections with professional societies in several countries, including Britain, Denmark and Belgium.

One good example of HIAE efforts is the The Platform for Continuous Improvement of Quality of Care and Patient Safety (PAQS), a Belgium-based initiative which aims to consolidate relationships between various stakeholders in healthcare in order to work together, in a consistent and cohesive manner. Other facets of IHI which are expected to make a mark in Europe include the so-called Open School Online Courses. Several of these are directed specifically concerned with IT-focused elements of patient safety and the need to build a culture of safety in a health organization.
New technique reduces side effects, improves delivery of chemotherapy nanodrugs

Carnegie Mellon University researchers have developed a new method for delivering chemotherapy nanodrugs that increases their bioavailability and reduces side effects. Their study shows that administering an FDA-approved nutritions source prior to chemotherapy can reduce the amount of the toxic drugs that settle in the spleen, liver and kidneys. Nanodrugs — drugs attached to tiny bio-compatible particles — show great promise in the treatment of a number of diseases, including cancer. Delivery of these drugs, however, is not very efficient — only about 0.7 percent of chemotherapy nanodrugs reach their target tumour cells. The remainder are absorbed by other cells, including those in the liver, spleen and kidneys. When the drugs build up in these organs, they cause toxicity and side-effects that negatively impact a patient’s quality of life.

Chien Ho, professor of biological sciences at Carnegie Mellon, and his colleagues have developed a novel way to improve delivery of chemotherapy nanodrugs by using Intralipid, an FDA-approved nutritions source to temporarily blunt the reticuloendothelial system — a network of cells and tissues found throughout the body, including in the blood, lymph nodes, spleen and liver, that play an important role in the immune system.

Ho and colleagues tested their technique in a rat model of cancer using three FDA-approved chemotherapy nanodrugs, Abraxane, Marqibo and Onivyde, and one experimental platinum-based anti-cancer nanodrug. In the study, they administered Intralipid one hour before giving the animal a chemotherapy nanodrug. They found their method reduced the amount of the drug found in the liver, spleen and kidneys and reduced the drugs' toxic side-effects. They also found more of the drug was available to attack tumour cells. Additionally, the Intralipid treatment had no harmful impact on tumour growth or drug efficacy.

The researchers believe their drug delivery methodology can be applied to a variety of nanodrugs without any modifications to the drugs. “This methodology could have a major impact in the delivery of nanodrugs not only for patients undergoing chemotherapy for cancer treatment but also to those being treated with nanodrugs for other conditions,” Ho said.

Continuous glucose monitors warn of low blood sugar threat

Continous glucose monitors (CGM) can protect individuals who have had type 1 diabetes for years and are at risk of experiencing dangerously low blood sugar by increasing their awareness of the symptoms, according to a study. Episodes of low blood sugar, known as hypoglycemia, are a major barrier to achieving glycemic control for people with diabetes.

The study’s publication comes as the Endocrine Society is developing a multi-year, multi-stakeholder initiative to improve understanding of hypoglycemia and reduce associated costs by implementing strategies to improve prevention and surveillance.

Severe hypoglycemia can cause seizures, loss of consciousness and death. Hypoglycemia linked to the use of insulin was responsible for an estimated $600 million (£510 million) in emergency room visits between 2007 and 2011.

“In individuals who have repeatedly experienced hypoglycemia, the body blunts awareness of symptoms warning of impending episodes,” said the study’s first author, Michael R. Rickels, M.D., M.S., of the Perelman School of Medicine at the University of Pennsylvania in Philadelphia, Pa. “Wearing a continuous glucose monitor that flags falling glucose levels and has built-in alarms raises recognition of the threat.”

Eleven individuals who had been diagnosed with type 1 diabetes for at least 10 years and had impaired awareness of hypoglycemia received CGMs to monitor their blood sugar levels during an 18-month period. The researchers found the participants became more aware of hypoglycemia events and were less likely to experience severe hypoglycemic episodes after they started using CGMs. However, the body’s defence mechanisms against developing low blood sugar remained impaired. The participants’ hemoglobin A1c levels, which track average blood glucose over time, did not change.

“While the body’s own defences against hypoglycemia did not improve, CGMs filled a valuable need in alerting individuals to oncoming episodes,” Rickels said. “In the absence of physiologic defences against the development of low blood glucose, near-constant use of continuous glucose monitoring may be required to minimize the burden of problematic hypoglycemia in patients with long-standing type 1 diabetes.”

The Endocrine Society and its 18 partners in the Hypoglycemia Quality Collaborative identified reducing and preventing the condition as a high priority. The Society's new hypoglycemia quality initiative aims to improve outcomes in individuals with type 2 diabetes. The project’s goals include decreasing the frequency and severity of hypoglycemia episodes, identifying patients who are at high risk in a timely manner, and supporting appropriate clinical interventions that can be administered in doctors’ offices and clinics, avoiding the need for hospitalization. The effort brings together stakeholders from industry, nonprofit organizations and patient groups.

Endocrine Society
https://tinyurl.com/yar64wb

Holding infants – or not – can leave traces on their genes

The amount of close and comforting contact between infants and their caregivers can affect children at the molecular level, an effect detectable four years later, according to a new research from the University of British Columbia and BC Children’s Hospital Research Institute. The study showed that children who had been more distressed as infants and had received less physical contact had a molecular profile in their cells that was underdeveloped for their age – pointing to the possibility that they were lagging biologically. Although the implications for childhood development and adult health have yet to be understood, this finding builds on similar work in rodents. This is the first study to show that in humans the simple act of touching, early in life, has deeply-rooted
and potentially lifelong consequences on the epigenome — biochemical changes that affect gene expression. “In children, we think slower epigenetic aging could reflect less favourable developmental progress,” said Michael Kobor, a Professor in the Department of Medical Genetics who leads the “Healthy Starts” theme at BC Children’s Hospital Research Institute. The study involved 94 healthy children in British Columbia. Researchers from UBC and BC Children’s Hospital asked parents of 5-week-old babies to keep a diary of their infants’ behaviour (such as sleeping, fussing, crying or feeding) as well as the duration of caregiving that involved bodily contact. When the children were about 4 ½ years old, their DNA was sampled by swabbing the inside of their cheeks. The team examined a biochemical modification called DNA methylation, in which some parts of the chromosome are tagged with small molecules made of carbon and hydrogen. These molecules act as “dimmer switches” that help to control how active each gene is, and thus affect how cells function. The extent of methylation, and where on the DNA it specifically happens, can be influenced by external conditions, especially in childhood. These epigenetic patterns also change in predictable ways as we age.

Scientists found consistent methylation differences between high-contact and low-contact children at five specific DNA sites. Two of these sites fall within genes: one plays a role in the immune system, and the other is involved in metabolism. One plays a role in the immune system, and the other is involved in metabolism. However, the downstream effects of these epigenetic changes on child development and health aren’t known yet. The children who experienced higher distress and received relatively little contact had an “epigenetic age” that was lower than would be expected, given their actual age. A discrepancy between epigenetic age and chronological age has been linked to poor health in some recent studies.

“We plan to follow up on whether the ‘biological immaturity’ we saw in these children carries broad implications for their health, especially their psychological development,” says lead author Sarah Moore, a postdoctoral fellow. “If further research confirms this initial finding, it will underscore the importance of providing physical contact, especially for distressed infants.”

**Call for Europe-wide screening of babies for heart defects**

All babies across Europe should be routinely screened for critical congenital heart defects (CCHD) within 24 hours of their birth, say a group of experts led by a University of Birmingham Professor and Honorary Consultant Neonatologist at Birmingham Women’s Hospital. The European Pulse Oximetry Screening Workgroup (EPOSW), a group of neonatologists and pediatric cardiologist, including Presidents of leading European Neonatal Scientific Societies, has published a consensus statement recommending screening with pulse oximetry for all babies across Europe. CCHD occur in around two in every 1,000 newborn babies, and are a leading cause of infant death. Timely diagnosis is crucial for the best outcome for these babies, but current screening methods may miss up to 50% of affected newborn infants, and those sent home before diagnosis frequently die or suffer major morbidity. However, babies with CCHD often have low blood oxygen levels which can be detected quickly and non-invasively by pulse oximetry screening (POS), using a simple sensor placed on newborn infants’ hand and foot. This medical device monitors the oxygen saturation of a patient’s blood through their skin, as opposed to measuring oxygen levels directly through a blood sample. EPOSW’s statement is a culmination of almost a decade’s work and calls for POS in all European countries for newborn babies after six hours of life or before discharge - preferably within 24 hours of birth. The recommendations follow the PulseOx study led by a team from University of Birmingham and Birmingham Women's Hospital in 2011 which screened over 20,000 newborn babies for critical heart defects using POS. This study, and an important meta-analysis of the test published by the same team in 2012, has led to POS being used by an increasing number of hospitals in the UK and Europe. However, to date, only a few countries such as Poland, Ireland and Switzerland have issued national guidelines recommending universal screening with pulse oximetry. Senior author Professor Andrew Ewer, of the Institute of Metabolism and Systems Research at the University of Birmingham, said: “These recommendations are the culmination of almost a decade’s work driven by one focus; to prevent as many babies as possible from dying as a result of undetected heart defects. “Surgical and catheter interventions for CCHD now lead to excellent outcomes for most cases of CCHD, but timely detection is essential.”

University of Birmingham
https://tinyurl.com/y89od57l

**Which GERD symptoms in NICU babies actually need treatment?**

In the latest of their numerous innovative studies of the symptoms and experiences of neonatal intensive care unit (NICU) babies with trouble swallowing (dysphagia), physicians and researchers at Nationwide Children’s Hospital and The Ohio State University College of Medicine have identified and refined which symptoms suggest treatment-worthy gastroesophageal reflux disease (GERD). The team believes its body of work on the topic will make future GERD diagnosis and treatment in infants more appropriate.

More than 10 percent of NICU babies are believed to have GERD. Despite several risks associated with acid-suppressive medication in NICU babies, such as nosocomial infections, enterocolitis, osteoporosis and malabsorption of nutrients, these tiny patients are often medically treated for GERD when any common symptom of the condition is present. In such young babies, these symptoms can include feeding difficulties, gagging, coughing, arching the back or acting irritable, grimacing, vomiting, sneezing, flushing, or grunting.

“NICU infants have many aerodigestive symptoms on a daily basis. There is a perceived myth that these symptoms are due to acid GERD and therefore using acid-suppressive medications will ameliorate the symptoms. This myth is not true, and can be dangerous,” says Sudarshan Jadcherla, MD, director of the Neonatal and Infant Feeding Disorders Program at Nationwide Children’s, member of the hospital’s Division of Neonatology and senior author on the publication, released earlier this year in Dysphagia. “Using acid-suppressive therapy without a definite diagnosis and symptom association probability not only diverts attention from what might be a different, undiagnosed problem, but also creates the new problem...”

University of Birmingham
https://tinyurl.com/yd8jpk5f
of dealing with dosing, treatment duration decisions, side effects and sequelae.”

Dr. Jadcherla acknowledges the practical challenges to confirming acid GERD and symptom association probability, however. “Accurate documentation of troublesome symptoms is required in a timely manner so that comparisons with the actual GER event characteristics can be made,” he says. To help overcome this clinical disconnect and determine which symptoms merit acid suppression therapy, Dr. Jadcherla and his colleagues performed 24-hour pH-impedance tests on 53 infants in the NICU at Nationwide Children’s. More than 2000 acid reflux events (AREs) were documented, allowing the team to determine whether the babies’ GERD symptoms correlated with the presence and location of acid in the esophagus.

Their findings suggest that treating apparent GERD with proton pump inhibitors may be appropriate when the baby’s acid reflux index (ARI) score is greater than 7, AREs reach the middle or proximal areas of the esophagus, and there is abnormal symptom correlation between the ARI and ARE based on pH-impedance testing. “This approach will separate false positives from true positives, thus providing opportunities to test the effect of therapies for those with the probability of acid-GERD,” Dr. Jadcherla says. “We still have to learn whether a placebo or acid-suppressive therapy can produce the same benefits, both in the short term and long term.”

Dr. Jadcherla hopes that this research and eventual randomized control trials evaluating GERD therapies using pH-impedance testing will move neonatologists closer to an actionable, objective and more specific treatment criteria for GERD management in NICU babies.

Nationwide Children’s
https://tinyurl.com/y9d83jey

**Probiotic gets boost from breast milk**

Supplementation with probiotics can improve a person’s gut health, but the benefits are often fleeting, and colonization by the probiotic’s good microbes usually doesn’t last. Breast milk may help sustain those colonies in the long run, say researchers at the University of California, Davis. In a study they report that breastfeeding babies who received a three-week course of a probiotic that consumes human milk still had colonies of those beneficial gut microbes 30 days after the end of probiotic treatment. The study is the first to show that a combination of breast milk and a probiotic organism can lead to lasting changes in the gut microbiome, says neonatologist Mark Underwood, who led the study.

“Even though we stopped giving the probiotic on day 28 of life, the particular organisms we gave stayed in their fecal community out to 60 days and even longer,” he says. “They were surviving and dominating, and that’s something we really have not seen before.”

For the study, Underwood and his colleagues recruited 66 breastfeeding mothers. In one group, 34 mothers fed their newborns a three-week course of Bifidobacterium longum subspecies infants EVCO01, a probiotic supplement. In the other group, the mothers did not administer probiotics. Analyses of fecal samples from the infants, collected during the first 60 days of life, revealed stark differences. Genetic sequencing, PCR analysis, and mass spectrometry revealed larger populations of B. infants, which improves gut health, in the infants who received supplementation than in the infants who did not. Those colonies persisted for at least 30 days after the end of supplementation, suggesting that the changes were durable, say the researchers. They hypothesize that because the benefit is linked directly to breastfeeding, once the infant stops breastfeeding the colonies will diminish.

Underwood says he and his group suspected B. infantis would pair well with the sugars in breastmilk to shape the gut microbiota. “Compared to all the bugs we’ve tested, this one is a really good consumer of milk oligosaccharides,” he says. “It’s able to use the sugar molecules in mom’s milk better than any other gut microbiota. Compared to all the bugs we tested, this one is a really good consumer of milk oligosaccharides,” he says. “It’s able to use the sugar molecules in mom’s milk better than any other gut microbiota.”

Accordingly, the study’s analysis showed that infants who received supplementation had lower levels of human milk oligosaccharides in their feces, which meant more had been consumed by B. infantis.

Studies conducted over the last decade or so have shown deep connections between disease and dysbiosis, which is an imbalance in gut microbial populations. Disruption of the microbiota, particularly early in life, may increase risk for many diseases both inside and outside the gut, including diabetes, allergies and asthma, irritable bowel syndrome, and some cancers, says Underwood. Finding ways to colonize an infant’s intestines with beneficial bacteria might lower those lifelong risks.

Further comparisons of the two groups of infants showed other benefits. Fecal samples from infants who received supplementation had lower numbers of potential pathogens and higher levels of lactate and acetate, which are beneficial products of fermentation of human milk sugars by B. infantis.

Underwood says formula could be developed to include oligosaccharides, which might extend the benefits to children who aren’t breastfed as well. “If mom can’t breastfeed for whatever reason, our hypothesis would be if you give that baby a 3-week course of this probiotic and a formula with added human milk oligosaccharides, colonization should happen and persist as long as they’re on that formula,” he says.

The American Society for Microbiology
https://tinyurl.com/y7yntxhm

**Incidence of brain injury in babies estimated for first time**

New research has estimated that each year five babies in every 1,000 born in England suffer a condition or sign linked to brain injury.

The study, conducted by researchers at the Neonatal Data Analysis Unit at Imperial College London and Chelsea and Westminster Hospital NHS Foundation Trust, analysed data on babies born between 2010 and 2015 to assess the number that may have sustained brain injury at or soon after birth.

The researchers used routinely recorded NHS data and so were able to measure the incidence rate of brain injury in newborns without any additional workload for doctors or nurses. Ultimately, this research could lead to a better understanding of how to prevent brain injury in preterm and full term babies.

Dr Chris Gale, lead author and Clinical Senior Lecturer in Neonatal Medicine at Imperial College London and Consultant Neonatologist at Chelsea and Westminster Hospital NHS Foundation Trust, said: “Brain injury at or soon after birth is a serious problem, as it can lead to long-term conditions later in life such as cerebral palsy, blindness, deafness and learning deficits. A proportion of these cases could be avoided.”
Neena Modi, Professor of Neonatal Medicine at Imperial College London and Head of the Neonatal Data Analysis Unit, said: “Before now UK health services did not have a standard definition of brain injury in babies and there has been no systematic collection of data for this purpose. Professor Modi added: “With colleagues, and in collaboration with the Department of Health, we have devised a practical way to measure the incidence rate of brain injury in babies.”

Published in the journal Archives of Disease in Childhood, the research estimated that 3,418 babies suffered conditions linked to brain injury at or soon after birth in 2015, which equates to an overall incidence rate of 5.14 per 1,000 live births. For preterm births (babies born at or less than 37 weeks) the rate was 25.88 per 1,000 live births in 2015, more than seven times greater than the rate for full term births, which was 3.47 per 1,000 live births.

It is often not known whether a baby has suffered brain injury until later in life. Therefore, the new standardized definition of brain injuries in newborn babies, developed by a group of experts convened by the Department of Health, consists of a range of conditions and signs that are known to be related to brain injury. These include seizures or fits, bleeding within the brain, stroke just before or at birth, infections like meningitis, and damage caused by oxygen deprivation.

The research, commissioned by the Department of Health, is the first to present estimates for the number of babies with brain injuries based on a definition that includes multiple conditions in one measure.

It is also the first time this estimate has been made using data gathered routinely during day-to-day clinical care on neonatal units. The use of routine data required no additional work for clinical staff and provides a valuable way to measure the effectiveness of interventions to reduce brain injury.

As part of a drive to make England a safer place to give birth, the Department of Health has set a target of reducing the number of babies that incur brain injury during or soon after birth by 20% by 2020 and to halve them by 2030. Using these new estimates this equates to lowering the incidence of babies with brain injury to four per 1,000 live births by 2020 and to 2.5 babies per 1,000 live births by 2030.

Overall, the research found that the most common type of condition that contributed to brain injuries was damage caused by lack of oxygen to the brain, called hypoxic ischemic encephalopathy; this is seen mainly in full term babies. For preterm babies, the largest contributor to brain injuries is from bleeding into and around the ventricles of the brain, a condition called periventricular hemorrhage.

Dr Gale added: “Being able to measure how common brain injuries are allows health professionals and researchers to focus on reducing these devastating conditions. This includes the consistent use of treatments that reduce the risk of brain injuries in preterm infants, such as steroids and magnesium sulphate given to the mother before birth.

“This measure will also help us to evaluate other interventions, for example, making sure that as many preterm babies as possible are born at hospitals with advanced neonatal services on site, which we know reduces the risk of brain injury.

“The next step is to use routine data to understand the long-term effects of these conditions on the children and their families.”

**Imperial College London**
https://tinyurl.com/ycnbqzlo

**Analysis shows lack of evidence that wearable biosensors improve patient outcomes**

Wearable biosensors have grown increasingly popular as many people use them in wristbands or watches to count steps or track sleep. But there is not enough proof that these devices are improving patient outcomes such as weight or blood pressure, according to a study by Cedars-Sinai investigators.

As of now, we don’t have enough evidence that they consistently change clinical outcomes in a meaningful way,” said senior author Brennan Spiegel, MD, director of Cedars-Sinai Health Services Research. “But that doesn’t mean they can’t.”

Wearable biosensors—non-invasive devices that automatically transmit data to a web portal or mobile app for patient self-monitoring or health provider assessment—have been touted as a means to reduce healthcare utilization, decrease costs, generate research data and increase physician satisfaction.

In their literature analysis, Spiegel and his co-authors found that remote patient monitoring with these sensors had no statistically significant impact on any of six clinical outcomes studied: body mass index, weight, waist circumference, body fat percentage, systolic blood pressure and diastolic blood pressure. The analysis found that these devices did show early promise in improving outcomes for certain conditions, including obstructive pulmonary disease, Parkinson’s disease, hypertension and low back pain.

“There is a big difference between using these sensors to track sleep for self-betterment and using them to make medical decisions,” said co-author Michelle S. Keller, MPH, a clinical research specialist at the Cedars-Sinai Center for Outcomes Research and Education.

Investigators did a statistical analysis and in-depth literature review of 27 studies from 13 countries published between January 2000 and October 2016. Each study examined the effects of remote patient monitoring using wearable biosensors. The interventions targeted patients who were overweight or had heart disease, lung disease, chronic pain, stroke or Parkinson’s. The devices studied included physical activity trackers, blood pressure monitors, electrocardiograms, electronic weight scales, accelerometers (devices measuring acceleration) and pulse oximeters (oxygen saturation monitors), among others. These devices were embedded in everything from watches and belts to skin patches and textiles.

A statistical analysis of the relevant literature revealed that remote patient monitoring resulted in no significant impact on any of the reported clinical outcomes. Certain types of interventions worked best, including efforts grounded in social science models and established care guidelines and those that used personalized coaching.

Lack of data may be the culprit. Of more than 4,000 studies the authors initially reviewed, fewer than 1 percent were eligible to be included in the study, and only 16 were considered high-quality research. The authors found very few randomized controlled trials for each of the clinical outcomes analysed, and studies varied significantly in terms of the types of devices used, the populations studied and the interventions tested.

"Many of the studies we reviewed were still in the pilot phase," said lead author Benjamin Noah, a clinical research associate at the Center for Outcomes Research and Education. “There just is not enough data yet.

**Cedars – Sinai Hospital**
https://tinyurl.com/yaw3kupv
A new portable gel that could save an injured eye

When a soldier sustains a traumatic eye injury on the battlefield, any delay in treatment may lead to permanent vision loss. With medical facilities potentially far away and no existing tools to prevent deterioration, medics are in a high-stakes race against the clock.

A multidisciplinary team of scientists and engineers at USC are close to solving the problem. They have developed a reversible, temperature-sensitive temporary seal that changes from a fluid to a super-strong semi-solid when applied to the eye. When the patient is ready for surgery to permanently close the injury, doctors can remove the seal by adding cool water.

“If you look at historical data over the last several decades, the rate of war-related ocular injuries has steadily increased from a fraction of a percent to as high as 10 to 15 percent. Some of that can be attributed to changes in warfare, especially with the use of improvised explosive devices,” said corresponding author John Whalen, assistant professor of research ophthalmology at the USC Roski Eye Institute and member of the USC Institute for Biomedical Therapeutics. “When the Department of Defense asked the scientific community to develop novel approaches to treating ocular injuries, we immediately thought of an advanced material we had previously worked with as a possible adhesive for a retinal implant.”

The material the group was working with for retinal implants was a hydrogel called PNIPAM, poly(N-isopropylacrylamide), which had a unique attribute that made it a natural fit for this application: when cooled, the hydrogel became a liquid for easy application, and when heated, it became a viscous semi-solid with strong adhesion. All that was needed was some tailoring.

“Since the initial hydrogel’s transition temperature was very close to the temperature of the human eye, we had to modify its properties to ensure that it would form a solid seal as soon as the gel was applied to the eye by a soldier or medic,” said lead author Niki Bayat, a doctoral candidate in the Mork Family Department of Chemical Engineering and Materials Science at USC Viterbi. “Providing a perfect, yet reversible seal, the smart hydrogel shows promise for the next generation of tissue adhesives.”

When an ophthalmologist is ready to repair the eye, the hydrogel can be extracted by applying cool water and converting it back to a less adhesive state.

The research team also developed a special syringe for the hydrogel that would be easy to use on the front lines and capable of quickly cooling the hydrogel before application. The syringe has a cooling chamber filled with calcium ammonium nitrate crystals — the type used in instant ice cold packs. By adding water to the chamber, the crystals activate and cool the hydrogel to operating temperatures within 30 seconds.

“We were able to optimize the delivery device so that it not only rapidly cools the hydrogel but also holds it at that temperature, giving users a 10-minute window to fill penetrations in the eye,” Whalen said. “It’s very simple to use — almost like caulking a bathroom seal.”

The customized seal and delivery device will also reduce the amount of time it takes to close penetrating eye injuries overall. “This temporary intervention could decrease repair time from 30 minutes or longer to less than five minutes, freeing up valuable time for first responders and trauma units,” said principal investigator Mark Humayun, University Professor of Ophthalmology and co-director of the USC Roski Eye Institute, director of the USC Institute for Biomedical Therapeutics and a professor of biomedical engineering at USC Viterbi.

University of Southern California
https://tinyurl.com/y9oqfbe4

Brachytherapy for cervical cancer: a net loss for hospitals, study finds

The evidence is clear: Cervical cancer is best treated with brachytherapy, a form of radiation therapy. Yet the use of this potentially lifesaving treatment has been declining, and a new study from the University of Virginia School of Medicine may explain why.

UVA researchers have determined that offering brachytherapy for locally advanced cervical cancer ends up costing hospitals money. After accounting for the costs and time involved, the researchers found that Medicare reimburses four times more per minute required for a less effective alternative than it does for brachytherapy. Ultimately, providing brachytherapy results in a net loss for the providing healthcare facility, the researchers determined. This can leave hospitals particularly smaller hospitals that don’t do a lot of brachytherapy in the lurch.

“Studies have time and time again shown that brachytherapy is the most important part of cervical cancer treatment, because it is essential to eradicating the tumour,” said Timothy Showalter, MD, a radiation oncologist at UVA Cancer Center. “A decline in brachytherapy utilization is associated with a higher rate of mortality in cervical cancer, so there’s a direct relationship.”

The problem stems partly from the amount of physician time brachytherapy requires: It takes 80+ percent more personnel time to administer brachytherapy than it does to deliver the increasingly popular alternative, external beam radiation. Both methods deliver radiation to the tumour, but brachytherapy delivers much greater doses in a much more targeted manner. Another key difference, the researchers found: Medicare reimbursement makes external beam radiation profitable, while brachytherapy is not.

Overall, the researchers determined that it costs hospitals more than twice as much to provide brachytherapy as it does to provide external-beam radiation. But the reimbursement doesn’t reflect that.

“Brachytherapy requires a lot of physician effort and expertise and reimburses poorly for that effort,” Showalter said. “I can certainly imagine how the comparatively poor reimbursement rates compared to external beam radiation could contribute in some environments to not establishing a service for brachytherapy or just not committing physician time to it.”

He noted that healthcare providers face a cold, hard truth when deciding whether to offer brachytherapy, or any other treatment: “If practices don’t run at least a profit greater than zero,” he said, “then they fold.”

The researchers concluded that hospitals that see a high volume of patients, such as UVA, are best equipped to provide brachytherapy - and to absorb the major resource commitment that comes with it. “My job specifically involves brachytherapy,” Showalter said. “We’re at this big hospital with all the equipment we need at the ready and a wonderful streamlined process that enhances the patient experience and reduces patients’ time on the table. That makes it easier to provide efficient and effective care.”

EurekAlert
https://tinyurl.com/y9oqfbe4
Video game improves doctors’ recognition and triage of severe trauma patients

Playing an adventure video game featuring a fictitious, young emergency physician treating severe trauma patients was better than text-based learning at priming real doctors to quickly recognize the patients who needed higher levels of care, according to a new trial led by the University of Pittsburgh School of Medicine.

The results held even though doctors assigned to the game enjoyed it less than those assigned to traditional, text-based education. This indicates that if game enjoyment can be improved, the already favourable results might be enhanced.

"Physicians must make decisions quickly and with incomplete information. Each year, 30,000 preventable deaths occur after injury, in part because patients with severe injuries who initially present to non-trauma centres are not promptly transferred to a hospital that can provide appropriate care," said lead author Deepika Mohan, M.D., M.P.H., assistant professor in Pitt’s departments of Critical Care Medicine and Surgery. “An hour of playing the video game recalibrated physicians' brains to such a degree that, six months later, they were still outperforming their peers in recognizing severe trauma.”

Mohan created the game Night Shift with Schell Games, a Pittsburgh-based educational and entertainment game development company. The game is designed to tap into the part of the brain that uses pattern recognition and previous experience to make snap decisions using subconscious mental shortcuts – a process called heuristics.

Physicians in non-trauma centres typically see only about one severe trauma per 1,000 patients. As a result, their heuristic abilities can become skewed toward obvious injuries such as gunshot wounds, and miss equally severe traumas such as internal injuries from falls. On average, 70 percent of severely injured patients who present to non-trauma centres are under-triage and not transferred to trauma centres as recommended by clinical practice.

Both the game and the text-based learning are intended to help physicians improve their decision making regarding severe traumas. The game, however, sought to do this through narrative engagement, or the use of stories to promote behaviour change, which has shown promise in recalibrating heuristics.

Mohan’s team recruited 368 emergency medicine physicians from across the country who did not work at hospitals with trauma specialization. Half were assigned to play the game and half were asked to spend at least an hour reading the educational materials.

Participants then responded to questionnaires and completed a simulation that tested how often they “under-triaged,” or failed to send severe trauma patients to hospitals with the resources necessary to handle them. Physicians who played the game under-triage 53 percent of the time, compared with 64 percent for those who read the educational materials.

Six months later, Mohan reassessed the physicians and found that the effect of the game persisted, with those who played the game under-triage 57 percent of the time, compared to 74 percent for those who had read the educational materials.

UPMC https://tinyurl.com/y9rlhcu3

Electronic triage tool improves patient care in emergency departments

When a patient arrives in any emergency department, one of the first steps in their care process is triage, an opportunity for a care team member to identify critically ill patients and assign priority treatment levels.

“With increases in annual visits to U.S. emergency departments, declines in capacity have led to unprecedented levels of crowding and consequential delays in care,” says Scott Levin, Ph.D., associate professor of emergency medicine at the Johns Hopkins University School of Medicine. “So what emergency departments have to do is very quickly assess whether a patient is in need of real critical, time-sensitive treatment versus a patient who is safe to wait.”

Across the country, nurses and physicians typically use the emergency severity index (ESI) during triage to assign a score from Level 1 for patients who are the most critically sick, to Level 5 for patients who are the least sick. A patient’s ESI level determines in which area of the emergency department that patient will be seen, places the patient in a queue and influences provider decision-making throughout the patient’s care process. “This algorithm is completely subjective,” Levin says. “Nurses and physicians make a quick assessment on whether the patient can wait solely based on their clinical judgment.”

In most cases, researchers say patients are assigned to a Level 3 and not entirely differentiated. “We thought that Level 3 patient group included a large mix of patients who are pretty sick and others who weren’t, and our goal was to determine whether these patients could be sorted out,” Levin says.

To help differentiate patient triage levels, Levin and a team in the Department of Emergency Medicine developed an electronic triage tool. In a recently published paper the e-triage tool showed equal or improved identification of patient outcomes compared to ESI based on a multi-site retrospective study of nearly 173,000 emergency department visits. The study showed significant differences in patient priority levels using e-triage and ESI. For example, out of the more than 65 percent of visits triaged to ESI Level 3, e-triage identified about 10 percent, or more than 14,000, ESI Level 3 patients who may have benefited from being up-triage to a more critical priority level, such as Level 1 or 2. These patients were at least five times more likely to experience a critical outcome, such as death, admission to the ICU or emergency surgery, and two times more likely to be admitted to the hospital.

The e-triage tool was also able to increase the number of patients down-triage to a lower priority level, such as Level 4 or 5, to help minimize low-acuity patients from waiting and overusing scarce resources.

The e-triage tool uses an algorithm to predict patient outcomes based on a systems engineering approach and advanced machine learning methods to identify relationships between predictive data and patient outcomes. “When a patient comes in, and we collect the patient’s information, the e-triage tool is comparing that mix of patients who are pretty sick and others who aren’t, and our goal was to determine whether these patients could be sorted out,” Levin says.

These methods are common in other industries, such as defence, transportation and finance, but rarely, if ever, are implemented in healthcare.
“Machine-based learning takes full advantage of electronic health records and allows a precision of outcomes not previously realizable,” says Gabor Kelen, M.D., director of the Department of Emergency Medicine and professor of emergency medicine at the Johns Hopkins University School of Medicine. “It is the wave of future healthcare, although some providers may be hesitant. Decision aids that take advantage of machine-learning are also highly customizable to meet the needs of an emergency department’s patient population and local healthcare delivery systems.”

The e- triage tool is also designed to be a decision support tool to help clinicians make better care decisions about their patients. “The theory behind this tool, and all clinical decision support tools, is that the tool paired with the clinician can make better predictions or better prognostics tasks like this than the tool alone or the clinician alone,” Levin says. Better differentiating patients’ priority levels, can, in turn, help patients get the appropriate care they need. “The ultimate objective is patients should be waiting less in the emergency department,” Levin says. “For patients at risk of having a critical care need, this technology is designed to detect them better and make sure they are seen quicker. For patients who are less sick, e- triage should detect those patients and put them on an expedited track, so they don’t need to wait as long.”

John Hopkins Medicine
https://tinyurl.com/y7whserq

ICU patients who survive respiratory condition may suffer from prolonged post-intensive care syndrome

Patients who survive acute respiratory distress syndrome (ARDS) often leave a hospital intensive care unit with debilitating mental, physical, or cognitive problems that may limit their quality of life.

Now, a new study of 645 ARDS survivors by researchers at Intermountain Medical Center, Johns Hopkins University, and the University of Utah, has identified subgroups of ARDS survivors who suffer what’s been called post-intensive care syndrome, a collection of symptoms that can linger for years.

ARDS is a potentially life-threatening injury to the lungs that occurs most often in an intensive care unit among critically-ill patients with pneumonia or other infections, although it can have other causes.

For many ARDS patients, the primary symptom is shortness of breath so severe they require lung life-support therapies in order to breathe. ARDS can kill, and older patients are especially vulnerable. Many ARDS survivors leave the hospital with an array of challenges that form post-intensive care syndrome. The survivors may live with long-term effects, including permanent lung damage and different degrees of physical, cognitive, and mental health problems.

During the last quarter-century, the symptoms of post-intensive care syndrome have been increasingly recognized and understood. Critical care specialists say between half and two-thirds of ARDS survivors struggle with it after they’re released from the hospital.

To that end, researchers at Intermountain Medical Center and Johns Hopkins University have been seeking common threads among survivors, focusing on combinations of impairments, including physical health, mental health, and brain function. The study builds on previous research by the team.

Researchers say the threads within survivor subgroups may help them better identify factors that increase risk, and could potentially lead to tailored treatments to bolster patients’ recovery.

In the study of ARDS survivors six months out of intensive care, the researchers found four different patient subgroups:
- those with mildly impaired physical and mental health (22% of patients)
- those with moderately impaired physical and mental health (39%)
- those with severely impaired physical health and moderately impaired mental health (15%)
- those with severe physical and mental health impairments (24%).

According to the research, physical and psychological injuries tend to go hand in hand. Cognitive impairment is independent of those two, however.

The study found people who have worse physical problems have worse symptoms of anxiety, depression, or post-traumatic stress disorder. The one exception was a small but distinct group (15% of all survivors) who had severe physical limitations, but only moderately severe mental health problems.

Researchers speculate that could mean those individuals already had some chronic physical challenges before developing ARDS and were more accustomed to living with physical limitations.

“It’s also possible that group might have more resilience, so they’re better able to respond to the new physical disability, which is consistent with other recent studies suggesting that improving resilience may help ARDS survivors,” Dr. Brown said.

The study noted that six months after leaving intensive care, about half of the subjects in the study still weren’t living independently, even though 91 percent of them had done so prior to contracting ARDS. Instead, they lived in nursing homes or with relatives.

Intermountain Healthcare
https://tinyurl.com/yctcfnl8s

PIVC insertion in the ED can be reduced using multimodal approach

Peripheral intravenous cannula (PIVC) insertion in the emergency department can be reduced using a multimodal approach designed to support critical thinking and promote clinically appropriate peripheral intravenous cannula insertion and use.

The lead author of the study is Tracey Hawkins, Grad Cert (ENurse), in the Department of Emergency Medicine, Royal Brisbane and Women’s Hospital, Brisbane, Queensland, Australia.

The study, by Hawkins, et al, showed that multimodal intervention not only reduced PIVC placement in the ED, it also increased the percentage of PIVCs placed that were used. These findings suggest that this program benefits patients and health services alike, with potential for large cost savings. Ali Tann, BSN, RN, CEN a registered nurse in the emergency department at IU Health Methodist Hospital, Indianapolis, commented:

“Many PIVs are placed because we know that labs will be ordered, but may not be sure about fluids and/or meds and don’t want to stick the patient too many times. Simply stated, the more sticks the unhappier the patient. But ultimately, in order for PIV campaigns to be successful, there needs to be more consensus among the providers. In other words, if the gut works, use it!”

Medical News
https://tinyurl.com/y72ktac7
Siemens Healthineers and ScreenPoint Medical sign agreement to jointly develop AI-based applications in breast imaging

Siemens Healthineers and ScreenPoint Medical have agreed to partner to develop artificial intelligence-based applications for breast imaging. This collaborative arrangement also includes the acquisition of a strategic minority stake in ScreenPoint Medical by Siemens Healthineers.

The partnership intends to leverage the superior expertise of Siemens Healthineers in breast imaging as well as that of ScreenPoint Medical in mammography decision support to develop innovative clinical applications for breast cancer screening and diagnosis. Professor Nico Karssemeijer, CEO of ScreenPoint Medical, explains, "together with Siemens Healthineers, we can bring our expertise in AI into the entire screening and diagnostic pathway, starting from risk stratification to image acquisition and diagnosis."

"The aim of our collaboration with ScreenPoint Medical is to expand precision medicine by providing automated clinical decision support that makes it easier and faster to distinguish between healthy and tumour tissue, thus increasing diagnostic accuracy," adds Dr. Pete Schardt, head of X-ray Products at Siemens Healthineers. "Working with strong partners such as ScreenPoint will help us drive personalized breast care pathways with new applications based on deep learning and artificial intelligence."

Both companies pool their individual strengths in their strategic partnership. ScreenPoint Medical’s current, highly innovative mammography reading software, Transpara, is available for a variety of mammography systems. It enables clinical decision support and computer-aided detection for higher reading accuracy. It has been proven to help radiologists better detect breast cancer with mammography and reduce variations between different users – both aspects integral in expanding precision medicine. Transpara is cleared for clinical use for CE-countries with the digital mammography and reading portfolio of Siemens Healthineers. In the coming months, ScreenPoint plans to attain regulatory approvals for the Transpara solution in further clinical applications and countries.

Siemens Healthineers has a long-standing history of innovations in breast imaging and a comprehensive portfolio of systems across ultrasound, mammography and MRI as well as the accompanying reading solutions. The latest addition in mammography, Mammomat Revelation, offers the highest depth resolution on the market with a unique 50-degree wide angle for tomosynthesis. Automated and precise breast density measurements allow for instant risk stratification. On the reading side, Syngo.BreastCare offers advanced visualization for 2D and 3D mammography with automatic workflows and Artificial Intelligence (AI)-based tomosynthesis reading.

Nova Biomedical opens new subsidiary in Switzerland

Nova Biomedical is pleased to announce the opening of a new sales and after-sales support subsidiary in Switzerland. The new facility demonstrates Nova’s commitment to the Swiss market and to supporting the strong growth of Nova’s biotechnology and in vitro diagnostic testing platforms.

Located close to Zurich in the canton of Zug, Nova’s new subsidiary is designed to fully support current business and to allow for anticipated future growth. The new subsidiary provides full sales and service support and inventory warehousing.

With the new subsidiary, Nova brings the most advanced technology analytical platform for use in cell culture facilities: FLEX2. FLEX2 offers automated, online sampling for up to 16 cell culture analyses including chemistries, dissolved gases, cell density/viability, and osmolality. The system uses a maintenance-free sensor card, requires only 265 µL of sample, and performs all 16 analyses in 4.5 minutes.

Nova’s line of Stat Profile Prime whole blood analysers are designed for use in both hospital and point-of-care (POC) settings in...
Switzerland. Prime hospital analysers include the Critical Care System (CCS), Electrolyte System (ES), and Prime Plus, which all feature Prime’s innovative, maintenance-free cartridge and reagent technology that saves time, space, and costs.

Prime CCS offers a comprehensive testing menu of pH, PCO2, PO2, Hct, Na, K, Cl, iCa, Glu, and Lac. Prime Plus combines blood gas, electrolyte, and metabolite testing with co-oximetry for an extensive, 22-test menu that’s ready in about one minute.

The newly launched Allegro system is a fast, simple, capillary blood analyser designed for use in primary care settings such as physician offices. Allegro offers a test panel including HbA1c, lipids, glucose, and creatinine, together with urine albumin and creatinine.

The StatStrip and StatSensor line of handheld, POC meter and test strip analysers provide rapid glucose/ketone, lactate, and creatinine results at the bedside to support clinical decision making.

“We at Nova Biomedical are very excited to welcome our new Switzerland subsidiary to our international team and for the opportunity to continue to bring Nova’s biotechnology and in vitro diagnostic testing technologies to this important European market,” said Andy O’Toole, VP European Operations at Nova Biomedical.

www.novabiomedical.com

Carestream DRX-Revolution Nano Mobile X-ray System designed by Micro-X Ltd wins 2018 Good Design Award

The Carestream DRX-Revolution Nano Mobile X-ray System, designed by Micro-X Ltd, received the Good Design Award* Best in Class in Product Design which is one of the highest honors for design innovation in Australia.

The annual Good Design Awards are based on market success, excellence in architectural design, digital and communication design, business model innovation, social impact and design entrepreneurship. Dating back to 1958, the annual Good Design Awards are Australia’s most prestigious awards for design and innovation.

Rob Williams, X-ray Systems Business Manager for Australia and New Zealand, received the award on behalf of Carestream at the Sydney Opera House at the 60th annual Good Design Awards ceremony along with key MicroX staff.

The DRX-Revolution Nano Mobile X-ray System utilizes Carbon Nano Tube technology to deliver significantly reduced size and weight when compared to existing mobile X-ray systems. The ultra lightweight design allows for easier positioning in cramped critical care areas such as the ICU and NICU. The Good Design Awards Jury commented that “The design and engineering team has tackled a healthcare problem with an innovative and ground-breaking solution - rather than bringing a patient to the equipment, the equipment is brought to the patient. Simple idea but extremely difficult to execute. The end result is a revolutionary product where the benefits are huge: smaller footprint, lighter weight and greater manoeuvrability that saves space in hospitals, aids in patient comfort and provides greater flexibility around mobile and field hospital solutions. Every element and touch point has been meticulously designed and detailed. The articulated arm is well balanced over the range of motions required and the large aperture for taking the X-ray images is easy to move around and lock in place. This is a brilliant design solution with a very high standard of manufacturing and carefully considered raw materials selection. Good design and innovation at its best.”

www.carestreamhealth.com

The change of Esaote’s ownership has been completed

Esaote SpA, active in the biomedical equipment sector - in particular the areas of ultrasound, dedicated MRI and software for managing the diagnostic process – has announced the completion of the acquisition of its share capital by a consortium of leading Chinese investors. The Consortium is composed of major companies in the medical and healthcare technology sectors as well as investment funds with significant experience in this field.

As a result of this change in ownership, Esaote will be in a stronger position and have the opportunity to accelerate its development plans, and in particular its growth projects in China. In addition to its current worldwide presence, Esaote is to benefit from the widespread distribution networks of the new shareholders, relying on the full complementarity of its products with those of the Consortium. Significant synergies will also derive from the distribution of the Consortium’s main products in the international markets in which Esaote operates.

The Consortium is composed of Yufeng Capital (a leading private equity fund co-founded by Mr. Jack MA and Mr. David YU), Wandong (China’s largest medical equipment manufacturer), Shanghai FTZ Fund (China’s first Free Trade Zone fund), Tianyi (an investment group focused on the healthcare sector), Yuyue (the holding company of the largest homecare medical equipment manufacturer in China) and Kangda (a leading OEM manufacturer and distributor of medical imaging equipment).

Under the agreement Esaote will continue to operate as an independent international company, with its headquarter in Italy (Genoa) and R&D and production centres in Italy (Genova and Florence) and the Netherlands (Maastricht).

www.esaote.com

POC ultrasound an integral part of emergency care at St Mary’s

St Mary’s Hospital is one of London’s four major trauma centres and uses point-of-care ultrasound extensively in the assessment of patients visiting its extremely busy A&E department. Dr Ehsan Hassan, a consultant in emergency medicine with a special interest in ultrasound, explained: “Our normal practice with trauma patients is to perform a FAST scan during the primary survey. This can make a significant difference to the care of unstable patients – for example, stab wounds to the heart – giving you a diagnosis straight away. This approach has enabled some patients to be fast-tracked into theatre.” The department’s Sonosite X-Porte ultrasound system is based in resuscitation, although its portability means it can be easily moved to other areas of A&E as required. Dr Hassan continued: “The Royal College of Emergency Medicine requires that all A&E consultants are trained to perform FAST (Focused Assessment with Sonography in Trauma), aortic scans, IV access and basic echo. However, once you are familiar with the techniques, it has a role in assessing so many different conditions – shock patients, abdominal pain, query ectopic pregnancies, pneumothoraces or hemothoraces, and numerous musculoskeletal complaints – as well as for draining pleural effusions and placing central or difficult-to-access IV lines. It is a very versatile technique.”

www.sonosite.com
MEDICAL FAIR ASIA 2018: Future-ready products and industry-leading conferences & forums

MEDICAL FAIR ASIA 2018, is set to continue its growth path with its 12th edition. An expected 1,000 exhibitors from 50 countries and 20 national pavilions will grace the exhibition to be held in Singapore from 29th to 31st August. Visitors will get to source from a comprehensive range of more than 5,000 products ranging from digital health technology, electromedical equipment, rehabilitation supplies to consumables.

There will be a total of 20 National Pavilions and Country Groups, this edition will see debut group participations from Belgium, Brazil, the Netherlands, Iran, Denmark, European Union Business Avenue, Russia, Spain and Qatar, adding to the internationality of the exhibition.

Inaugural Community Care Pavilion
On the show floor, visitors can also expect to see products relating to the current healthcare trends and needs of the Asian region. The debuting Community Care Pavilion, with its keen focus on geriatrics and digital health technology seeks to address the healthcare needs of both the ageing population and the region’s remote population by bringing healthcare beyond traditional healthcare institutions and into the community. Exhibitors have already arranged for product launches to take place during the 3-day period. France Bed Co Ltd will be showcasing their unique powered turning bed. It features an automatic turning support function that prevents users from bed sores. Xiaoniu Health Co Ltd will be unveiling their intelligent sleep machine that can perform both CPAP and AutoCPAP to sleep apnea patients.

Another first on the show floor is the inaugural Start-Up Park. Providing a platform for young and exciting start-ups, the exhibits will feature products that could transform the market in the near future including the latest innovations in big data, and IoT. Australian start-up Rapid Response Revival Research will unveil a prototype of their phone case defibrillator, CellAED, the world’s smallest, lightest and first truly mobile AED (Automatic External Defibrillator) for the very first time.

Conferences and forums
Back by popular demand, the exhibition will play host to the second edition of the MEDICINE + SPORTS Conference. This benchmark event for sports medicine will discuss topics ranging from digital innovations in sports and healthcare, exercise medicine to tailored exercise programmes for patients and athletes. A stellar lineup of speakers including experts Dr. Paul Gastin, Director for the Centre for Sport Research at Deakin University, Mr. Christian Stammel, CEO of WT | Wearable Technologies and Prof. James S. Skinner, Professor Emeritus in the Department of Kinesiology, Indiana University, have been confirmed.

With Start-Ups and SMEs deepening their presence in global business, the exhibition will also host the Medtech SME Workshop. Organized by the first and only regional medical technology association, Asia Pacific Medical Technology Association (APACMed), the workshop will provide small businesses with concise knowledge on clinical trials, product validation, patent laws and many others. Through this workshop, Medtech start-ups and SMEs can learn to navigate processes to develop cost-effective solutions to meet the region’s healthcare needs.

In line with the highlight on Community Care, the exhibition will also feature the first-ever Paradigm Shifts in Healthcare seminar from 30th to 31st August. Leading speakers will discuss the evolution of the healthcare industry while attendees learn how to overcome future challenges as healthcare goes beyond hospitals to the community.

Supported by the Robotic Surgery Society of Singapore, the Medical Innovation & Technology Forum will focus on robotic surgery and discuss how patients evolve from passive healthcare recipients to active value-seekers, encouraging healthcare providers to tap into the latest technological advances to provide more efficient treatment options.

www.medicalfair-thailand.com
**FRONT COVER PRODUCT**

**Premium 1.5T MRI system**

Canon Medical Systems Corporation enters the premium 1.5T MRI market with the launch of its new Vantage Orian system. Vantage Orian is one of Canon Medical Systems’ first major product releases since officially changing their company name from Toshiba Medical on January 4, 2018, and represents a major foray into the premium wide bore 1.5T market along with new technology designed to boost productivity, enhance patient comfort and deliver diagnostic clinical confidence to users and patients alike. With a new slim gradient that delivers a gradient performance with a maximum amplitude of 45 mT/m, combined with a slew rate of 200 T/m/s that enhances high resolution and diffusion imaging, Vantage Orian offers high performance imaging capability previously not available on 1.5T systems from Canon Medical Systems and utilizes migrated high-end 3T technology. Canon Medical System’s PURERF and Saturn Gradient technology means that stable and consistent imaging performance is ensured, increasing signal to noise ratio (SNR) by up to 38%.

The Vantage Orian offers a range of new Rapid Scan and Easy Tech technology that reduces scan time and helps improve workflow. A redesigned gantry interface and dockable table ensure seamless patient handling. New applications like Multiband SPEEEDER, that shortens acquisitions such as high angular resolution diffusion imaging (HARDI), and up to x8 accelerated k-t SPEEDEER allows high frame rate cardiac cine and perfusion imaging with free breathing.

Vantage Orian also offers one of the smallest footprints in the 1.5T wide-bore class and low power consumption eco features that reduce energy use by up to 21%. The reliable system is equipped with excellent maintenance programs to satisfy the needs of hospital administrators.

A relaxed patient is key in MRI, and Vantage Orian features quiet scan sequences that reduce ambient noise by Pianissimo Zen technology. The 71cm wide bore and immersive virtual MR Theater are designed to put patients at ease. Vantage Orian also addresses challenging patients with Pediatric SPEEDEER coils, contrast- free applications and ForeSee View for simplified scan planning.

**KONICA MINOLTA**

www.interhospi.com & search 47324

**Dynamic cardiac phantom**

The CIRS Dynamic Cardiac Phantom, Model 008C, is a precision instrument that simulates the realistic motion of an average human heart. It provides known, accurate and repeatable 3D motion of a solid heart model inside the tissue-equivalent thorax phantom. The phantom is designed as a comprehensive image analysis tool for calculation detection, iodine contrast resolution and ECG signal gating. The cardiac phantom is constructed from a tissue equivalent thorax body, moving rod with a solid tissue equivalent heart inside, motion actuator, motion controller and CIRS Motion Control software. The 3D movement of the heart is controlled by CIRS Motion Control software, which is installed on a Windows PC or Laptop. The software comes loaded with three basic motion profiles that are specific to different anatomical parts of the heart and one correlated ECG profile. The software can overlay respiratory motion with cardiac motion to account for total displacement of the heart. The respiratory motion can mimic either breath hold or continuous breathing of a patient. With repeatable and controllable 3D heart motion, this tool could help define protocols in the cardiac field for better and safer patient imaging. The Dynamic Cardiac Phantom joins CIRS’ existing lineup of dynamic phantoms, which includes the Dynamic Thorax Phantom (Model 008A), MRI-LINAC Dynamic Phantom (Model 008M), Dynamic Pelvis Phantom (Model 008P) and Dynamic Platform (Model 008PL). Each of these products is operated using CIRS Motion Control Software.

**CIRS**

www.interhospi.com & search 47325

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**Premium portable ultrasound**

**Designed to meet the requirements for a wide range of applications and clinical environments**, the Sonimage HS1 delivers premium performance and an intuitive workflow, combining the advantages of a mobile solution with high performance and advanced features. Konica Minolta’s Ultra broadband transducers in combination with the advanced 3THI (Triad Tissue Harmonic Imaging) deliver an exceptional resolution and image clarity through the whole picture, starting from the very first millimeters. The Simple Needle Visualization (SNV) technology enhances the needle visualization on the ultrasound image. SNV is straightforward and effective and supports ultrasound-guided procedures, performed with both in-plane and out-of-plane approaches. For in-plane interventions Sonimage HS1 detects automatically the needle, optimizing its visualization. Simple Clear Flow provides a precise and sensitive visualization of low flow velocities, enabling early detections. The Sonimage HS1 offers the possibility to display the 18MHz imaging scaled down to 1 cm depth which provides a comfortable visualization of details on the screen. The Sonimage HS1 features an intuitive user interface, thanks to the touch screen technology on the 15” IPS LCD monitor. It also offers the possibility to display the ultrasound image full screen, making it 133% larger. The Sonimage HS1 also implements phased array technology, meeting the requirements for cardiac applications with tools and features, such as TDI and CW-mode. Auto IMT (intima-medial thickness) calculation is an advanced quantification application to assess arterial health. This non-invasive method to evaluate cardio-vascular risk also calculates vascular age and Framingham risk factors. Strain elastography, a real-time qualitative imaging method displaying the relative stiffness of tissues, is also delivered by the Sonimage HS1, providing further clinical information in the assessment of soft tissues and superficial lesions.
Expanded POC test menu includes creatinine and urea

Radiometer has announced the commercial launch of its CE-marked point-of-care tests for creatinine and urea, the latest additions to the ABL90 FLEX PLUS blood gas analyser’s test menu. The versatile ABL90 FLEX PLUS is the only compact blood gas analyser on the market to offer such an extensive range of critical care parameters – blood gas, electrolytes, metabolites and co-oximetry. It provides rapid analysis of 19 parameters from as little as 65 µL of blood, with results available in just 35 seconds.

The addition of creatinine and urea to the ABL90 FLEX PLUS analyser’s test menu makes this device ideal for point-of-care testing, proving fast results that allow caregivers to make clinical decisions faster and more accurately. This enables a more proactive approach to treatment, helping to improve patient flow and reduce waiting times in emergency and critical care settings, benefitting clinicians and patients alike.

RADIOMETER

www.interhospi.com & search 47329

64-slide compact CT system

Fujifilm is expanding into the CT market with the release of the FCT Speedia 64-slide CT system. Its compact size, powerful applications, and optimized workflow provide the solution to multiple routine examinations without compromise. The 75cm-wide gantry bore reduces patient anxiety and allows easier access to the patient even when the patient’s arms are raised and the patient cannot lie flat on her/his back, while maintaining a compact footprint to facilitate installation into existing rooms. By utilizing only 3 main system modules, gantry, patient table, and operation console, the Speedia HD achieves a remarkably compact footprint. Advanced noise reduction processing employing iterative reconstruction technology reduces image noise and artifacts while maintaining a high quality image. 7 levels of dose reduction can be selected to optimize dose and image quality per examination.

GE Healthcare’s new generation of high-end fully digital radiology ultrasound system, the LOGIQ E10, integrates artificial intelligence technology, cloud connectivity, and advanced algorithms to acquire and reconstruct data faster than ever before. As a result, it enables confident diagnosis with comprehensive tools and concise workflow. Artificial intelligence technology is now used in this ultrasound system’s platform – the eSound Architecture. This advanced GPU hardware technology acquires and reconstructs data in a similar way to an MRI or CT system, enabling 48 times the data throughput and 10 times the processing power of previous systems. The eSound Architecture is so powerful that it can process an amount of data equivalent to playing two entire DVDs in just one second, in real-time. The system eliminates the need for focal zones, as the entire image is always in focus throughout the exam.

With hospital systems growing and expanding their geography, many ultrasound exams are now read by a clinician not on site. The new Photo Assistant App enables users to photograph relevant anatomy and include the photos with the clinical images sent to the radiologist, providing valuable context and documentation. Another tool – called remote clinical application – allows radiologists to manipulate the ultrasound’s settings with a remote control on their tablet or smart phone. Clinicians can also analyse how the system is being used with a web-based secure portal or get assistance remotely. Providing a new way for clinicians to connect with their colleagues and patients, Tricery from Trice Imaging adds cloud-based image sharing, diagnostic collaboration, remote viewing, archiving and Electronic Health Record (EHR) integration.

GE HEALTHCARE

www.interhospi.com & search 47328

Medical robotic platform

Robocath, a company that designs, develops and commercializes cardiovascular robotic systems for the treatment of vascular diseases, has recently announced that its first robotic solution, R-One, met all its primary efficacy and safety endpoints in the first pre-clinical study. The prospective, randomized, controlled,
multi-operator study evaluated the efficacy and safety of the robotic system compared to a manual procedure. Results showed that there was no significant difference between the procedures for all the primary endpoints and that R-One achieved 100% technical success, no major adverse cardiac events (MACE), total protection from X-rays for the operator as well as no arterial damage. This study demonstrates how safe, intuitive and easy to use this solution is with only a one-minute difference in procedure duration between the two groups. R-One will bring huge benefits during Percutaneous Coronary Interventions (PCI) to both patients, in terms of intervention precision, and operators, with increased comfort. R-One is expected to be commercially available at the end of the year in Europe and the Middle East. The pre-clinical prospective, randomized, controlled, multi-operator study was designed to demonstrate the non-inferiority of R-one compared to manual percutaneous coronary intervention (PCI) in a porcine model. In total, 42 arteries were stented either manually (21) or with robotic assistance (21); 24 arteries were analysed for patency and flow at 30 days and 24 arteries went through histopathological analysis. Endpoints included technical success and MACE.

ROBOCATH
www.interhospi.com & search 47326

**Hemoglobin and hematocrit meter system**

The latest addition to the StatStrip line of handheld, hospital meters, the StatStrip Hemoglobin and Hematocrit Meter System (StatStrip Hb/Hct), has gained CE mark certification and is now available in all CE regulated countries. StatStrip Hb/Hct is the only point-of-care (POC) meter to measure hemoglobin and hematocrit for accurate anemia screening and blood loss monitoring.

StatStrip Hb/Hct provides measured hemoglobin and hematocrit results, which are more accurate than calculated results, with excellent correlation to laboratory reference methods. With a fingertip capillary sample and results in 40 seconds, StatStrip Hb/Hct provides the real-time accuracy that helps improve clinical decision making in a variety of healthcare settings. These include blood banks and temporary blood collection locations, dialysis centres, primary care clinics, hospitals, and oncology clinics. For example, in blood banks, StatStrip Hb/Hct provides safe and effective blood donor screening and avoids false deferrals. For patients receiving dialysis, StatStrip Hb/Hct helps maintain Hb target levels and also monitor erythropoiesis stimulating agents (ESAs) to the lowest effective dose. In emergency care settings and in hospitals, StatStrip Hb/Hct can aid in rapidly evaluating blood loss, initiating treatments more quickly, and monitoring critically ill patients who are at risk for low hemoglobin and hematocrit. In oncology clinics, StatStrip Hb/Hct can help proactively identify patients at high risk for chemotherapy-induced anemia and direct treatment accordingly. StatStrip Hb/Hct’s single-use biosensors do not require calibration or coding, and testing is as easy as glucose self-testing. StatStrip Hb/Hct helps reduce costs by eliminating the need for blood drawing supplies, venous phlebotomy, and laboratory testing. Wired and wireless connectivity for data integration with patient records are available. Compact and lightweight, StatStrip Hb/Hct is less than half the size and weight of other POC systems that measure only hemoglobin.

**NOVA BIOMEDICAL**
www.interhospi.com & search 47323

**Calendar of Events**

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For more events see www.interhospi.com/events/

Dates and descriptions of future events have been obtained from usually reliable official industrial sources. IH cannot be held responsible for errors, changes or cancellations.
REGISTER NOW!

Lisbon, Portugal
September 22-25
CIRSE 2018

MEET  SHARE  CONNECT

View the programme and find out more at www.cirse.org

Preliminary Programme available: www.aorticideas.org

Cardiovascular and Interventional Radiological Society of Europe
Highly accurate
Easily portable
Always reliable

Introducing the NEW VT650 and VT900
Gas Flow Analyzers from Fluke Biomedical

Choose the highly accurate VT650—great for testing all types of ventilators and respiratory equipment at a competitive price. Or choose the VT900 if you also test anesthesia and flow meters needing ultra-low flow and ultra-low pressure for the highest accuracy. Both are built with a compact, lightweight, all-in-one design, which allows you to easily test on-the-go.

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