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ARAB HEALTH EXHIBITION & CONGRESS:
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THE OFFICIAL MAGAZINE OF THE ARAB HEALTH EXHIBITION

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Letter from the editor

Gearing up for the future

From groundbreaking technologies and products including a real-time image-guided surgical robot and artificial intelligence enabled CT scanners, the 2018 Arab Health Exhibition & Congress had on display advanced healthcare innovations that are pushing the boundaries of precision medicine and patient outcomes. In our overview of the event, we outline how smart health technologies and personalised healthcare options have turned the spotlight on the value of connected health and its potential in this rapidly growing field. As innovation and technology are transforming the healthcare sector, we also offer insights into the endless medical possibilities of harnessing the power of 3D printing technology.

In our interview section Paolo Rotelli, President of Italy's Gruppo Ospedaliero San Donato, unveils his plans to boost the company's presence in the UAE and the wider regional healthcare market. We also profile Dr Joseph Lamelas from Baylor St. Luke's Medical Center/Texas Heart Institute, a pioneer in the most advanced forms of Minimally Invasive Cardiac Surgery.

In this issue, our conference speakers shed light on new procedures in bariatric surgery while in the field of radiology, Hedvig Hricak and Michael Fuchsjäger offer a glimpse of the future in oncologic imaging.

We hope you enjoy reading this issue and look forward to seeing you at our forthcoming events later in the year.



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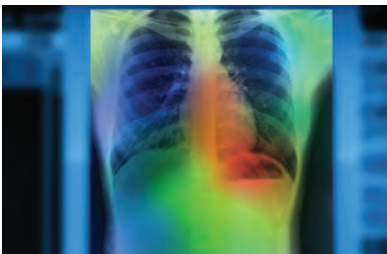
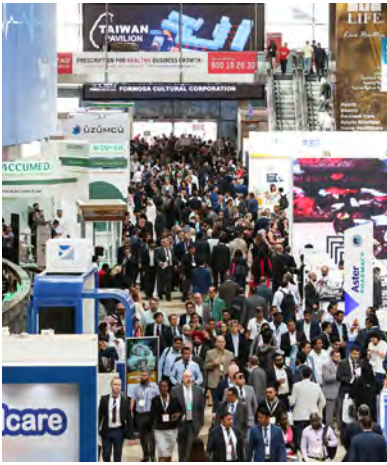


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ARAB HEALTH: SETTING THE TONE FOR 2018

As the curtains close on another successful Arab Health Exhibition & Congress, the global medical community gets set for another busy year ahead.

By Inga Louisa Stevens, Contributing Writer

In line with the UAE Vision 2021, which aims to achieve a world-class healthcare system, the 43rd Arab Health Exhibition & Congress welcomed more than 4,200 of the most innovative healthcare companies and 103,000 attendees from 150+ countries to its home at the Dubai World Trade Centre from 29 January – 1 February 2018. With the demand for healthcare products and services continuing to increase within the region, Arab Health has once again proved its credentials as a must-visit exhibition for anyone associated with the industry - not only in the Middle East, but also across the globe.

Arab Health 2018, organised by Informa Life Sciences Exhibitions, was officially opened by His Highness Sheikh Hamdan bin Rashid Al Maktoum, the Deputy Ruler of Dubai and the Minister of Finance and Industry of the United Arab Emirates, who toured the exhibition along with local and regional dignitaries.

During his tour, HH Sheikh Hamdan inaugurated the Dubai Health Authority (DHA) online media channel known as Sahaa Wa Saada (Health and Happiness). Speaking during the inauguration, His Excellency Humaid Al Qutami, Chairman of the Board and Director-General of the DHA, said: "In line with the vision of our leaders and in line with the Dubai Health Strategy 2016-2021, we are keen to develop initiatives that promote healthy lifestyle and wellbeing. Prevention and healthy lifestyle is an important pillar of the DHA strategy and the launch of this online media channel stems from our goal to promote a healthy environment through community engagement."

There are Deals to be Done

As expected, the exhibition floor at Arab Health was buzzing with excitement as many of the world's leading healthcare companies showcased groundbreaking technologies and innovative solutions designed to improve patient experience and clinical outcomes across the region. A number of regional 'firsts' were announced, and millions of dollars of contracts were negotiated and signed during the four-day industry showcase.

One example was GE Healthcare's announcement that it would deliver advanced diagnostic technology to fully equip the radiology department of King's College Hospital London in the UAE, which is set to open in Q1 2019.

"The future of healthcare is fast, simple and about affordable solutions that drive tangible outcomes for patients and providers alike," said David Mezher, General Manager- Middle East, GE Healthcare. "GE Healthcare has an established heritage of equipping the leading public and private sector hospitals in the region with the advanced technology physicians need to be able to focus on what matters most: delivering high quality care to their patients."

Another announcement came from RAK Hospital in Ras Al Khaimah, UAE, as they launched a revolutionary stem cell therapy for the treatment of arthritis and other joint related issues. RAK Hospital's Bone and Joint Centre will be led by world-renowned knee regenerative and reconstruction specialist Dr William Andrew Hodge.

Meanwhile, Royal Philips was at Arab Health to showcase its broad portfolio of smart digital platforms and intelligent solutions to help address the region's biggest healthcare challenges. Some of the

technologies on show included Azurion, Philips' new-generation image guided therapy platform, MR Prodiva - the new MR Prodiva 1.5T provides enhanced clinical performance, workflow and patient experience. Philips also unveiled new solutions to drastically reduce exam times and elevate neuro-oncology.

The UK's largest specialist heart and lung centre, the Royal Brompton & Harefield Hospitals Specialist Care, demonstrated two live surgeries on their stand at Arab Health - the Ozaki procedure for reconstruction of diseased aortic valve function and the VATS lobectomy to treat large tumours of the lung. Both surgeries were performed in response to growing Middle East health concerns surrounding heart and lung disease. Each procedure highlighted how innovative techniques can have life-changing benefits for those living in the region.

Siemens Healthineers was at Arab Health to present a new range of diagnostic imaging and therapy solutions, the latest innovations use Artificial Intelligence (AI) and 3D camera technology to expand precision medicine and improve patient experience, reducing unwanted variations and repeat procedures. The innovations launched at Arab Health 2018 included the Cios Spin, an intra-operative 3D imaging device set to reduce revision surgery; the Mammomat Revelation, a premium mammography system featuring 3D HD Breast Biopsy, providing automated breast density measurements and improving patient access to functional breast imaging; and nexaris Therapy Suites, a solution to better integrate multi-modal imaging in surgery and interventional radiology.

All Eyes on Personal Health Tech

Manufacturers and providers of personalised



healthcare products and services showcased pioneering technologies in the first-ever Personal Healthcare Technology Zone at Arab Health. The 800sqm Zone featured smart watches, health monitors, telemedicine technologies, and mobile device accessories.

One of the technologies on show was the Yirdoc intelligent mesh nebuliser from Qingdao Future Medical Technology Ltd in China. The mesh nebuliser is the third generation of technological innovation and comes with OOT-technology. It has one-button operation and uses intelligent technology to maximise the effect of the medication and offers adjustable nebulisation rate via the smartphone or tablet app.

According to Yuheng Feng, leader of the Global Market Unit at Yirdoc, "Traditional medical treatments for respiratory diseases come with a lot of problems including the possibility of cross infection in a hospital setting or the distress caused to children due to the noise from a traditional nebuliser. We have committed ourselves to providing a reliable, intelligent and portable home solution for the treatment of respiratory diseases."

As part of the Personal Healthcare Technology Zone, the recently introduced

Product Demo Zone also featured the latest 'Smart' healthcare products, from a healthcare concierge app which helps you connect to pharmacies and doctors, to the first smartphone electrocardiograph that enables remote reporting, to glucose monitoring devices.

A key exhibitor at the Product Demo Zone, Richard Thomas, Managing Director of Activinsights commented: "Arab Health is the perfect platform to showcase our latest innovative products, such as the Activinsights Band, which delivers efficient diagnostic solutions for healthcare providers and patients alike. Wearables and smart technologies are truly transforming the healthcare market, enabling higher quality and more efficient solutions."

The 3D Medical Printing Zone returned to Arab Health for a second year in partnership with the Dubai Health Authority, displaying the most innovative technologies that are revolutionising the healthcare sector and the limitless clinical applications of 3D printing.

Beyond Borders

With global healthcare technology and service providers competing to deliver high quality, cost-efficient and smart healthcare, the international community was keen

to put their best foot forward in terms of their national capabilities and expertise. This year, Arab Health hosted 40 national pavilions packed with innovative medical technology solutions aimed at impressing the stakeholders in the Middle East region.

Finland had a stronger than ever presence with more than 35 companies showcasing the latest innovations in Finnish healthcare services and technologies. One of the key highlights was the Adesante's Clinical Operation Simulator (SurgeryVision™) - a virtual reality solution for surgery planning.

According to Teppo Lainio, Senior Advisor, QMS, SurgeryVision, and co-exhibitor at Business Finland stand: "This was our first time at Arab Health and it is the premiere of SurgeryVision to the world and the first place outside of Finland. We have gained a very good reputation here and have got an exceeding amount of leads from this area including UAE, Saudi Arabia and even further away from India and Pakistan. It is an extremely good exhibition and has proved to be useful for us. We are very happy and look forward to coming back next year."

Meanwhile, the focus for Healthcare UK at Arab Health 2018 was on prevention,





quality and innovation - with outstanding applications in the field of digital healthcare. As Healthcare UK managing director Deborah Kobewka explained: "We have an excellent presence at Arab Health, as we have done for many years. Our objective is to profile the very best of British healthcare - both our public sector capabilities which are encapsulated by the NHS, as well as the private sector. This year, we have brought with us four innovative private sector companies that are all showcasing the very best of digital capabilities in the UK."

Other national pavilions with a strong presence at Arab Health included the Italian pavilion with 127 exhibiting companies. The French pavilion took up 1,300 sqm of exhibition space and showcased medical expertise in a wide variety of areas from 130 French companies. From across the Atlantic Ocean, 30 Brazilian companies gathered at Arab Health to highlight innovations in healthcare technology solutions.

Getting Hands-On with Training

For the second year, Arab Health hosted the popular Hands-On Training (HoT) concept - real-time training modules that were delivered on the exhibition floor. With a number of unique programmes, participants were able to train on the advanced techniques with the latest state-of-the-art equipment across different modalities such as aesthetic and conservative dentistry, OR risk management, ultrasound, endoscopy, and many more.

Ansell, an Australian company that manufactures protection solutions, hosted a number of HoT sessions including on the hazards of glove powder. This education module examined the risks associated with powdered glove use to both healthcare providers and patients, as well as strategies

to prevent exposure to glove powder.

Meanwhile, American medical technology firm Becton, Dickinson and Company (BD) hosted a medication management module that covered topics such as inventory optimisation in central pharmacy, outpatient smart pharmacy solutions and automating supply management in procedural areas.

Education the Arab Health Way

More than 8,000 delegates from across the globe participated in the Arab Health Congress that offered 19 business, leadership and Continuing Medical Education (CME) conferences aimed to bridge the gap in medical knowledge. Attendees had the chance to learn from leading experts in the field to hear about the most prominent topics in the region, including public health, family medicine and obesity, bringing the latest issues and developments in the industry to the forefront.

Speaking as part of the Paediatrics Conference, a popular speciality with this year's attendees, Dr Rabi Hanna, a specialist in pediatric haematology, oncology, and blood and bone marrow transplantation at Cleveland Clinic in the US, shared his insights into a series of clinical breakthroughs that will revolutionise treatment of genetic blood disorders and increase the life expectancy of children diagnosed with sickle cell disease and thalassemia.

Dr Hanna said significant changes in treatment are likely in the next five to ten years, including advances in bone marrow transplant techniques, gene therapies, and improved medications. "In the past few years there have been big steps forward in haplo-transplants, using family members that are only half-matched, particularly a mum or dad with 50 percent of the child's genes. That will give more children the chance of a cure,

replacing bone marrow that is defective with new bone marrow that is healthy."

With lifestyle diseases and chronic illnesses such as cardiovascular diseases, diabetes and arthritis becoming more prevalent in the region, speakers at the first Family Medicine Conference highlighted current approaches to diagnosis and management, as well as the latest preventive measures. The congress also welcomed its first Obesity Conference - a timely and relevant forum for clinicians in the region where prevalence of the disease has reached epidemic proportions.

The Show Goes on!

Since its launch at Arab Health 2017, Informa's global medical directory - Omnia - has had over four million page views, more than 200,000 plus viewers, +7000 members and an estimated 30,000 products uploaded on its portal www.omnia360.com. Breaking all geographic boundaries and time zones for all of Informa's Life Sciences events across the globe, year-round access to the portal enables visitors to source information on companies exhibiting at Informa Life Sciences' shows as well as interact with and explore products beyond the show floor, whenever and wherever it is needed.

This year promises to bring in even more exciting possibilities for growth for all Omnia members and visitors. "In 2018, we will bring all of Informa's Life Sciences events under the Omnia 360 umbrella - this includes 12 global trade shows," said Joseph Chackola, Publications Director, Informa Life Sciences, Dubai, UAE. "In addition, several new platform features are being developed and deployed to guarantee business leads for each and every single member on Omnia. The goal is to enhance the whole exhibition experience - whether it is for the exhibitor, manufacturer or healthcare provider." **AH**

Bernd Ohnesorge, PhD, has been heading the Regions Central Europe, Middle East and Africa (CEMEA) of Siemens Healthineers since October 2015



‘New and innovative technologies are changing the way our customers deliver care to their patients’

Interview with Dr Bernd Ohnesorge, President Central Europe, Middle East & Africa at Siemens Healthineers

With the healthcare environment changing for healthcare providers around the world, Siemens

Healthineers aims to enable healthcare providers worldwide to achieve better outcomes at lower costs by empowering them on their journey towards expanding precision medicine, transforming care delivery, improving patient experience and digitalising healthcare, says Dr Bernd Ohnesorge, President Central Europe, Middle East & Africa at Siemens Healthineers.

A leader in medical technology, at Arab Health 2018 earlier this year, Siemens Healthineers presented its latest innovative portfolio of products and services in the company’s core areas of diagnostic and therapeutic imaging and in laboratory diagnostics.

“Arab Health is a key tradeshow for Siemens Healthineers not only in the Middle East and Africa region but also globally,” says Dr Ohnesorge. “It serves as a great platform for us to exhibit our innovations and meet key decision makers, thought-leaders and industry experts.”

In an interview with *Arab Health Magazine*, Dr Bernd Ohnesorge discusses the main ideas and strategies that are transforming the healthcare industry, and

the innovations that Siemens Healthineers brings to the healthcare arena to meet these new challenges.

As President Central Europe, Middle East and Africa at Siemens Healthineers, what do you think is currently driving the healthcare industry forward, both in the Middle East and Africa region and globally?

The healthcare environment is changing for healthcare providers around the world. The main trends of the business – consolidation, industrialization and managing health – affect the way decisions are made. Cost pressures and outcome orientation are dominant drivers. It is our ambition to enable healthcare providers worldwide to achieve better outcomes at lower costs by empowering them on their journey towards expanding precision medicine, transforming care delivery, improving patient experience and digitalizing healthcare.

As a leader in medical technology, we are constantly innovating our portfolio of products and services in our core areas of diagnostic and therapeutic imaging and in laboratory diagnostics and molecular medicine. In addition, we are actively developing our digital health services and enterprise services.

What current trends do you see specifically in the UAE healthcare industry and what do you see as the growth areas going forward?

The UAE healthcare industry is continuing to develop further as healthcare has always been a prime focus for the country. Presently, one of the main pillars outlined in the country’s National Agenda – Vision 2021 – is to develop a world-class healthcare infrastructure. Reducing out-bound medical tourism, further emphasis on preventive medicine and curbing life-style diseases are some of the targeted objectives. Considering the increasing in-flux in population levels, key areas that will continue to grow are precision medicine, preventive care and improving patient experience.

What, according to you, are the main ideas/strategies that will transform the healthcare industry of the future?

The healthcare industry is going through a transformation that’s being driven by the rapid growth of healthcare data. The number of connected devices is growing exponentially with projections that by 2020 there will be more than 50 billion smart connected devices. Despite these ►

statistics, only 20 percent of these data are structured for use and analyzed. There's a tremendous opportunity to tap into this data pool and create new insights and value.

New technologies have emerged to tackle these data: The Internet of Things connects devices and sensors to collect and exchange data. Big data computing analyzes large, complex stores of data to extract value. And artificial intelligence (AI) allows digital machines to sort through all the data and think, reason, and solve problems like humans do. This transformation will change the way our customers deliver care to their patients. At Siemens Healthineers we want to support our customers in tackling these changes by helping them generate, aggregate, analyze, and operationalize data.

How important is innovation in healthcare? What are the technological, medical and strategic innovations that your company brings to the healthcare arena?

Some of the biggest challenges for healthcare delivery are to confirm the right diagnosis, make the right treatment decision for every patient, and appropriately utilize therapy resources. It is all about increasing the specificity and sensitivity of medical tests, and artificial intelligence can support this big time. What could help are integrated decision solutions that are currently being developed in the Diagnostic Imaging Business Area. They could support personalized diagnostics and treatment decisions using real-time, global, and connected datasets and enable quality and efficiency analytics. Therefore, it is important to have historical patient data as well as genomic and lab data.

The actual status of the patient – whether it is lab information, imaging information, or information from physical tests – is also important. This might even be correlated to reference data and population cohorts in order to make the right decisions along the whole pathway of care, from early diagnosis to therapy and follow-up care. But it is not just about data access. It is also about data quality assurance and data curation. There are hundreds of different algorithms we

need to develop. We need to industrialize the process of deep machine learning algorithm development; otherwise, the cost will be too high. To get access to all the necessary data, building partnerships with healthcare providers worldwide will be more important than ever.

Siemens Healthineers not only offers a broad portfolio of in-vivo and in-vitro diagnostics equipment, we have also built a system to bring it all together. The Siemens Healthineers Digital Ecosystem was designed to integrate and interconnect healthcare data from imaging, in-vitro diagnostics, and medical documentation. This data is generated in one of the healthcare industry's largest installed bases. With this Digital Ecosystem, we want to reach healthcare providers faster with our innovative services and applications.

What new products or innovative technology did Siemens Healthineers showcase at Arab Health and MEDLAB 2018 exhibitions?

At Arab Health 2018, we showcased our latest innovations in radiology. For example, our latest mammography system Mammomat Revelation with unique 50 degree 3D HD Breast Tomosynthesis provides the highest depth resolution in tomosynthesis, and thus delivers excellent quality 3D images. Now biopsies can also be performed leveraging this wide tomosynthesis angle.

Another example is the new high-end 3 Tesla MRI scanner Magnetom Vida. It is the first scanner equipped with BioMatrix, a brand-new, innovative scanner technology that addresses inherent anatomical and physiological differences among individual patients, as well as variability among users.

Our Business Line CT range at Arab Health this year included the latest high-end single-source system Somatom Edge Plus and its innovative FAST (fully assisting scanner technologies) Integrated Workflow with the FAST 3D Camera. Using artificial intelligence and deep learning technology, the camera automatically facilitates precise and consistent isocentric positioning of patients.

We also presented nexaris Therapy Suite, a system to better integrate multi-modal imaging in surgery and interventional radiology. It provides support for precise

diagnostics, intraoperative real-time imaging and direct check-up of results.

And, at MEDLAB, we prepared selected presentations of our in-vitro portfolio to show our customers our comprehensive capabilities in diagnostics. Highlights included the Atellica Solution – world's first IVD analysers with a patented, bi-directional magnetic sample transport that is 10 times faster than conventional conveyors. Our new epoc blood gas analyser makes us the only company to enable customised testing offerings based on individual facility needs to help improve process efficiency – whether that is handheld testing, benchtop solutions or central lab applications.

What was unique or new about the products Siemens Healthineers presented at Arab Health this year?

With increasing volumes and complexity of data from different sources and across a range of disciplines, artificial intelligence is the key to make medical technology smarter, image data and lab result analysis faster, and examinations more accurate. Now, we are starting to implement artificial intelligence more and more in our systems like Somatom Edge Plus and its FAST 3D Camera.

As a company closely associated with Arab Health for the past several years, how would you evaluate the impact of the event on the healthcare industry in the MENA region?

Arab Health is a key tradeshow for Siemens Healthineers not only in the Middle East and Africa region but also globally. It serves as a great platform for us to exhibit our innovations and meet key decision makers, thought-leaders and industry experts.

What, according to you, are the real benefits and opportunities available to healthcare and trade professionals to attend Arab Health?

The CME-accredited conferences that run alongside the exhibition are highly-valued by healthcare professionals – continuing medical education is an important topic and a core area of focus also for Siemens Healthineers. Other than that, visitors benefit from attending the exhibition which has grown substantially over the years and presents a range of equipment and services together with the very latest innovations. **AH**

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*Paolo Rotelli, President of Gruppo
Ospedaliero San Donato (GSD), the largest
private healthcare group in Italy*



HEALTHCARE THE ITALIAN WAY

Italy's Gruppo Ospedaliero San Donato sets its sights on the UAE

By Inga Louisa Stevens, Contributing Writer

With an impressive portfolio of 18 hospitals with more than 5,000 beds, over 4,000 doctors, 2,500 medical students and more than 250,000 patients per year in emergency room services, Italy's Gruppo Ospedaliero San Donato (GSD) has firmly cemented its position as the largest private healthcare group in the country. With three of their institutes classified as IRCCS (Scientific Institute of Recovery and Care) - a recognition distinguishing those institutions within which the research activity has a direct and immediate impact on the quality of the cure delivered to patients - the result is 4 million patients treated each year.

The history of GSD is tied to the history of Luigi Rotelli, a physician and founder of the first hospital in 1957 - the Istituto di Cura Città di Pavia, followed by the Policlinico San Donato - from which he went on to lay the grounds for the Group as it is known today.

With its foundations rooted in science and research, and the central belief that the patient is primarily a human being and should be cared for on a personal level, research, cooperation, and transformation of results into cure are the three activities that have accompanied GSD throughout their more than half a century history.

"Our way of curing and caring, with paths that we personalise in all respects, is inspired by this fundamental belief," says Paolo Rotelli, who took over as President of GSD in 2015 from his father. "As a family-owned Group, this belief has remained at our core and was a particular point of pride as we celebrated our 60th anniversary in 2017. My grandfather was the founding father of the Group and, after him, my father used his lawyer's acumen to build a further 16 hospitals and make the Group the success that it is today."

Focus on the UAE

Last year, GSD Healthcare (the UAE arm of GSD International) opened its first office in the United Arab Emirates, based in Dubai Healthcare City. In 2018, the focus for GSD Healthcare is to offer medical training courses to regional medical professionals looking to develop their medical skills and to earn Continuing Medical Education (CME) accredited by the Dubai Health Authority (DHA).

Hosted in partnership with international medical device companies, GSD brings out their top chief surgeons and medical officers from their various institutes and hospitals in Italy to teach the latest techniques on the most cutting-edge medical devices. To date, they have successfully carried out two training courses that were fully booked and well received by the attendees.

"What sets us aside in the training world is that all of our teaching and training is done by those at the very top of their medical professions," says Rotelli. "Secondly, people don't pay to listen to a lot of theory presented through a slideshow; we focus solely on hands-on, practical training that attendees take back to their practices and apply them immediately. During the training course, we teach particular skills, we allow them to practice these skills using the latest medical devices and we assess each of our participants individually at the end of the course."

All GSD Healthcare training courses in the UAE are certified by the Vita-Salute University in Milan, which has been ranked by TIMES Higher Education list as the No.1 University in Italy.

"For us, these training courses are a means to understand the needs of the market - what the physicians really want to learn. Our two-day courses are just the

beginning of what we have to offer in the UAE and we are extremely flexible with how and what training opportunities we are able to customise for those that have the passion to keep learning," Rotelli explains. "If any of the participants want to apply for further training in a specific field, they can apply to attend more in-depth, certified training courses at our university in Milan."

According to Rotelli, these UAE-based training courses are a first step in creating a network of cooperation and knowledge sharing between the healthcare facilities, healthcare professionals and local patients in the UAE and with those in the GSD network in Italy.

"Our country is traditionally known around the world for our food, fashion and, of course, the Ferrari brand. We want to change this perception of our country. For example, the fashion industry is worth 70 billion euros of our GDP while healthcare is worth 180 billion euros. The healthcare industry in our country is a much stronger product and we want the world to become more aware of our brand of healthcare."

Once their network in the UAE is sufficiently strong, and they have achieved strong brand awareness within the local medical community, Rotelli explains that their ultimate goal is to open a healthcare facility in the UAE. "This is our long term goal, but right now, our focus is on building connections and introducing ourselves to the region and making our name synonymous with over half a century of medical excellence."

"While we are now concentrating our main efforts on creating partnerships within the UAE, we are keen to utilise these connections to eventually begin to explore opportunities in the wider regional healthcare market such as in the Kingdom of Saudi Arabia." ►

Trust in science and research

In Italy, GSD has a stellar reputation for scientific research, especially molecular medicine and gene therapy. Ranking second only to CNR (National Research Council) among the Italian institutions, GSD produces more than 1,600 publications, many of which have a wide resonance inside the international scientific community.

Through the three IRCCS institutes (Scientific Institutes of Recovery and Care), GSD has achieved an important position in the international arena of scientific research. The high number of publications, the training of young physicians and scientists, and the new treatment options offered to patients testify to the results achieved in highly interesting disease areas.

It is within the Ospedale San Raffaele shelter for science, which is the educational centre of the Vita-Salute University in Milan, in which researchers focus their efforts on understanding the molecular processes underlying the diseases, and has reached excellence in the field of molecular medicine. Meanwhile, the focus of the Policlinico San Donato institute is on the study and treatment of heart and large vessels diseases. Founded in 1969 and with an extension of 50,000 square metres in the south-east of Milan, the Policlinico is a multi-specialised healthcare institute renowned for cardiovascular excellence and carrying out the largest number of cardiac surgeries in Italy (over 1,500 per year).

While the IRCCS institutes have been credited with discovering workable cures for some of the world's rarest genetic conditions, today, they have turned their attention towards discovering a cure for a genetic disease that is much more prevalent in the Middle East – Thalassaemia.

"Within the same modalities, our researchers are now working in collaboration with pharma giant GlaxoSmithKline to find a cure for Thalassaemia," explains Rotelli. "Although this is a rare disease, there are tens of thousands of patients, especially in this region, who could benefit from a more effective treatment for this genetic disease."

The Ospedale San Raffaele institute has also made considerable advancements in the treatment of leukemia. They have the latest Phase 1 drugs and treatment options, much like in the US. The institute also has an experimental treatment for Diabetes Mellitus

Type 1 in the form of a stem cell transplant.

"All of this was made possible because, for the last 30 years, the Italian government continued to allocate huge amounts of funding into medical and scientific research," says Rotelli. "Today, due to fiscal deficit in the country, this funding has been significantly reduced."

"This is why we are increasingly focusing our efforts on showcasing our medical technologies and specialist research capabilities to the global medical community in order to find funding that will enable us to continue to develop these techniques that are changing the face of medicine."

GSD is willing to enter into partnership with medical laboratories in the UAE in order to co-develop some of these revolutionary techniques that are bringing hope to so many patients around the world. "We know that the UAE government is one of the largest donors worldwide and that they are committed to making the world a better place through medical research. We are fully aligned with this vision and we would like to share our know-how and expertise on how to make it possible to go from the research stage, all the way to being used on real patients in a clinic setting."

International expansion

GSD is a family-owned private hospital group operating for profit; however, the funding for over 80% of their patients comes directly from the national health system in Italy. This is a form of Public-Private Partnership (PPP) which works under a "checks and balances" system to ensure that the government does not overspend and exceed their budgets. Each private hospital in the country can only generate a maximum of 80% of their revenue from patients that are referred by the government and each type of treatment is charged at the same fixed rate, regardless of if you are treated in a public or private hospital. GSD generates 1.25 billion euros per annum from the national health system and this figure is capped at its maximum capacity.

"The remaining 20% of our business comes from out-of-pocket (OOP) payments or from health insurance companies. While Italian patients are traditionally reluctant to pay OOP, or to invest in private health insurance for themselves, we are still

seeing that this figure is growing year-on-year. This is one of the reasons why we are setting our sights on the international market," Rotelli explains.

Last year, GSD welcomed more than 1,600 international patients from countries such as Canada, Australia, Romania and The Maghreb. Due to ongoing humanitarian efforts where surgeons from GSD travel abroad to train local surgeons in specialist paediatric cardiac procedures, particularly in countries such as Tunisia, Morocco and Egypt, GSD continues to receive hundreds of paediatric patients whose treatment is paid for by the respective governments.

Similarly, GSD receives a large number of paediatric cardiac patients from Romania due to a bilateral agreement signed by the Government of Italy and the Romanian government to treat Romanian nationals in Italian hospitals. "As a result of this, if we receive a patient from Romania, we will get reimbursed for this by the Italian national health system," Rotelli adds.

In 2017, GSD opened their doors to a brand new market of international patients from ex-Soviet countries such as Ukraine, Moldavia and Russia. This was as a direct result of the establishment of two GSD offices in the region and the in-bound flow of patients initially began because surgeons and physicians from GSD hospitals were willing to accept the impossible cases.

"These were the cases that no one else would take on," says Rotelli. "For example, last year we successfully carried out the first ever organ transplantation on a foreign patient, with a foreign (living) donor, in Italy. It took nine months to get all the appropriate approvals from the government but once the ethics part of the process was taken care of, our patient from Russia was able to go ahead and receive a kidney transplant in our hospital."

From over half a century of cutting-edge medical research, to training an army of Italy's future surgeons and physicians, the Gruppo Ospedaliero San Donato certainly has the pedigree to make a statement in the global healthcare arena. With their international expansion plans well under way, and their ambitions to begin to collaborate with the UAE government on finding a cure for some of the region's troubling diseases, the future certainly looks interesting for this successful family group. **AH**



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ZOOMING IN ON WOMEN'S HEALTH

The 2018 Obs-Gyne Exhibition and Congress conference served as a perfect platform for obstetricians, gynaecologists, fertility specialists, family physicians and the industry's leading manufacturers to meet, exchange knowledge, share best practices and advances on a variety of stimulating topics in the field of women's health.

By Arab Health Magazine Staff



Featuring new and leading obstetrics and gynaecology devices, equipment and solutions, the Obs-Gyne Exhibition and Congress 2018, saw more than 50 speakers from the Middle East, UK and US bring in international perspectives and insight into medical and health issues prevalent worldwide, as well as tackle current issues and challenges within women's health specific to the MENA region. Co-located with MEDLAB for the first time this year, the event was held at the Dubai International Convention and Exhibition Centre, UAE, from 5 - 8 February 2018.

Keeping abreast of the advances in medicine

A specialist in minimally invasive procedures for advanced laparoscopic and hysterectomy surgery, Dr Sadoon Sadoon, Medical Director, Consultant, Obstetrics & Gynecology, Danat Al Emarat Hospital, Abu Dhabi, believes that the opportunities for interaction between

regional and international experts with participants at the 2018 edition of the Obs-Gyne Exhibition & Congress holds the key to the ongoing success of this event.

"Obs-Gyne is undoubtedly the region's leading expo and congress for obstetricians and gynaecologists," says Dr Sadoon, who also served as a member of the Scientific Committee of the 2018 Obs-Gyne Congress. "This year we had a line-up of eminent experts from the region and beyond who addressed current issues and challenges within the industry, as well as presenting best practice case studies that practitioners could implement into their day-to-day work. My colleagues and I worked together to produce a comprehensive scientific programme involving all areas in the field of general obstetrics and gynaecology, oncology, maternal and foetal medicine and infertility which were the focus areas of the conference this year. Interactive sessions

with participants was one of the most positive outcomes of the Conference as it enabled practitioners to keep abreast of the latest advances in medicine, particularly for women's health in the Middle East."

Dr Sadoon, who was also a speaker at the event, says the event offered an opportunity to address "how we at Danat Al Emarat manage or develop the services for advanced laparoscopic surgery and how we perform complex procedures including the advanced hysterectomy laparoscopically. Apart from gaining an insight into research from within the UAE, the event also shed light on advances made by our colleagues in the MENA region and beyond."

Rising infertility rates

Infertility was one of the key topics at the Obs-Gyne Exhibition and Congress, as it is a prominent health issue women across the globe face today. According to Dr Elsamawal Elhakim, IVF & Reproductive Medicine



Consultant, HealthPlus Fertility Centres, UAE, "Obs-Gyne brings in internationally renowned speakers and clinicians which makes it a fantastic event for practitioners to discuss complex cases, exchange ideas on new approaches and learn about recent advances in this field."

It is a great opportunity to meet with experts in the field and share knowledge, he adds as infertility is a worldwide issue. "Women are delaying child bearing because of a host of reasons," he explains. "Compounding the problem is that obesity – considered an epidemic worldwide – is affecting fertility rates of both men and women. Junk food, irrational use of drinks and tobacco, lifestyle factors – all affect sperm and egg quality."

One of the most interesting topic for IVF clinicians is the challenge of implantation failure, he adds. "Why does pregnancy sometimes not occur despite transferring a good quality embryo inside the uterus?"

This raises an important question for us all. As a speaker at the event, I spoke about the role of blood thinning injections in reducing implantation failure and preventing miscarriage. In some patients, natural killer cells in the body or clotting factors could prevent the flow of blood to the womb. This was based on data I have collected from all over the world including meta-analysis, randomised, controlled studies, etc that look into the role of blood thinning injections in implantation."

The infertility plenary track at the Obs-Gyne Congress also reviewed recent research evidence and discussed different treatment options, including IVF, and the pros and cons of every treatment plan.

New technologies

Obs-Gyne 2018 featured a host of device and equipment manufacturers including imaging companies who showcased the latest technologies in ultrasound and mammography.

Other product areas at the event ranged from endoscopic, laparoscopic and hysteroscopy equipment to more conventional surgical equipment, cervical cancer screening products to gynae chairs and stretchers.

According to Machel Norman, Managing Director, m.e.r limited, UK, "We have been exhibiting at Obs-Gyne for five years now. We are very happy with the outcome and that is why we continue to exhibit at this event as we see year on year growth."

m.e.r limited is a resource business, specialising in niche, superior quality devices, with unique attributes for the gynaecological and obstetrics disciplines, adds Norman. One of the popular devices on exhibit was the babyLance safety heelsticks that are reputed for their smooth and accurate incisions, ease of use and safety.

The Medica Group, the leading distributor of beauty solutions, aesthetic products and medical equipments, attracted the ►

attention of visitors at the event as it offered a fantastic choice for women to improve symptoms of laxity or loss of sensation, urge incontinence, stress incontinence and overactive bladder. Corrine Dowling, Training Supervisor, Medical Equipment Department, MEDICA Group, UAE, explained that Viveve Geneveve is a breakthrough one-time 25-minute procedure using radio frequency for vaginal tightening and stress incontinence symptom relief. "The treatment uses clinically proven cryogen-cooled monopolar radiofrequency (CMRF) to uniformly deliver gentle volumetric heating while cooling delicate surface tissue," she said. "This unique technology stimulates the body's natural collagen formation process."

Founded by a midwife and said to induce the positive effects of upright positioning and moving during birth, the aptly titled 'Moving Mattress' displayed at the Obs-Gyne event naturally garnered plenty of attention. According to Anna Peters, Midwife & Co-Founder, Vibwife GmbH, "Continuous active mobilisation and positioning of the woman giving birth is essential for the natural progression of labour. What we have developed is an automated system that moves the woman's pelvis during childbirth so that she does not have to rely on the time and strength reserves of her midwife. The aim is to reduce the duration of labour through optimal movements, thereby avoiding unplanned cesareans."

Quoting scientific studies undertaken recently, Anna explained that upright positioning and moving techniques have led to 29 percent fewer unplanned Caesareans and 19 percent fewer requested epidurals. It has also reduced duration of labour, shortening the process by 1 hour 22 minutes.

Screening tests

A superior first-line screening test for all women was showcased by Scientific Clinical Laboratories with Panorama, a non-invasive prenatal screening test (NIPT) that analyses cell-free DNA in a pregnant woman's blood to estimate the risk of foetal chromosomal abnormalities. Performed through a simple blood draw from the arm, Panorama works by distinguishing between foetal and maternal cell-free DNA thanks to SNP-based sequencing and Natera's proprietary Natus™ (Next-Generation Aneuploidy Test Using SNPs) algorithm.

Panorama is a highly accurate and comprehensive screening that screens for common genetic conditions caused by extra or missing chromosomes in the baby's DNA including Down Syndrome. Compared to first trimester screening, it has higher sensitivity and lower false positive rate for the conditions screened.

India's leading diagnostics chain, SRL Diagnostics, continued its ongoing support for the Obs-Gyne event by showcasing its superior quality diagnostic services to its customers that works through a very efficient network of labs and collection points. According to Nikita Panchal, Senior Executive -Sales & Insurance at SRL, "Our mission is to become the first-choice diagnostics provider for customers in all the markets that we operate in, and participation at Obs-Gyne is important to showcase our accurate and precise diagnostic, prognostic and predictive testing services to a large audience. We use this platform to cultivate new business contacts and we will certainly be back again next year."

The building blocks of life

Another area of focus at the Obs-Gyne exhibition were the cord blood bank and stem cell technology based organisations that are involved in the collection and storage of potentially life-saving stem cells that secure immense health benefits and are often seen as the future of human medicine. Exhibiting their latest stem cell service at the event, Darryn Keast, Managing Director at Med Cells International FZ LLC, explained that Cells Plus powered by TotiCyte was a ground-breaking new cord blood separation technology that had the potential to deliver 2 to 5 times more stem cells at the point of treatment than any other method.

"It has been developed and patented by Cells4Life and is the highest performing cord blood processing system in the world," he said. "The key to TotiCyte's incredible cell recovery is that it causes the red blood cells to sediment, leaving the stem cells and other cell types suspended in plasma. This enables almost all of the red cells to be removed without losing any stem cells. As only the number of viable cells at the point of therapy actually matter, CellsPlus offers the best chance of successful treatment for regenerative therapies than ever before."

Also exhibiting at the event was Future

Health Biobank, the only stem cell bank to successfully release a sample for treatment in the Middle East. Ahmad Al Ahmad, Territory Manager GCC for Futurecells FZ-LLC, Dubai, explained: "This was in 2012 when a cord blood sample processed and stored by us was released and transplanted into a sick teenager in Jordan who had Fanconi's Anemia, a condition that affects the bone marrow's ability to make healthy blood cells. In the absence of a suitable bone marrow sample, fresh hopes arrived with the birth of his baby sister whose cord blood sample proved to be a perfect match for her sick brother."

Storing stem cells could prove to be a lifeline not only for the child but also for his/her sibling and parents, he says. "Here at Obs-Gyne, we have had several guests approach us to know more about the system and the conditions it treats. Backed by scientific research and clinical trials, this field of study is constantly evolving, thereby increasing the potential for the use of stem cells for an ever-expanding range of health issues."

Clinical excellence

American Hospital Dubai showcased its range of care offered to women by the Obstetrics and Gynaecology department that included care during pregnancy, infertility, menopause, as well as a multitude of other women's health related afflictions.

One of the largest stands at Obs-Gyne belonged to Danat Al Emarat Hospital, part of United Eastern Medical Services Group, and the Gold Sponsor of the event. "We are a world-class specialty women and children's hospital, and Obs-Gyne was a very good platform for us to inform and update people about our services and what we do," said Dr Sadoon. "The UEMedical also manages HealthPlus, a network of highly specialised outpatient centres in Abu Dhabi including HealthPlus Fertility Centers. The IVF Laboratory of HealthPlus Fertility is the first of its kind in the UAE to receive international accreditation by the College of American Pathologists (CAP), a testament to its high quality and its compliance with internationally recognised standards and procedures. So, Obs-Gyne was the apt venue for us to meet with visitors, interact with them and get some good ideas that we can bring back to our Group because we believe that quality is a responsibility, and that a flow of ideas is critical to keep raising the bar of excellence." **AH**



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INTERDISCIPLINARY 3D SERVICES: Development, Gains, and Example Applications

By Dr Muhanad Hatamleh BSc, MPhil, MSc (mgrmt.), Dip (MaxFac), PhD., Clinical Scientist (Reconstructive Science) at King's College Hospital, London, UK and 3D Service Manager at Great Ormond Street Hospital for Children, London, UK

3D technologies have been largely employed in regular medical services among different specialities including neurosurgery, orthopaedics, maxillofacial surgery, and plastic surgery. Applications vary from anatomical models used in preoperative surgical planning to customisation and designing of surgical splints and patient specific implants. These applications result in significant advantages characterised mainly by reduced surgical time, improved medical outcome, improved understanding of complex cases, improved confidence of both surgeon and patient, and overall cost reduction. An example of the main uses of 3D printing applications can be seen in Image 1.

Hence, there is huge demand for establishing 3D services within major hospitals to enhance quality of care provided alongside improving hospital standing and developing local hospital expertise. However, it is not an easy task to plan requirements for a 3D service within an ongoing hospital system and sustaining such service. This article aims to discuss briefly the chief aspects to take into account when planning an in-house 3D service along with some innovative applications.

1. 3D Service Finance

This deals with securing funding for setting up, running and sustaining the 3D services. 3D technologies can be expensive as it includes different resources, staffing and space. A business case is usually developed around the needs of possible users. These can include surgical departments, academic university partners, and research centres. Funding can be central through the government and having a state-wise strategy for such 3D services makes it easy to obtain government funding. Other funding can come from clinical care regional groups, hospital budgets or through charity organisations. Costs associated with sustaining the service is the biggest factor

in determining the usefulness of using such 3D service in clinical practice. It is important to show how such 3D service can be cost-effective, in the long-term. Running cost can encompass consumables like materials, software and hardware, service contracts, overheads and staff salaries. Additionally, cost can be complicated by the fact that hospital finances look at budget and possibilities of cutting off services that are not generating enough income to cover their running costs.

2. 3D Service Support

It is beneficial to gather local evidence within the hospital of costs associated with outsourcing its 3D need to private companies (i.e. models, planning, PSI). The cost is usually high considering its speciality and complexity. Hence, a business case proposing to re-channel these costs by an in-house 3D service will be appealing to hospital management. This is not only because the cost incurred will aid in service development but also because such a service can be easily accessed by medical professionals without the risk of breaching patient confidentiality usually associated when outsourcing cases to other providers. Local surgical teams can aid greatly in supporting such evidence by highlighting 3D use in their practice. Other funding sources include organising reimbursement based on well-established systematic evidence that clearly show direct benefit of 3D service in relevant medical speciality. For example, there is ample evidence in the cranial and maxillofacial world that 3D services decrease costs related to time saving in the operating room.

3. 3D Service Resource: Selection and Location

3D service workflow goes through different stages as summed up in Diagram 2 below. These involve 3D reconstruction of patient scan images into virtual 3D model that can be visualised in 3D space using Specialised

Segmentation Software. There is a range of segmentation software available to perform this operation with *Mimics* (Materialise, Belgium) being the commonly used software. Once digitally created, the virtual 3D model is exported as standard triangular language (.stl) which can be accessed by a 3D Printer software to print it. There is a variety of prototyping as 3D printers vary in cost, printing accuracy, materials printed and colours of 3D models. Files created are stored virtually and linked to the patient electronic records. In some cases, 3D Surface Imaging Systems can be used to enhance the clarity of patient scan (i.e. 3DMD).

It is integral for the service to be easily accessible by all possible users, especially medical clinicians. Surgeons would be more inclined to attend the 3D facility between surgeries for a quick review of the 3D planning of a case. Hence a location close to operating rooms and in close proximity to radiology department would be ideal. Utilising the right resource of software and hardware is a challenge especially if there are different service users. An ideal 3D service workflow includes different processes as shown in Diagram 2. It begins by processing scan data (i.e. CT, MRI) into virtual 3D reconstruction which is then 3D printed into 3D model. It might be challenging to secure a central space for all needed processes, however, processing facilities can be centrally located and production facilities (i.e. 3D printers) can be peripheral but all within close proximity.

4. 3D Service Regulation Management:

3D services within hospitals impact demand for regulation and management for safe and efficient use. Its regulation has gone through three phases as described by Christensen and Rybicki. From a regulatory perspective, there are different views on what does or does not constitute a medical device, and there is regulatory difference between hospitals

constructing 3D parts versus companies providing such parts. For example, a 3D model generated based on CT data is considered a medical device in EU but not the USA. In the EU, Medical Devices Directive treats 3D printed medical devices and accessories to medical devices as “custom made devices”. Furthermore, such devices need to satisfy relatively strict criteria about prescription, material production, and patient customisation. It is integral to develop an in-house Quality Management System (QMS) of its software, hardware, and patient data. For example, the software needs to be updated regularly, and segmented 3D models should be checked against their original axial scan. The 3D printer needs to be calibrated after certain printing hours (i.e. 300 hr), and printing accuracy needs to be checked against known measurements of 3D models.

Innovative 3D applications: A variety of cases are presented in this section highlighting the innovative use of 3D technologies in 3D planning and reconstructive treatment of various patient groups.

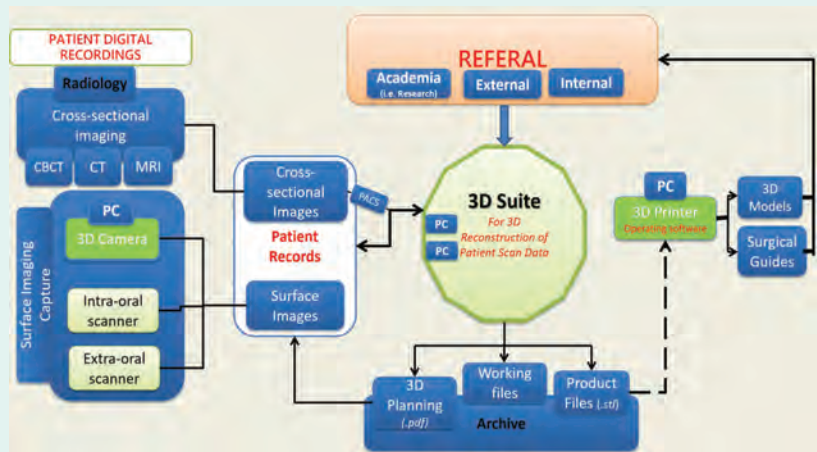
Skull Defects: A young patient had a history of convexity meningioma growing on the surface of her brain directly under the skull. She was treated by several surgeries resulting in two thirds of her skull bone being removed including frontal bone, left side parietal, temporal bones along with right side parietal bone as shown in her CT view in Image 3 (A). The CT scan was reconstructed to 3D representation of her skull bone and soft tissues (B). The 3D skull file was exported as .stl file and 3D printed (C). A biocompatible titanium skull implant was constructed restoring the missing bones of the 3D model (C). The implant was fixed as planned (D). Improved skull aesthetics and reduced operating times were achieved along providing optimum protection to brain.

Ear Reconstruction: In this case, the patient had a right side pinna resection secondary to skin melanoma. The case was presented to the clinic with concerns about his look (Image 4 a, b). Treatment options were discussed and he opted for adhesive retained ear prosthesis. An impression of his existing left ear was taken. The impression was cast in gypsum (c), which was then surface scanned using 3Shape surface scanner. The digital file was then mirrored to become the right ear which was then printed in 3D printer (d). The printed ear was then duplicated in maxillofacial silicone elastomer (e). The ear was made to match patient

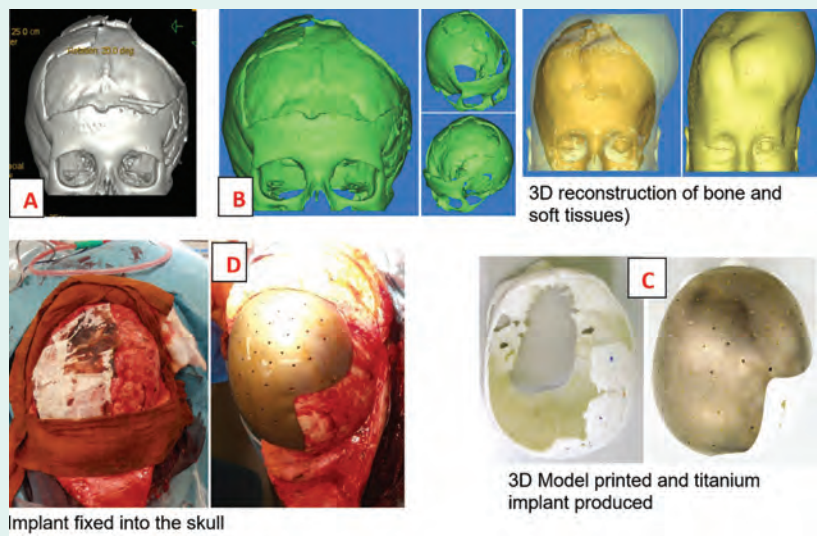
▼ **IMAGE 1:** Various uses of in-hospital 3D services in treating different head and neck defects



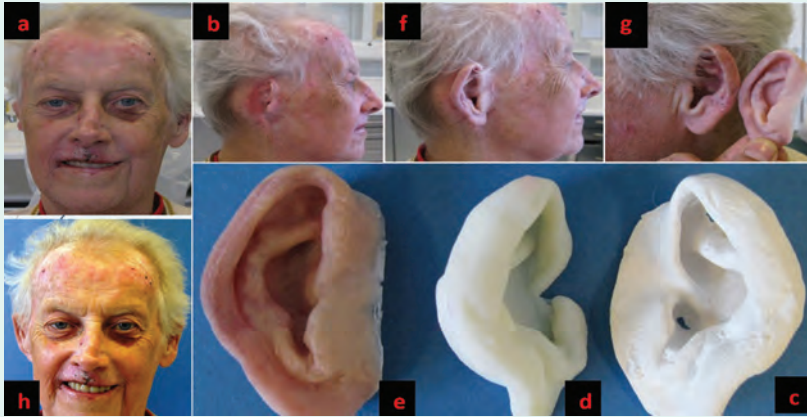
▼ **IMAGE 2:** Suggestive workflow process of 3D service management from referral to archive.



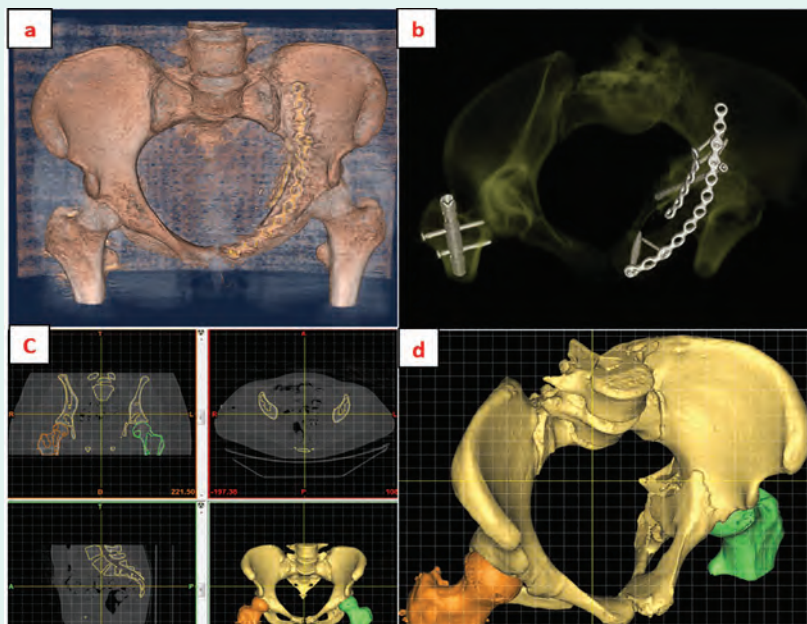
▼ **IMAGE 3:**



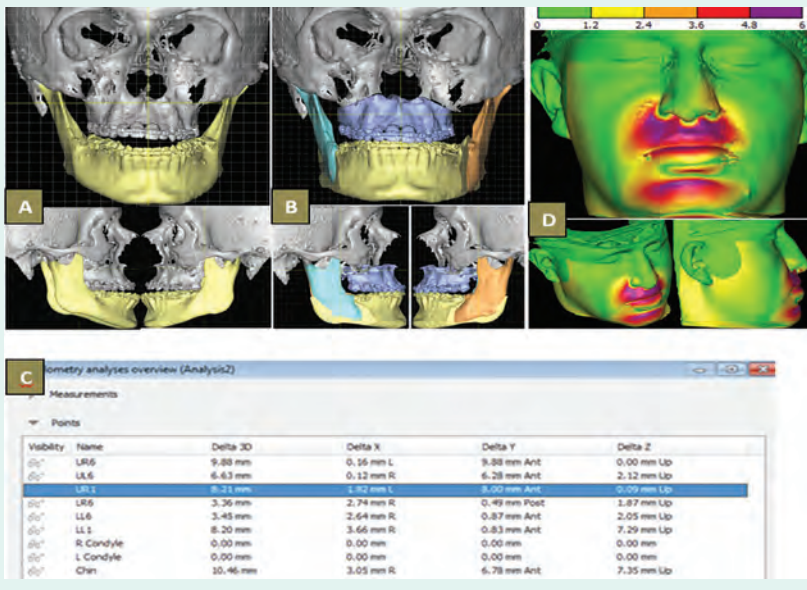
▼ IMAGE 4:



▼ IMAGE 5:



▼ IMAGE 6:



skin colour using 3D Spectromatch colour system (g). The patient was happy with the outcome (f, h). The same principle applies to reconstructing missing facial parts. We have presented different publications describing integration of advanced 3D technologies in reconstructing missing facial tissues in earlier publications.

3D planning: The case as seen in Image 5 presents left acetabular orif with posterior column screws and multiple metal artefacts (a, b). There is associated postsurgical haematoma with surrounding soft tissue swelling and locules of free gas. There is a right femoral intermedullary nail across the lower femoral fracture (b). 3D planning was performed to enable visualisation of current implanted plate and to view optimum access during corrective surgery (c, d).

Bi-Maxillary Jaw Surgery: Image 6 is a case of class III malocclusion. The treatment plan involved Le Fort I Maxillary surgery and BSSO (Buccal Sagittal Split Osteotomy) of the mandible. 3D reconstruction of the patient's CBCT scan was done using CMF Pro Plan software, then a scanned copy of patient's teeth was amalgamated with the scan (A). The plan was to advance maxilla forward 8mm and rotation of upper midline 1.82 mm to the left so it is coincident with facial midline. It also included impaction at upper six molar of 2mm to correct occlusal cant. Accordingly, the mandibel moved 3.66mm forward (B) and these movements were accepted (C). Soft tissues simulation was performed and facial profile changes were accepted (D). Surgery splints were designed and printed to translate surgery to the operating room.

2 in 1 Skull meningioma reconstruction:

In Image 7, a case of skull meningioma presented on the left side of the skull and involving left sphenoid wing, frontal, parietal, temporal, and super-orbital bones. Treatment plan required the resection of the bone meningioma, and reconstruction of defect at the same surgery. First step was 3D reconstruction of patient's CT scan data using CMF Pro Plan software to visualise the 3D meningioma bone and soft tissues (A). Then virtual surgery was performed and meningioma was resected with a cutting guide to define bone removed (B). Two-part implant was 3D designed by external company (C) and then 3D milled in PEEK and cutting guide was 3D produced in polyamide

(D). During surgery the guide was fitted over the skull (E) and bone resected (F) and defect was reconstructed with the implants (G).

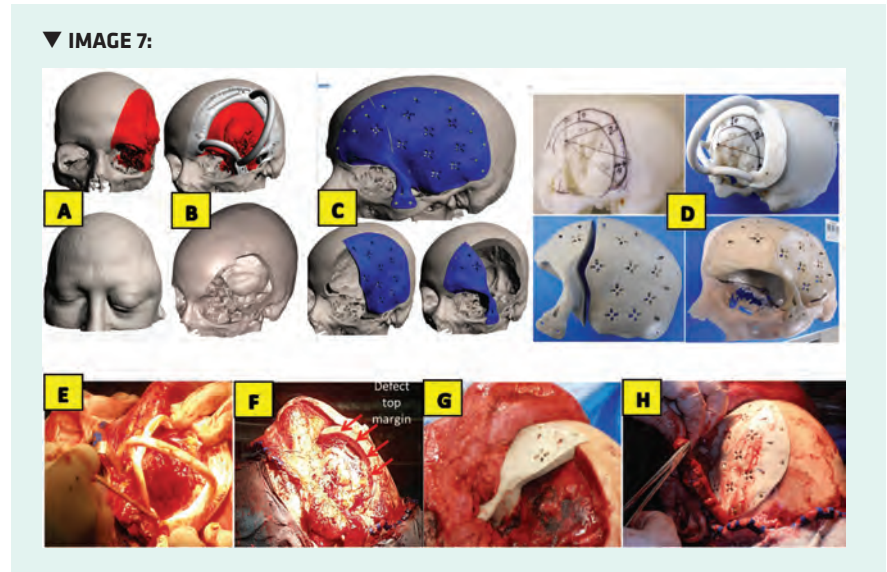
Conclusions and Clinical Significance

3D printing has revolutionised practice of medicine in all aspects from pre-surgical planning of complex medical pathologies, to patient education and medical training. It means that for any speciality, a 3D replica of patient targeted anatomy (i.e. skull meningioma, heart) can be obtained in a timely fashion for assessment and refinement of treatment, which in turn enhances surgeon's confidence and patient's understanding of their disease and rationale of their surgery. Accordingly, this means surgical intervention will benefit through reduced time, improved outcome (i.e. function, aesthetics), and minimal postsurgical complication and revisit. On the other hand, in-house 3D services can have significant non clinical advantages as they aid in advanced ranking of hospital and development of local expertise. Out of the top 20 hospitals as ranked by *U.S. News and World Report*, 16 have implemented a

medical 3D printing strategy. Furthermore, out of the top 10 children's hospitals, 9 have implemented a medical 3D printing strategy.

A centralised interdisciplinary 3D service within any hospital will impact greatly and positively on treatment outcome. A variety of complex cases can be attempted with such in-house service as shown with the

case examples earlier. 3D technologies are a breakout point in healthcare with accelerating number of healthcare institutions adopting it. Its application can vary greatly among different medical specialities as it has become an essential component of most surgical specialities, with infinite opportunities. ^{AH}



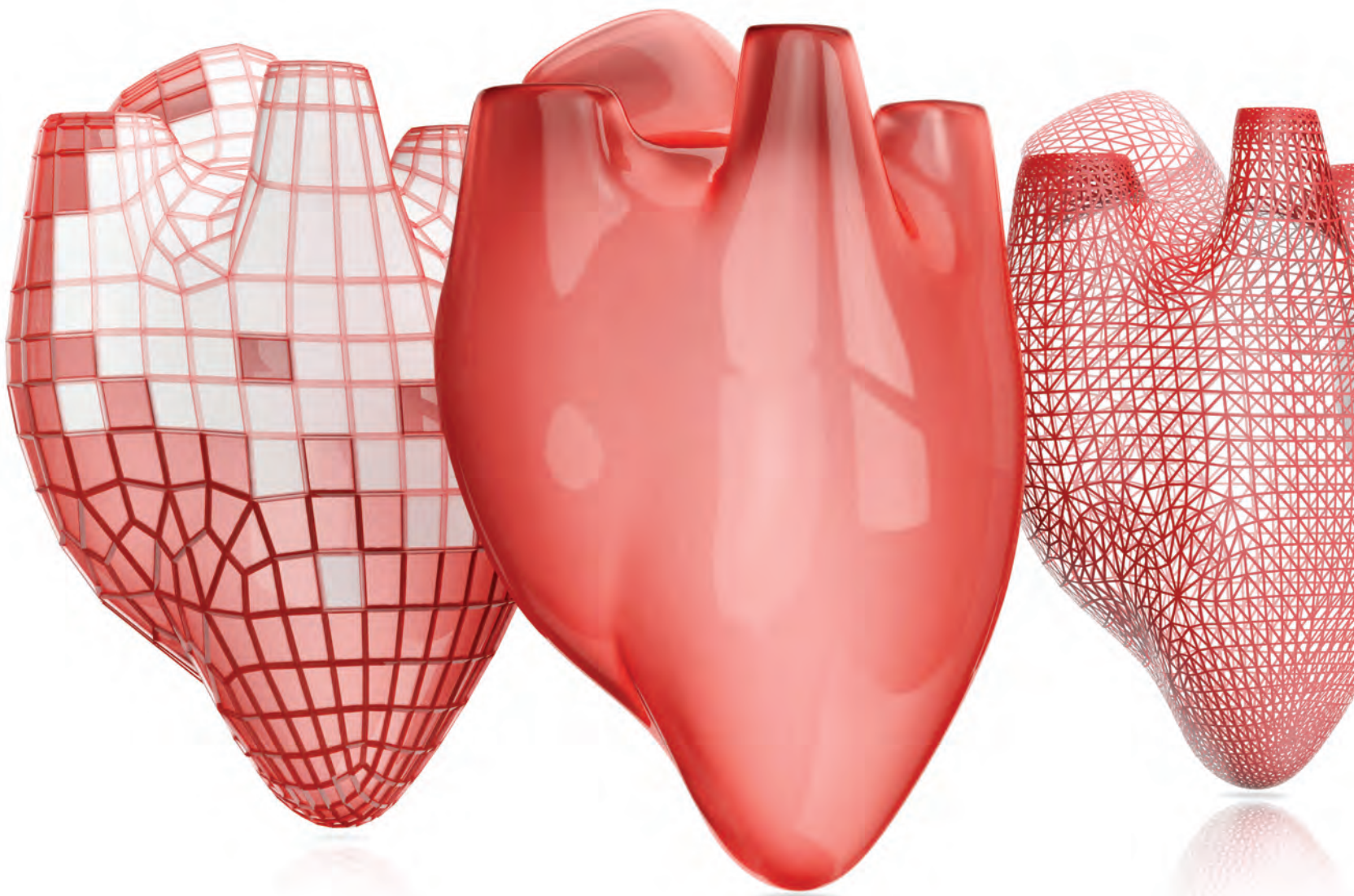
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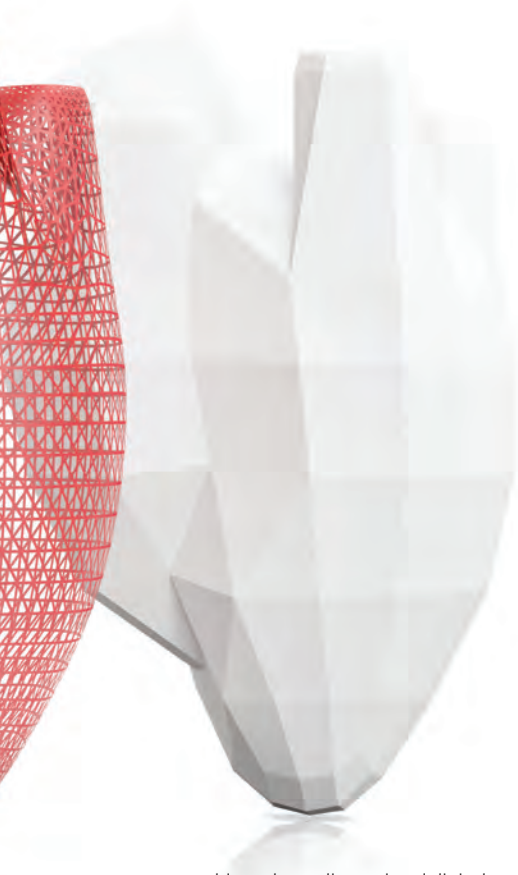
STATE-OF-THE-ART ADVANCES IN 3D PRINTING & BIOPRINTING

By Faiz Bhora, MD, Chief of Thoracic Surgery, Co-Director Airway Center, Director of Thoracic Surgical Oncology, Robotic Surgery and Research, Associate Program Director General Surgery, Surgeon Advisor CDI, Mount Sinai West and St. Lukes, Mount Sinai Health System, New York, NY

Three-dimensional (3D) printing, or additive manufacturing (AM), has benefited several industries over the past 30 years by expediting manufacturing, lowering costs, and aiding in research, but its applications are yet to have a revolutionary impact on the medical field. In

medicine, 3D printing is currently being used to create unique anatomical structures for pre-operative planning, customized grafts and prosthetics, and drug delivery systems. However, the day is quickly approaching where we will print viable tissues that can self-assemble, self-regenerate, and adapt to their environment: You.

Today's 3D printers differ greatly depending on the type of material being used as well as the intended object to be printed. The most widely used form of 3D printing is Fused Deposition Modeling (FDM), where a tangible structure is fabricated by stacking multiple thin layers of material from the ground up. To do



this, a three-dimensional digital model is first constructed on a computer from scratch using computer-aided design (CAD) software, or from a single or combined CT, PET, MRI, or ultrasound image that is imported and reconstructed in 3D. CAD software transposes this digital model to practical dimensions before rendering it as an STL (stereolithography) file—a typical format understood by most 3D printers. The model is reduced to multiple 2D slices whose data is sent to the printer for reconstruction layer by layer. There is a slew of different materials being used today as “ink”, each with their own characteristics; texture, rigidity, half-life, and biocompatibility. The subset of these materials which are biocompatible are of particular interest to researchers in developing fully functional tissues and organs.

The emergence of bioprinting has seized focus in the medical field of 3D printing for its range of applications, promising results, and the profound magnitude of its potential.

One of the goals of 3D printing in the medical field is to mainstream customisable tissue replacement. Though we have not yet achieved consistent methods for mass production, there have been several promising steps forward. For example, Wake Forest Institute for Regenerative Medicine has

had success in printing a customised ear, as well as bone and muscle structures. In a 2017 study, Bulanova *et al* bioprinted fully functional murine thyroid spheroids that were self-vascularised. They proved competence of their bioprinted constructs by grafting them under the renal capsule of hypothyroid mice, restoring blood T4 level and body temperature. While vascularisation of bioprinted tissues has historically been a dilemma, the results of this study represent a significant step forward in the development of organ printing technology.

Duan and his group at Cornell University report a method for fabricating living heart valves using 3D bioprinting with multiple valve cell populations. To do this, they harvested and cultured both porcine aortic valve interstitial cells (VIC) and human aortic root smooth muscle cells (SMC). Each cell culture was mixed with alginate/gelatin gel and loaded into separate syringes within the 3D printer. Reconstructing the valve from an imported CT image, the 3D printer alternated between extruding VIC and SMC for the leaflets and root, respectively. The result was a mechanically robust living tri-leaflet heart valve with high viability. But these methods still have a way to go before they can be up-scaled.

One group that has received a lot of attention for its progress towards clinical use is Dr Tandon and team EpiBone who are engineering customised bone models. Their proprietary process involves 3D printing an exact replica scaffold of the bone to be replaced using decellularised animal bone. This scaffold is then impregnated with stem cells acquired from human adipose tissue, and incubated in a customised bioreactor for 3 weeks. During this time, the stem cells mature into osteoblasts colonising and remodeling the scaffold with living tissue which can then be implanted without fear of rejection. They are currently in the works of modifying this process for cartilage and osteochondral constructs.

Our team at Icahn School of Medicine at Mt Sinai has recently had success in transplanting bioengineered circumferential tracheal grafts. Advancing our previous work repairing partial tracheal defects, we designed a proficient research platform using 3D printing to produce easily customised circumferential tracheal replacement segments for large-animal models. This platform serves to expedite graft design and fabrication, as well as facilitate further research. In essence, dimensions obtained from preoperative CT scans are used to generate a

3D model using CAD software. This model is 3D printed as a size-matched polycaprolactone (PCL) scaffold whose lumen is then lined with an extracellular matrix collagen layer. The 3D biosynthetic graft is produced with high fidelity to the native organ, and can be fabricated in 36 hours. In porcine models, our grafts have shown to incorporate well into live native tissue with extensive vascularisation. Despite this, we notice significant granulation tissue which continues to be the Achilles heel of tracheal grafting. We are diligently at work in designing a method to achieve minimal granulation tissue with enhanced graft integration.

The promising results already being reported in the field of bioprinting have inspired researchers to take the next step in the evolution of tissue engineering. An avenue that is already being explored with some results is tissue self-assembly. Kirillova *et al* have developed a method for creating self-folding tubes with customisable diameters as little as 20 μm , which is comparable to the smallest blood vessels in the human body. This could eventually help overcome the issue of vascularising our current tissue constructs. Wilkinson *et al* out of UCLA have created a novel technique for generating bioreactor-assisted self-assembling pulmonary tissue for disease modeling, which they intend to use for studying personalised lung therapies.

While it may seem futuristic, the use of real-time intraoperative bioprinting has already had success, though on a small scale. Di Bella *et al* have proven feasibility of in situ bioprinting using a handheld “biopener” to repair chondral defects in sheep. Their proof of concept study may prove to be a historical milestone in the field of regenerative medicine, eventually leading to in situ bioprinting of larger structures, including organs.

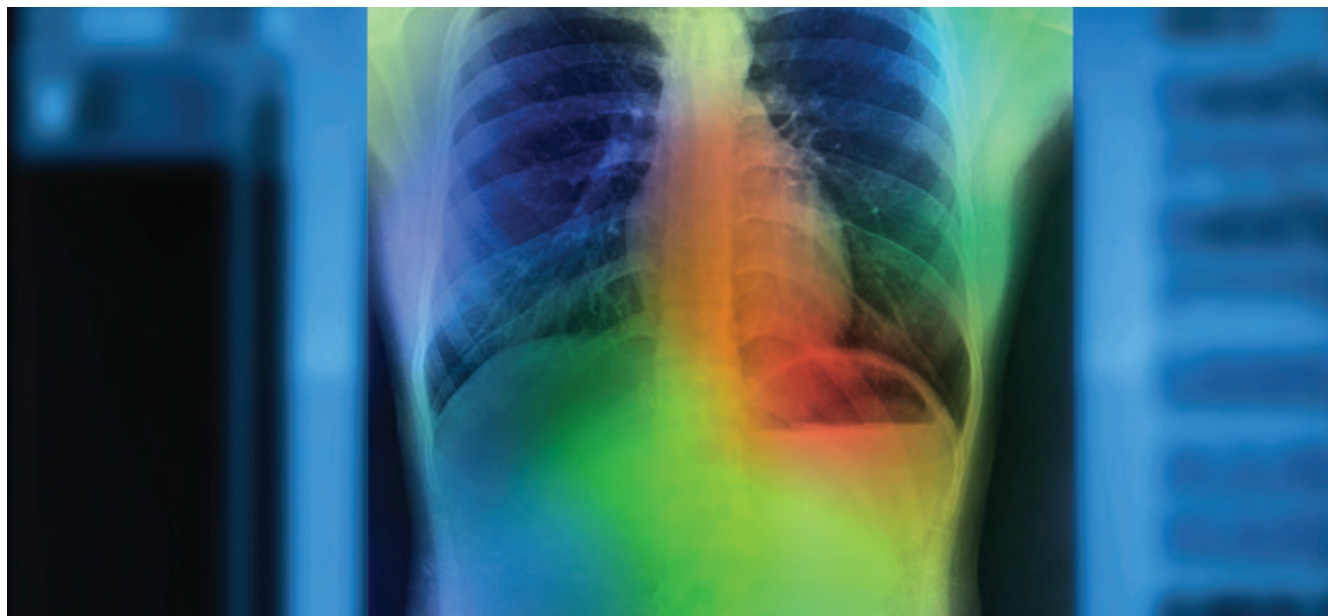
Many significant, and even hard to believe, advances are being made in the medical world of 3D printing and bioprinting. Though these technologies are still in their youth they have already bestowed insight into cellular mechanisms, facilitated the development of current treatments, and set the bar for future developments. There is still an unknown vastness of information to be learned and technology to be discovered, though, we are headed in the right direction. There has never been a more exciting time in medicine, yet we have only scratched the surface of its depth. **AH**

References available on request.

Artificial Intelligence technology to revolutionise radiology algorithms in the UAE

Radiology imaging departments at select Dubai Health Authority Medical Fitness Centres to validate the use of AI technology for chest X-rays

Article provided by Dubai Health Authority



At the 2018 edition of the Arab Health Exhibition and Congress that was held in Dubai, UAE, from 29th January to 1st February, Dubai Health Authority (DHA) announced plans to use Artificial Intelligence (AI) technology for chest X-ray scans required for mandatory medical fitness for residency purposes. The move is aimed at improving the workflow, ensuring faster image analysis and automating reports.

The DHA will first trial the technology in a few medical fitness centres, before expanding it to other facilities.

The DHA signed a Memorandum of Understanding (MoU) with Agfa HealthCare for validation of the first radiology AI algorithm in the UAE. This collaborative agreement will facilitate the key benefits of Artificial Intelligence and support DHA's goal of incorporating the latest technological advancements in the medical field for improved efficiencies and enhanced patient-centric care.

The MoU was signed by His Excellency

Humaid Al Qutami, Chairman of the Board and Director-General of the Dubai Health Authority and James Jay, President Imaging IT at Agfa HealthCare in the presence of H.E. Ambassador Dominique Mineur, Ambassador of the Kingdom of Belgium to the United Arab Emirates and senior officials from both sides.

The MoU is a culmination of the joint efforts of the DHA and Agfa HealthCare for over a period of two years during which the use of AI was reviewed across the radiology departments of DHA's medical fitness centres. As part of the MoU, Agfa HealthCare's Enterprise Imaging platform, currently deployed at the radiology departments of DHA's medical fitness centres, will be leveraged to validate artificial intelligence for fast image analysis, automated reports and improved clinical efficiency.

The MoU is in line with the Dubai Health Strategy 2016-2021 that seeks to foster the use of technology in the health sector to improve efficiencies, enhance healthcare management and overall workflows and

most importantly to further improve patient-centric care. According to His Excellency Humaid Al Qutami, Chairman of the Board and Director-General of the Dubai Health Authority, "Utilisation of AI in the health sector is also in line with the UAE Strategy for Artificial Intelligence. The DHA decided to use AI for X-ray imaging across medical fitness centres because of the scale of the service and the fact that it will greatly enhance work efficiencies and will lead to optimum utilisation of manpower. The move will have a significant positive impact on the overall medical fitness system."

The total number of people who visited the DHA run medical fitness centres during 2017 for new and renewal visas were 2,126,066. A medical fitness test is a mandatory requirement for all expats in the UAE. It is required for a residency, employment or education visa.

DHA has 19 medical fitness centres across the emirate for issuance and renewal of visas. DHA will implement this technology

across a few medical fitness centres. Then the DHA will access the feasibility of expanding this technology across all its medical fitness centres.

James Jay, President Imaging IT at Agfa HealthCare, said the MoU signifies its support for the vision the Government of Dubai has set for the use of AI in healthcare. "Our two organisations will be at the forefront in validating the value-based clinical application of Artificial Intelligence at Dubai Health Authority," he said.

He continued: "Healthcare systems are under enormous pressure to improve productivity; together we will be diving into specific use cases to turn the power of medical imaging data and validate specific workflow improvements in productivity by leveraging Artificial Intelligence. Dubai Health Authority is already building a data lake of imaging records with Agfa HealthCare's Enterprise Imaging Solution, making it available for multi-disciplinary reviews, potential research, teaching, and leverage these imaging data sets to validate the use of our Chest XRay AI Algorithm as part of the scope of this MoU."

Dr Anjum M Ahmed, Global Director

Imaging Information Systems at Agfa HealthCare reiterated, "We are excited about this opportunity, as this is the first AI validation project in the region, and this will help set a model for others to follow, and explore the use of AI applications to enable fast detection of chronic and critical diseases, help improve clinical productivity and enable care providers to better serve their communities. Together with Dubai Health Authority, we are validating the use of AI at Medical Fitness Chest XRay screening centres in Dubai."

Dr Mohammed Al Redha, Director of the Department of Organisational Transformation at DHA, said: "We will be utilising AI technology in the health sector since it has a strong potential to redesign healthcare completely – and for the better. As part of the collaboration, we will work together to establish an enterprise imaging strategy for the DHA to enable multi-speciality medical imaging consolidation. We will establish a framework of Artificial Intelligence workflow to augment radiology imaging, including in the area of detecting diseases and we will collaborate to validate machine-learning algorithms in

development."

Maisa Al Bustani, Director of Medical Fitness at the DHA, said: "The move will benefit a vast number of individuals on a day-to-day basis and revolutionise the way in which radiology imaging is done. With the implementation of this technology, we will be able to greatly enhance efficiencies and workflow management as doctors will now be able to accommodate more reports. The technology will generate automated reports that the doctor will confirm. This will make screening and evaluation more efficient; it will significantly reduce the time taken to receive reports and thus will speed up the overall process. The technology will enhance the overall medical fitness system."

Artificial Intelligence (AI) and Machine Learning are fueling innovations in healthcare to address the pressing clinical needs of care providers. Growing populations, chronic disease prevalence, co-morbidities and spiraling healthcare costs have generated the demand for augmented intelligence leveraging the power of AI and Machine Learning Algorithms, to help improve clinical decision-making, clinician productivity and care. **AH**

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IMPROVING BRAIN HEALTH THROUGH EXERCISE

With mounting evidence that exercise is good for the brain and may even slow brain ageing, Dr Sohail Al Rukn, President of the Emirates Neurology Society and neurologist at Rashid Hospital, discusses how aerobic exercise is just as good for the brain as it is for the body

By Kamakshi Gupta, Communications Analyst at Dubai Health Authority

Forget exercising to fit into a dress size—look at that as a coincidental benefit. New research now suggests that exercise causes changes in the brain that boosts memory and thinking skills. Additionally, let us not forget, exercise reduces the odds of developing a battery of lifestyle diseases: diabetes, blood pressure, stroke.

However, you probably know by now that the health benefits of regular exercise and physical activity include helping you lose weight, boost your mood, is healthy for your heart and reduces your risk of developing chronic diseases. But, if like most people, that is not motivation enough, perhaps a compelling reason would be facing the fact that exercise can get the brain working better. After all, who wants to deal with brain fog when you are old, right? Old age comes with its own set of health issues. If we can protect our minds; let us start the marathon today, literally.

In a study done at the University of British Columbia, researchers found that regular aerobic exercise seems to boost the size of the hippocampus, the brain area involved in verbal memory and learning. Resistance training and other exercises do not have the same results. Researchers from the University also pointed out that physical activity is associated with a reduced risk of Alzheimer's disease and that regular physical activity may improve the performance of daily activities for people afflicted with the disease.

At a time when dementia is highly prevalent and it is estimated that by the year 2050, more than 115 million people will have dementia worldwide, this study seems extremely pertinent.

According to a top neurologist in Dubai, Dr Sohail Al Rukn, President of the Emirates Neurology Society and neurologist at Rashid Hospital, Dubai, UAE, "Exercise is known to help brain health and over the years,



Dr Sohail Al Rukn, President of the Emirates Neurology Society and neurologist at Rashid Hospital, Dubai, UAE

research after research is reinforcing the same thing. It is a known fact that parts of the brain that control thinking and memory (the prefrontal cortex and medial temporal cortex) have greater volume in people who exercise versus people who do not."

Dr Rukn adds, "Exercise fosters the release of chemicals in the brain that affect the health of brain cells; it helps stimulate blood vessels in the brain, and even helps in developing new brain cells. Brain health decreases as we get older. Since aerobic exercise increases hippocampal volume, it can help maintain brain age."

If this does not get you running, maybe knowing that exercise will put you in a good mood will. "Exercise also helps the body release chemicals called endorphins," says Dr Rukn. "Endorphins also trigger a positive

feeling in the body. Regular exercise is known to improve your mood, reduce stress, reduce anxiety and even depression, and improve sleep."

The golden question is what type of activity or exercise should one follow. Dr Rukn says, "This research talks about aerobic exercises and while that is important, it is good to mix up your exercise to include resistance training etc so that the workout is balanced. This will help achieve overall good health.

"This research has looked at walking and participants walked briskly for one hour, twice a week. However, it is important to note that this was for research purpose. General recommendation is half an hour of moderate physical activity most days of the week, or 150 minutes a week."

Dr Rukn adds: "There are so many options for aerobic exercises and if individuals have other health problems it is best to seek a doctor's advice before chalking out an exercise regime."

Walking, running, swimming, cycling, rowing, boxing, kickboxing, and dancing are all different types of aerobic exercises that can provide a host of health benefits.

Discussing the importance of setting the right kind of goals when it comes to exercise, he says, "I think there needs to be a mindset change, especially in terms of understanding the right reasons for exercising. The younger generation seems to be hooked on to achieving a certain body shape, size, etc and while it is good to have goals, I think it is better to think of making exercise a regular habit. Once that is achieved, getting into shape, or improved physical and mental health become incidental."

He adds a word of caution: "While exercise is important, healthy nutrition, mindfulness and adequate sleep also go hand-in-hand. Opt for whatever motivates you but commit to establishing exercise as a habit, think of it like prescription medication." **AH**

Sysmex Middle East in MedLab exhibition 5 – 8 February 2018 in Dubai-UAE. Thank you!



Sysmex is creating new opportunities, involving more and more stakeholders, and increasingly getting to the root of the core issues our healthcare clients face.

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products and the new era in oncology, urinalysis and flow cytometry. It was a clear demonstration that Sysmex is truly shaping the advancement of healthcare and helping you, our customers, to stay ahead.

We hugely enjoyed the time building a closer link with you. Thank you for being part of our journey!



CUTTING-EDGE ENDOSCOPIC procedures improve patient outcomes

Cleveland Clinic Abu Dhabi conducted its first Peroral Endoscopic Myotomy (POEM) procedure – the first in the Middle East region – in 2015, and has since gone on to treat more than 11 cases of Achalasia, nine of which have been among UAE nationals

By Matthew Kroh, MD, Chief of Digestive Disease Institute, Cleveland Clinic Abu Dhabi

The introduction of a raft of cutting-edge non-invasive endoscopic procedures to the Middle East has been made possible over the last three years by Cleveland Clinic Abu Dhabi.

As the Middle East's leading multispecialty healthcare facility, the hospital is the first in the region to introduce new endoscopic techniques such as Peroral Endoscopic Myotomy (POEM), a procedure to counter the effects of the rare swallowing disease achalasia; and Peroral Endoscopic Pyloromyotomy (POP) to treat gastroparesis – a condition which stops the stomach from emptying properly.

Only a limited number of medical centres across the world are equipped with the expertise and experience to offer these forms of endoscopic treatment which are seen as a less-invasive alternative to open and laparoscopic surgery.

POP and POEM are part of a wave of recently introduced endoscopic procedures which have been changing the way many serious gastro-intestinal conditions are treated in the UAE and wider region.

Endoscopy

Since the 1970s, doctors have been using endoscopes, flexible tubes that can be passed through the mouth or rectum to cut away lesions of the gastrointestinal tract.

Endoscopes allow physicians to examine and operate on the surfaces of the esophagus, stomach, intestine and colon without making a surgical incision allowing for faster recovery and shorter hospital stays.

In 1971, two doctors named Shinya and Wolff described what was then a new method for removing colonic polyps using an endoscope inserted through the colon. In their research, they found that among 303 patients, all of whom had colonic polyps removed using the new technique, no patients died in the following two years and few developed other chronic conditions. The research heralded a new era in endoscopic surgical therapy.

Since then, doctors around the world have been regularly using endoscopes to remove polyps. Today, removal of large lesions using endoscopic surgery is increasingly used throughout the gastrointestinal tract.

And yet, as recently as the 1990s and early 2000s, attempts to use the technology to perform more complicated surgeries purely using natural orifices and without the need to make any external incisions had been met with resistance by a number of medical professionals.

Resistance came from general surgeons who were not used to using an endoscope and were concerned that the endoscopic techniques could cause conditions where stomach juices leaked from the stomach and intestines.

Gastroenterologists also shied away from using the new techniques at first because they were not familiar with general surgical principles and didn't feel comfortable performing many of the new surgical procedures.

This new development also coincided with new advances in keyhole surgery in which surgeons use a laparoscope to make small incisions of between 0.5 cm and 1.5 cms wide, often in the abdomen, diverting many surgeons' attention away from advances in endoscopic surgery.

Undeterred, proponents of endoscopy continued to develop new techniques using ►



Matthew Kroh, MD, Chief of Digestive Disease Institute, Cleveland Clinic Abu Dhabi

the rapidly evolving technology, enabling them to tunnel into the muscle walls of the esophagus, stomach and guts.

The non-surgical approaches are based on techniques pioneered in Japan and involve using an endoscope to tunnel into the dense, irregular connective tissue which joins the outer layer of mucous membrane to the muscle of the esophagus, stomach and intestines.

Peroral Endoscopic Myotomy (POEM)

One of the first of these was Peroral Endoscopic Myotomy (POEM), an endoscopic procedure where surgeons cut away at the inner layer of muscle near the lower esophageal sphincter to help patients who have developed a rare condition called achalasia, where the muscles at the top of the stomach have become too tight, preventing food from passing into the stomach. POEM is increasingly becoming accepted practice for patients suffering from achalasia.

Cleveland Clinic Abu Dhabi conducted its first POEM procedure – the first in the Middle East region – in 2015, and has since gone on to treat more than 11 cases of Achalasia, nine of which have been among UAE nationals.

With experts estimating that the rate of achalasia among the world population standing at far less than one per cent, doctors at Cleveland Clinic Abu Dhabi are currently investigating why the incidence of the disease in the UAE seems relatively high. The hospital is calling for other hospitals in the region to pool their numbers so that it can get a better understanding of how widespread the disease is in the region.

The development of POEM has also given the field of therapeutic endoscopy a new vigour, prompting a number of new developments.

Per-oral pyloromyotomy (POP)

The new techniques also include a recently introduced surgery known as per-oral pyloromyotomy (POP), an endoscopic procedure where surgeons perform a similar operation, using a submucosal tunnel to cut away at the pyloric sphincter muscle between the bottom of the stomach and the top of the small intestine. This is used to relieve the symptoms of gastroparesis, a debilitating and chronic digestive disease where the stomach does not empty properly.

Among these procedures, POP – dividing the pylorus using endoscopy in order to relieve the symptoms of gastroparesis – potentially has some of the most far reaching benefits.

Gastroparesis is a disease which stops the stomach from emptying properly, usually due to either end stage diabetes, surgery or other medications. Experts estimate that around 5.2 per cent of people with type 1 and 1.0 per cent with type 2 diabetes have the condition. It can occasionally also occur spontaneously with no known cause, although this is likely to happen for women 37.8 times per 100,000 people and for men only in 9.6 cases per 100,000.

Gastroparesis is diagnosed by studying the gastrointestinal tract to check whether the stomach is emptying. If doctors cannot find any obstruction or ulcer, they confirm the diagnosis by using what is known as a gastric emptying study. This usually involves the patient eating a meal in which the solid component of the meal (for example scrambled eggs) is mixed with a small amount of radioactive material. A scanner, acting like a Geiger counter, is then placed over the patient's stomach to see how quickly the radioactive material empties from the stomach.

Patients diagnosed with gastroparesis are at first given advice on modifying their diets and drugs to help them digest food better. But, the progressive nature of the disease and the fact that many of the drugs used as promotility agents become less effective over time, leads patients to search for other options to relieve their symptoms.

Currently these include everything from injections of botulinum toxin (botox); placing a stent – a small mesh tube – inside the muscle between the stomach and

the duodenum; inserting a device in the abdomen which sends mild electrical pulses to the abdomen to aid gastric emptying; or performing keyhole surgery using a laparoscope to cut away at the muscle. Yet all of these procedures have some drawbacks.

During a POP procedure, surgeons inflate the stomach with carbon dioxide gas and then tunnel beneath the mucosa membrane at the bottom of the stomach until the pylorus muscle is exposed. The muscle fibres of the pylorus are then divided and the endoscope removed from the tunnel. The tunnel is then closed with endoscopic clips and the endoscope totally removed.

Further study is needed

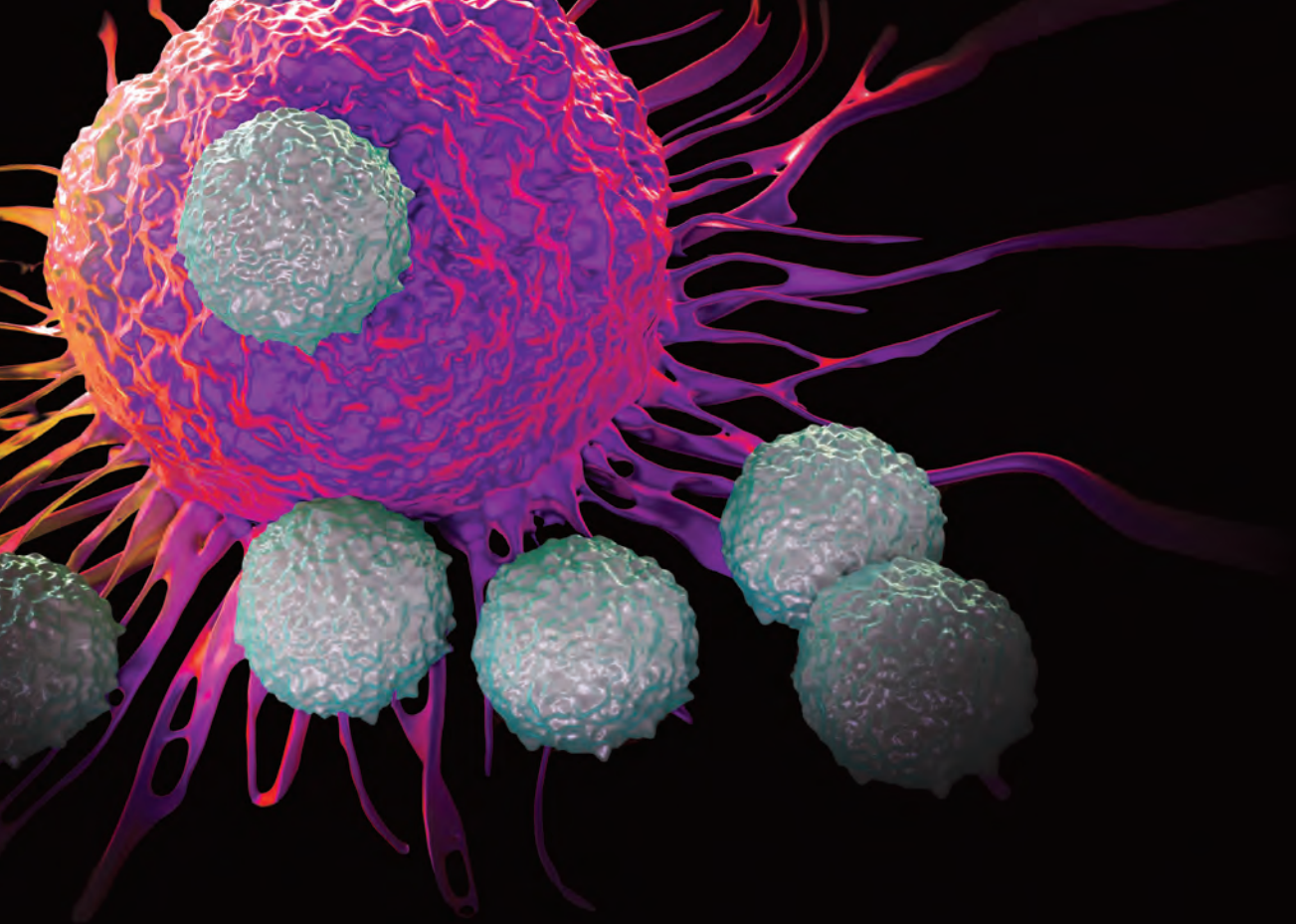
Although further study is needed to assess the long-term outcomes for patients who have undergone POP procedures, the results so far have been positive. Doctors working at both Cleveland Clinic and Cleveland Clinic Abu Dhabi have completed 57 POP procedures without seeing any post-operative leak or obstruction. The average amount of time it takes to perform the procedure is 41 minutes and most patients questioned after the procedure have reported improved symptoms.

And, with support for both POP and POEM procedures growing in the region and around the world, doctors are now looking at ways of using the new techniques to treat other gastrointestinal conditions such as gastroesophageal reflux disease (GERD), constipation and tumours.

By tunneling into the submucosal wall, surgeons may also have the chance to take targeted biopsies from the gastrointestinal area, implant tiny monitors, or to insert patches which slowly release drugs directly into the affected area.

This type of innovative surgery is also likely to usher in a new way of surgical thinking. In the past surgeons have been loath to avoid perforations which can get infected and cause leakage. Using the new technique, the tunnel is sealed by closing the mucosal defect, meaning that there is less chance of leakage and infection.

And so, as the world looks on to see how the next phase of cutting-edge non-invasive endoscopic procedures will develop, we at Cleveland Clinic Abu Dhabi hope that surgeons in the Middle East will be able to play a major role in advancing this field of medical technology. **AH**



FDA APPROVES HISTORIC CANCER BREAKTHROUGH

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Weight Recidivism after Sleeve Gastrectomy

THE ELEPHANT IN THE ROOM

Although the popularity of sleeve gastrectomy is likely attributable to its effectiveness for short-term weight loss, several studies have demonstrated that weight recidivism during subsequent follow-up beyond twelve months could be substantial. The underlying causes leading to weight regain are multi-factorial and are either patient- or anatomy-related

By Yen-Yi Juo, MD MPH, Resident Physician, Center for Advanced Surgical Interventional Technology (CASIT), Department of Surgery, University of California Los Angeles (UCLA) and Dr Erik Dutson, Surgical Director, Center for Obesity and Metabolic Health, Ronald Reagan UCLA Medical Center, Los Angeles, California



Morbid obesity is as much a public health crisis in the Middle East as in the United States. The 2017 World Health Organization (WHO) report on obesity showed that countries in the Arabian Gulf have the highest incidence of obesity in the 30% plus group in the world. The 2014 International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) world survey showed that Kuwait has the highest prevalence of bariatric surgery case volume of the national population (0.16%), in contrast with a worldwide average of 0.01%.

As in the United States, laparoscopic sleeve gastrectomy has recently overtaken Roux-en-Y gastric bypass (RYGB) as the most commonly performed bariatric procedure in the Middle East.

Besides its technical simplicity, the popularity of sleeve gastrectomy is likely attributable to its effectiveness for short-term weight loss, with one-year excess weight loss (EWL) ranging from 69.7% to 83%. In addition, it has been shown to produce durable remission of type 2 diabetes and other obesity-related comorbid conditions and leads to substantial improvement in quality of life. Similar short-term results have been described between bariatric surgical centres in the Middle East and United States.

However, laparoscopic sleeve gastrectomy has only begun to be performed as a stand-alone procedure since 2008 and it has gained its popularity before its long-term outcome data has been established. Recently, several studies have demonstrated that weight recidivism during subsequent follow-up beyond twelve months could be substantial. Following the first postoperative year, studies have reported stabilisation and slow upward trend in the weight gain in the order of 0.5 to 1.5 kg/m² among laparoscopic sleeve gastrectomies. The incidence of weight recidivism ranged from 5.7% at 2 years to 75.6% at 6 years. In addition, weight recidivism has been found to be associated with re-emergence of diabetes, and incremental economic costs.

Currently known etiologies for weight recidivism can be broadly categorised as either patient- or anatomy-related. Patient-related factors include lack of adherence to postoperative diet, physical inactivity, endocrinopathies, changes in gut

microbiome, brain structural connectivity, unrecognised and untreated eating and psychiatric disorders. While there is a paucity of data demonstrating effective prevention of weight recidivism with preoperative information, nutritional and psychological evaluation and follow-up, more research is needed to understand how lifestyle and mental health factors drive weight recidivism.

In addition, recently reported classification algorithms of brain imaging based on white-matter connectivity involving regions of the reward and associated networks may be high-value research targets for developing a prediction model for patients at risk for weight recidivism following sleeve gastrectomy.

The second category of etiologies is anatomic: it has been observed that the sleeve size is linearly correlated with post-operative body mass index, leading some researchers to speculate that weight recidivism may be attributed to a compromised restrictive effect of the surgery. Besides technical factors during the initial surgery, such as varying bougie size, preservation of fundal and antral remnant, it has also been found that the gastric sleeve gradually dilates over time. In view of these findings, current revisional surgery mainly consists of returning the anatomy to a desired bariatric configuration by sleeve resizing, conversion to RYGB, or secondary sleeve banding. However, if patient-related factors were not addressed following failure of the primary operation, then the revisional surgery will be at elevated risk to fail, too.

While weight recidivism is well recognised, literature specifically examining this as a complication is sparse. Few studies report weight recidivism incidence as a specific complication. The lack of attention devoted to the issue in current consensus statement and reporting guidelines lead to widely variable definition of the phenomenon. Definitions ranged from weight regain greater than 10 kilogrammes from the nadir, an increase in BMI of 5 kg/m² or more above nadir, regaining BMI to greater than 35 kg/m² after successful weight loss, to percentage of rebound in excess weight loss greater than 25%. This lack of consistency in definition lead to challenges for synthesizing and comparing outcomes

between research studies.

Early literature on weight recidivism after sleeve gastrectomy mainly consisted of revisional bariatric procedure case series after failed sleeve gastrectomy. However, these frequently confused insufficient weight loss, i.e. never achieving more than 50% excess weight loss, with weight recidivism, two distinct entities likely to have different etiologies. In addition, the lack of a denominator led to difficulties characterising the incidence and risk factor of the phenomenon.

Recently, several studies have emerged reporting long-term outcomes following sleeve gastrectomies. Even among these long-term case series, body weight loss is frequently analysed with survival analysis methods where reaching the desired excess body weight loss is treated as a one-time irreversible event, thereby excluding patient from further analysis, where weight recidivism could and frequently do occur. In order to obtain meaningful synthesis of experiences from different institutions, it is critical that weight recidivism be defined, described and reported in a standardised manner in accordance with guidelines published by an authoritative organisation, such as the American Society for Metabolic and Bariatric Surgery (ASMBS). The correct naming and acknowledgement of the phenomenon is the first step towards identifying risk factors and devising effective counter-measures to the problem.

In summary, weight recidivism is a commonly recognised but infrequently discussed complication following sleeve gastrectomy. While laparoscopic sleeve gastrectomy has demonstrated its efficacy for durable weight loss up to one year, recently emerged data suggested that the procedure's associated weight loss frequently peaks at the one-year point and a considerable proportion of patients experienced weight regain during subsequent follow-up. Considerable variability in the definition and reporting practices of this phenomenon exists in the literature, precluding a systematic synthesis of experience across various centres. Future efforts should be directed toward standardising definition of this complication in order to allow optimisation of patient selection criteria and treatment choice for revision surgery. **AH**



SURGICAL MANAGEMENT OF OBESITY

By Prof Aayed Alqahtani, MD, FRCS, FACS, Professor and Consultant of Obesity & MIS Surgery Obesity Chair, Department of Surgery, College of Medicine, King Saud University

Weight loss surgery is now an accepted solution for morbid obesity and obesity with uncontrolled type 2 diabetes. While these are not diseases that are restricted to adults, severely obese children and adolescents are often denied bariatric surgery because of unproven fears. Historically, these included concerns over the growth of children, the nutritional impact, unforeseeable long-term complications, as well as their ability to consent to have tissue removed or re-arranged.

While such concerns are debated, children with severe obesity continue to suffer from this crippling disease. Proceeding unhindered, it induces major irreversible consequences. The long-term effects of paediatric obesity have been well-documented in many longitudinal studies, such as the Bogalusa Heart Study and national data from several countries around the world. These effects include the development of type 2 diabetes, renal impairment, non-alcoholic fatty liver disease, obstructive sleep apnea, early onset of atherosclerosis, and many other obesity-related diseases. Moreover, studies have

found that childhood obesity is associated with a quality of life that is similar to that of children with cancer. In short, severe childhood obesity has serious life-threatening pathologic and psychological consequences.

Specialists classically opt for lifestyle and nutritional recommendations when treating severe childhood obesity. However, these methods have been repeatedly proven to cause insignificant weight loss at best, and no programme has been shown to cure diabetes or the metabolic syndrome. On the other hand, bariatric surgery is a proven cure for morbid obesity and related diseases. However, it is not widely adopted for children and adolescents.

In our center, we realised the profound consequences of childhood obesity and started to offer weight loss surgery for children and adolescents whose health fails to improve otherwise. We established a comprehensive multidisciplinary programme that involves paediatric endocrinologists, a bariatric surgeon, nutritionists, behavioural therapists, physical therapists, bariatric nurses, and coordinators who counsel each patient and monitor their progress. Every month, we hold a family-focused workshop for new patients and their families where the endocrinologist, the senior nutritionist, the behavioural therapist and a health educator give talks and host interactive sessions (Figure 1). We provide examples of poor practices, substitutes of common unhealthy choices, hands-on training on preparing healthy meals, and physical education lessons are also conducted. Each patient is then regularly seen in the clinic according to their health category.

We follow specific criteria for recommending bariatric surgery to a patient (Figure 2). We started offering laparoscopic adjustable gastric banding (LAGB) in 2005 owing to the fact that this is a minimally invasive, completely reversible procedure. However, long-term results with this procedure were not acceptable. Studies have shown that up to 60% of patients with gastric bands develop complications necessitating revision. Our centre's studies on gastric band conversion to sleeve gastrectomy (LSG) showed that weight regain and poor weight loss account for more than 70% of reasons for conversion, with the remaining patients having band slippage, erosion, or device failure. Consequently, we gradually dropped gastric banding in favor of LSG as a recommended option for children and adolescents with severe obesity.

LSG rapidly gained preference worldwide

because it offered superior weight loss to gastric banding, but with morbidity risks and surgical complexity compared to Roux-en-Y Gastric Bypass. Additionally, gastric bypass complicates abdominal anatomy, posing a challenge during future revisions, abdominal surgery, and endoscopy.

For LSG, patients are positioned in the reverse Trendelenburg French position and a five-trocar approach is used. The abdominal cavity is insufflated with to a pressure of 15 mmHg using a 10 mm optic port placed at or within a variable distance above the umbilicus based on the patient's age. Two 5mm trocars are inserted on the right side, one 5mm trocar is inserted in the midline few cm below the xiphisternum to assist in liver retraction, and one 12mm trocar is inserted on the left side. A nasogastric tube is inserted to deflate the stomach. The greater curvature is then freed close to the gastric wall, beginning from approximately 2 cm proximal to the pylorus and extending to the angle of His using a Ligasure™ (Covidien, Medtronic, USA) or Enseal™ (Ethicon, Johnson & Johnson, USA) device. The left crus is then dissected and the angle of His is delineated. Posterior adhesions to the pancreas are lysed. A 36-Fr calibrating tube (34-Fr for patients below the age of 12) is placed transorally and carefully advanced through the pylorus to the duodenum. At 2-3 cm from the pylorus, the stomach is divided using a linear stapler (Echelon 60™). A green load (4.1mm) followed by gold (3.8mm) and blue loads (3.5mm) are used for all patients except for those younger than 12 years with thinner stomachs, where only gold and blue loads are used. There is no routine staple line reinforcement or routine testing for leak or drain placement. The left 12mm port is slightly enlarged using a Kelly clamp. The resected stomach is extracted through this port site and the site is closed using the Endo Close device (US Surgical™). Wound sites are sutured and patients are extubated while awake. Children and adolescents with pre-booked ICU beds are sent to the ICU depending on their breathing effort and oxygenation during and after extubation.

The children and adolescents who undergo bariatric surgery spend an average of 19 months on the standardised nonsurgical weight management protocol before undergoing LSG at our center. Our latest statistics show that 1,341 children and adolescents underwent LSG. The mean age of

those who had surgery was 16.2 ± 3.9 years, and 187 patients (12.5%) had type 2 diabetes.

When we aimed to identify whether there were any valid concerns against offering bariatric surgery to young children with severe obesity, we analysed outcomes of up to 5 years of follow-up from 724 children and adolescents. About 40% (n= 302) of those patients underwent LSG at our center, and the remaining patients maintained non-surgical weight management. We divided the cohort according to baseline age and whether or not the patient had surgery. We compared growth, weight loss, co-morbidity resolution, and compliance to follow-up in surgical children and adolescents, and a matched group of children who did not undergo surgery. There was no significant difference in weight loss, co-morbidity resolution and complication rates after LSG comparing children with adolescents. Strikingly, the children who underwent LSG experience a significantly higher growth rate compared to those who ►

▼ **FIGURE 1:** Family-focused workshop with educational sessions (A), and Hands-on training (B)



▼ **FIGURE 2:** Flowchart describing the eligibility and the team members of the multidisciplinary paediatric bariatric surgery programme employed at the King Saudi University Obesity Center



did not (Figure 3). This led us to conclude that severely obese children who undergo LSG might experience an improvement in growth, contrary to the opinion that bariatric surgery may stunt the growth of children.

Our previous studies include our assessment of co-morbidity resolution after LSG in children and adolescents. In a study published in 2014, we documented the remission and improvement of type 2 diabetes, dyslipidemia, obstructive sleep apnea, and hypertension in more than 90% of cases (Figure 4).

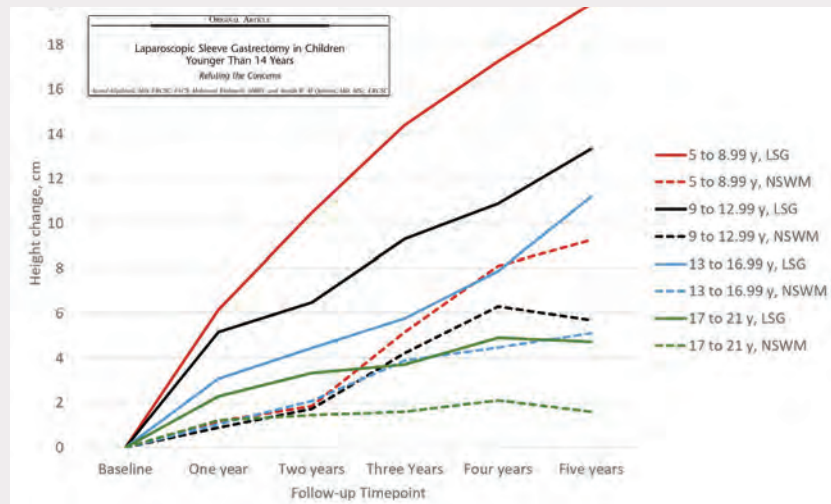
We previously compared the outcomes of LSG in 108 paediatric patients with 114 adults who had the procedure under a standardised protocol. The paediatric arm had a 30-day complication rate of 5.6% with no major complications. The adult arm had a complication rate of 7% with three major complications. At the end of two years of follow-up, the paediatric and adult arms achieved similar average excess weight loss results (64.9% for children and 69.7% for adults). Additionally, the paediatric patients showed significantly better compliance to follow-up, possibly owing to the fact that the multidisciplinary programme in our center is family-based, and stresses on the importance of having a caretaker from the child's family.

As for bariatric surgery in children and adolescents with syndromic forms of obesity. We previously published results on LSG in patients with Prader-Willi, Bardet-Biedl, Klinefelter and Alstrom syndromes. Results confirmed that those patients lose significant weight loss and resolution of comorbidities with no mortality or significant morbidity. Moreover, we closely reviewed our data on 25 children and adolescents with Prader-Willi syndrome. No mortality or excess morbidity after LSG was observed, and the children had significant weight loss and resolution of co-morbidities for the five years of study.

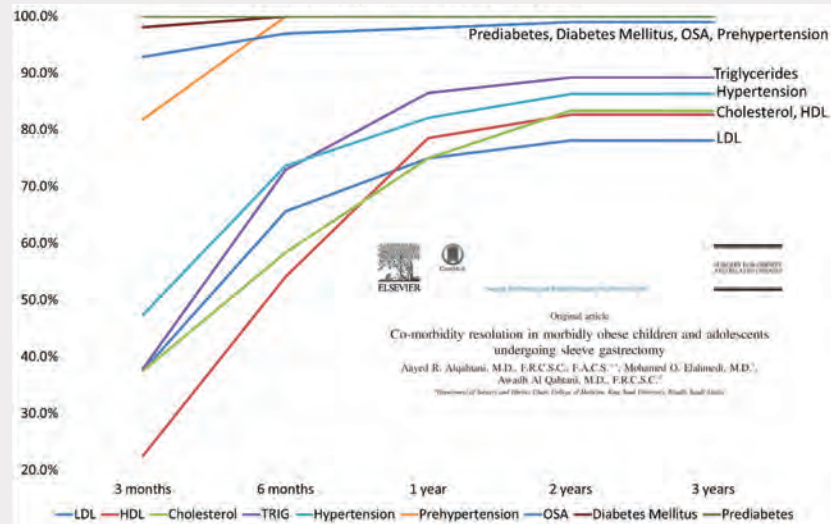
We believe that LSG is the most suitable bariatric procedure for severely obese children and adolescents. Our studies have shown that it is safe and effective in patients from all age groups including paediatric patients as young as five years old.

While bariatric surgery is slowly being adopted worldwide for severely obese adolescent patients, children younger than 14 years of age are still denied this option. We hope that current and future evidence convinces policymakers and specialists to adopt this solution for younger children. **AH**

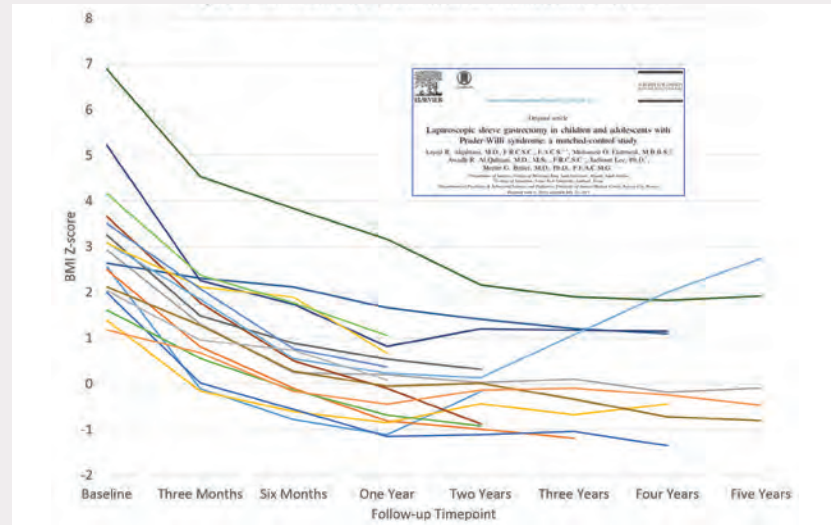
▼ **FIGURE 3:** Mean Height Change after LSG in Different Paediatric Age Groups Compared to Matched Non-Surgical Weight Management Controls



▼ **FIGURE 4:** Cumulative remission and improvement rates of different co- morbidities after LSG in severely obese children and adolescents



▼ **FIGURE 5:** BMI Z-score after LSG in severely obese Prader-Willi children and adolescents who underwent LSG



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Building Iconic HEALTHCARE BRANDS

By Sandeep Sinha, Vice President, Transformational Health Practice, Frost & Sullivan, and Vivek Shukla, Director - Transformational Health Practice - Middle East, North Africa and South Asia, Frost & Sullivan

Building a strong brand for your business happens by design and not by accident. Healthcare is no exception.

The biggest names in healthcare at the global or regional level have not attained the spot owing to a stroke of luck. The narrative is engineered and the elements that represent the name are carefully crafted. People who work there take pride in the brand they represent. Patients who use the services have stories to tell about their experiences.

A brand has a distinct positioning and is palpably consistent in displaying it across all communications and visuals year after year. Unfortunately, many potentially great brands in healthcare never go beyond a tagline or a nice logo. Some even fail to reach that far. With not many exemplary brands in healthcare, we see numerous opportunities for building healthcare brands squandered away by the stakeholders.

Brand and communications departments in these organisations is tucked in a corner and given the task of producing advertisements, brochures, some press releases, etc. from time to time. The brand people are seldom in touch with the ground realities their business is facing. They are

alienated from the core operational realities and are confined to their own boxes. Communications are created to please the top bosses and not to create a high-performing brand.

Employees in these organisations work for a salary or at the most work for a department and not for the philosophy behind the brand. Patients come for a popular physician or because they have limited options. The facilities are managed on 'ad-hoc opportunism' and the focus is usually short term. These players will never reap the benefits of being a brand. Their existence will be consumed by short term fire-fighting until they close shop or are acquired.

Reaching a colossal stature as a brand requires a very different approach. Leaders and managers need to own up brand building and every employee needs to be turned into a brand ambassador. Like Rome, brands are not built in one day. It takes massive perseverance to garner respect of peers and patients.

Over the years, having worked with numerous healthcare players, we are attempting to articulate the best practices that aid in building iconic brands. Here is a short list of what can be done to grow your brand.

Start with Inside-Out

Brands have to be genuine. They cannot pretend. The personality of a brand has to be consistent with the core ideology of the organisation. We have seen the values and principles of the founders and the top management percolate into various aspects of the brand. Hospitals or groups founded by skillful practicing clinicians have a different brand appeal than the hospitals or groups founded by corporate houses. Hospitals where the founders are academically oriented end up as different brands than the ones where the promoters are driven by profits.

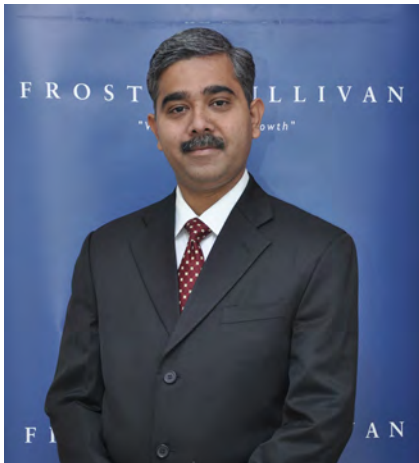
Iconic brands start right. They identify their core and build it from there. They articulate what is important for them and carefully pass on the legacy to the internal stakeholders. They make sure that the overall outlook of the brand stays consistent with the internal philosophy.

Then Think Outside-In

What you stand for and who you are has to be relevant to the target audience. A brand about the latest technology cannot just harp about machines. Having the latest robot for surgery is insufficient when it comes to building a brand. Unless the benefit to the end user is not highlighted, the brand story ►



Vivek Shukla, Director - Transformational Health Practice - Middle East, North Africa and South Asia, Frost & Sullivan



Sandeep Sinha, Vice President, Transformational Health Practice, Frost & Sullivan

is not born. Too often, a great potential brand fails to take off because it does not connect the inherent features with end benefits.

Differentiate. Differentiate. Differentiate

This is as fundamental as it gets. Differentiation is the foundation for any brand story. As one brand guru once said – ‘Being different is better than being better’.

There are too many ‘also ran’ brands in the healthcare market. This is an area that requires massive improvement. In surveys, when we ask about how one provider is different from others, we find that most healthcare players in the region have not done a great job of differentiating themselves. Point of parity and points of differentiation need to be clearly defined, both for internal use and in the minds of the

target audience.

The basis of differentiation can be many. However, differentiation is a moving target. Whatever is unique about you today may not be relevant tomorrow or may get copied by a competitor. Brands need to pre-empt that and calibrate their USPs accordingly.

Differentiation has to be radical rather than incremental. It should be scalable and difficult to replicate. Additionally, the points of difference cannot be based on what people would already expect. For example, empathy can rarely be a differentiating factor in healthcare. People already expect the doctors and nurses to be empathetic. There are no additional brownie points for ticking this box in a brand experience. However, if a provider fails to achieve this, they will draw considerable flak.

Win the Internal Battle

This is where philosophy translates into action. Internal buy-in is paramount to building iconic brands. What is the point of a great creative put on a billboard on the freeway, if the front office in the hospital continues to carry a grumpy face while registering out-patients? The leaders and custodians of the brand have to take the trouble of introducing the brand to the internal constituents. Further still, they have to not only introduce, but also ensure that people imbibe the brand philosophy deeply. After all, in the end, if the brand is not delivered, there will be no brand.

To put it more clearly, it is more important to create the right culture for the brand delivery through people than to create great logos and brochures. This is one mountain that has to be scaled, no matter how treacherous or lofty it is. It is mandatory that one needs to put the house in order before we invite guests.

With people being on board, the brand needs to be profoundly delivered at each point of contact [POC] during the patient journey. Needless to say, the delivery has to be consistent across each POC and for each visit in each of the facilities that the brand represents. The consistency must be maintained over a long time, even spanning to years and decades. We have divided the journey into over 120 contact points starting from the website or the call centre. Miss out on one or more of these touch points and you end up compromising your most valuable

asset – Brand.

Doctors are the most important people when it comes to internal brand onboarding. The maximum value for a patient is unleashed upon meeting the doctor. This is one encounter the patient will replay in the mind many times over even after leaving the facility.

Marketing as a Core Function

Brand aspirants miss a point if they treat marketing as a support function. Marketing is as much a core function as operations or sales. Brand is the most valuable asset of a company, besides its people. It is everyone’s responsibility to nurture and grow the brand. The marketing department needs to be at the forefront of driving the all-important mission of creating and sustaining the brand. It must not be relegated to making leaflets and releasing adverts for quick revenue.

Bring marketing and sales into the thick of action. The teams must be a part of day-to-day decision making as well as strategic planning. In fact, the marketing team should be involved even in hiring doctors, training staff and customer relationship management. This would give the team access to building a brand.

Consistency in Communication

Iconic brands are almost fanatical about what they say and how they are portrayed in the outside world. They keep the words, imagery and messages consistent. They even attempt at evoking the same emotion each time they put something for the world to see. Needless to say, they are also equally meticulous when it comes to delivering patient experience. They map the expectations well and getting past those is a norm rather than an expectation.

Choosing the Agencies Carefully

A very important element in building a brand is the partner agencies hired to represent the brand at various platforms. It will be a fallacy to dream of creating a great brand and then hiring agencies based only on the lowest quote in the request for proposal [RFP]. Most agencies do not fully understand healthcare, and therefore, are unable to deliver good communication. In addition, management of these healthcare companies is unable to extract maximum output from the agencies due to lack of awareness.

Long-Term Horizon

Creating brands that can stand the test of time is a huge investment in terms of time and resources. Organisations perpetually fighting short-time fires and having a 'this month' or 'this quarter' horizon, cannot make it big. The idea is to balance the focus between issues that require urgent attention with the important endeavour of building a sustainable mega brand. Always have more than an eye on the mid-to-long-term trends and what people want.

Frequent House Keeping

Brands need to be groomed. They need to be pampered with attention from time to time. Some edges need to be re-sharpened and redundant elements need to be weeded out. There has to be an open debate on how the brand is being perceived, the competition, successes and failures, etc. among the internal stakeholders. The open debate must allow everyone to question every aspect of the brand, including the sacred and untouchable areas. Many brands do a systematic 'brand audit' every three to five years. This throws forth useful insights about where the tweaks are required in the overall brand story. Changes must be agreed upon and carried out in the pre-decided timeframe.

Discounts and Deals

One sure way of eroding a brand is to put discounts and deals every now and then. Consumers today know that the 20% discount offered on teeth whitening is because that department is not doing well. They also know that there will be attempts to up-sell once they walk through the door. Additionally, people attracted to discounts are 'price shoppers' and not 'brand shoppers' and will shift their loyalties as soon as the next deal is announced by someone else.

In short, when you give a deal for no particular reason, you also give away a part of the brand.

Measure

The popular adage, 'you cannot manage what you do not measure', is equally relevant in brand building. Numerous metrics must be tracked when it comes to brand building. From brand loyalty to awareness to preference to perception, many areas need to

be taken care of. The in-house brand team or the trusted agencies must be mandated to carry out frequent surveys on various aspects of the brand.

Besides surveys, focus groups, observation, in-house data mining, benchmarking, etc. also help in measuring the performance of a brand.

Saying NO

When brands try to be everything for everyone, they end up being no one. As a brand evolves, many opportunities come its way. An astute understanding of the brand

and its boundaries is required at this stage. Many growing brands wither away because the decisions are taken only with short-term revenue or profit in mind. This does great harm. Brands need to be guarded from being diluted. The purity of the basic values cannot be compromised for any short-term gain.

Healthcare can and will see more iconic brands in the years to come, both at the global and regional levels. Whether it will be your brand, this will hinge upon how much time and effort is invested in this all-important asset. **AH**



Breaking Boundaries

Having performed more than 15,000 cardiac operations and over 6,000 minimally invasive surgeries, and consistently having one of the lowest morbidity and mortality rates across the US, Dr Joseph Lamelas, Professor and Associate Chief of Cardiac Surgery at Baylor St Luke's Medical Center/Texas Heart Institute, is a pioneer in the most advanced forms of Minimally Invasive Cardiac Surgery.

By Sangeetha Swaroop, Contributing Editor

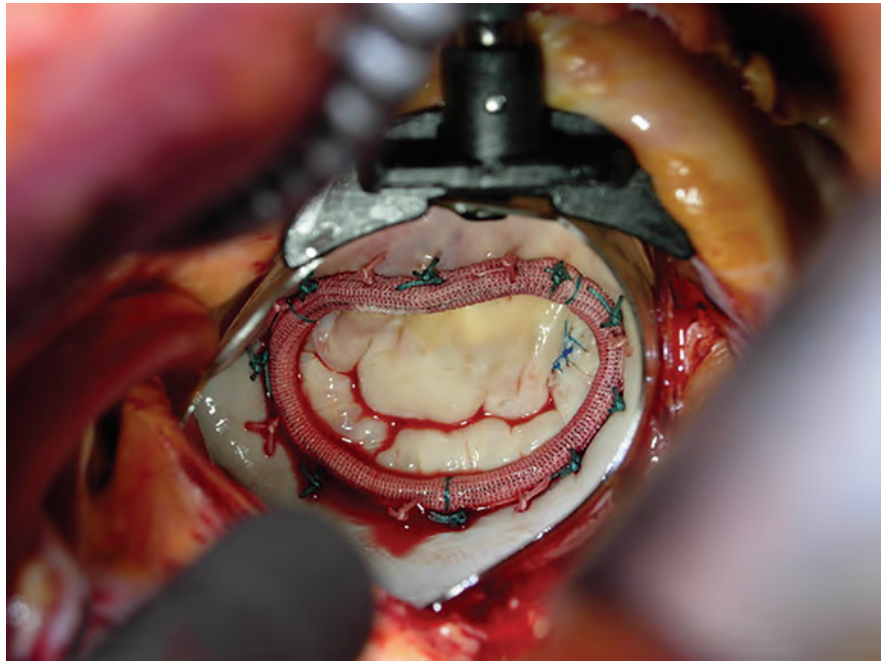


Even as a young child, Dr Joseph Lamelas recalls that he knew his calling in life would have “something to do with my hands”. Fond of painting and sculpture in his growing years in West Palm Beach and New York, he eventually specialised in general surgery and then in cardiac surgery which ultimately paved the way for his pioneering role in advanced forms of minimally invasive cardiac surgery. Thereafter, his dexterous operative techniques led to the development and subsequent refinement of the now popular ‘Miami Method’ for minimally invasive cardiac surgery.

Currently Associate Chief of Cardiac Surgery at Baylor St Luke’s Medical Center/ Texas Heart Institute, Dr Lamelas says that it was his desire to challenge his skills as a surgeon and improve patient outcomes by tapping into the new advances in the field of cardiac surgery that led him on the path of approaching surgery in an innovative way. “Around 2004, when I was practicing in Miami, there were several doctors across the US doing minimally invasive techniques in cardiac surgery. They all performed it in differently. With this background, I evolved and developed my own technique. Initially only performing the procedure on high-risk and extremely frail patients, I was intrigued to see the excellent results.”

Immediate and positive results encouraged him to perform the procedure on low-risk and asymptomatic patients who, he says, “fared even better.”

The so-called ‘Miami Method’ which Dr Lamelas has honed and is still evolving, is thus a Minimally Invasive Valve Repair and Replacement approach that was initially limited to the aortic valve alone. “It has since been expanded to facilitate minimally invasive approaches for repairing both simple and complex congenital cardiac defects, removal of cardiac tumours, mitral valve surgery, double and triple valve surgery, as well as replacing the ascending aorta without splitting the sternum,” he says. “Unlike the traditional method of fully opening the breast bone, the technique I have developed involves making only a small 2-inch incision on the right side of the chest, between the ribs, which gives access to and exposure of the heart chambers and valves. With this approach you don’t even have to break the ribs or go through the bone and there is



absolutely no manipulation of the heart.”

Amongst the most significant advantages of such a surgery is that because of less trauma to the tissues and the heart, patients require a shorter stay in both the ICU and the hospital and, return to a full and normal level of activity is far quicker. “Even with high-risk patients and those with multiple comorbidities, we have seen that the hospital stay is usually just 3 days, while a full recovery occurs within 2 weeks,” he says.

Dr Lamelas has performed more than 15,000 cardiac operations and more than 6,000 minimally invasive surgeries since he began his career as a surgeon in 1990. More than 500 cardiac surgeons worldwide have observed him in the operating room to learn about his advanced and innovative surgical techniques. He has also taught his surgical approach via live case demonstrations and through peer to peer courses.

Although minimally invasive surgery brings immense benefits to the patient, for the surgeons, this is seen as a challenging operation. According to Dr Lamelas, “Incorporating this new technique which involves viewing the heart from a different angle and with limited vision is not easy for surgeons who are accustomed to operating with the chest wide open. This brings a whole different perspective of the way the heart looks from a small incision and from the right side of the body. In addition, you need

specialised equipment and instruments that are so different from the conventional ones.”

The modified tools are quite long, which allow the reach needed to operate through a narrow opening. “It’s almost like working with really long chopsticks,” admits Dr Lamelas. “Therefore, precision and steadiness of hand are key to the success of the surgery.”

However, he believes that the technique he practices is still in a continuous mode of evolution. “I do not believe in perfection; there is no such thing as perfecting a skill,” he says. “The technique I started with in 2004 is vastly different from the way I do it today; it has evolved over time. For me, this has been a very interesting journey but at the heart of it is the idea that each improvement in the technique should conform to the primary goals of simplicity and reproducibility. There is no point in complicating a procedure that is meant to improve patient outcomes.”

One of the main challenges he faced in the early days was to create the tools and exposure devices to facilitate minimally invasive procedures as no medical device manufacturer was keen to support his ideas. “The concept took shape when a patient of mine, who happened to be an engineer, decided to implement my ideas into fruition. As a patient, he also wanted to give back to others, firmly believing that it could help more people with complex cardiac issues like ►

his," remembers Dr Lamelas.

The ensuing result was Miami Instruments, Inc., a collaborative venture for the design and development of new and innovative concepts and products for advancing the field of minimally invasive cardiac surgery.

Over the years, Dr Lamelas has consistently had one of the lowest morbidity and mortality rates in the US, drawing patients from around the globe to benefit from his expertise. "One important point that I have learned with this specific operation is that there is no room for error," he says. "Unlike the sternotomy approach, only a tiny area is exposed. Moreover, this is a very detailed operation where you are required to perform each step in its order; you cannot go back. Every day is therefore a learning curve, and every day I learn something new."

Surgeons should first be comfortable with general cardiac surgery before they embark on practicing the minimally invasive technique, he asserts, adding, it would take 50-75 operations before one begins to become proficient in both the technique and the procedure.

Surgery is not a science; it is also an art, believes Dr Lamelas. "As cardiac surgeons, we work on a three-dimensional object that is in a static state. We have to stop the heart to perform the surgery, and this in itself is one of the main challenges for a surgeon – for what you do to the heart in that state could take a completely different dimension when the heart starts pumping and becomes dynamic. Advances in imaging technology are therefore crucial for cardiac specialists as it guides us in how and what we do, and I believe, this vastly expanding field will help the cause of medicine in the future."

Born in 1960 in Cuba, Joseph Lamelas' parents emigrated to the US following the Cuban missile crisis, beginning their life from scratch in Miami where they settled down. Doing all forms of manual labour to support his family, the senior Lamelas constantly emphasised the importance of a good education. Having lost his house, wealth and all his hard-earned assets when he fled the country, he always insisted that 'Governments can take everything away from you, but they can never take away your education'.

"My parents are the pillars of my success," says Dr Joseph Lamelas. "Very early on in



*Dr Joseph Lamelas,
Associate Chief of
Cardiac Surgery at
Baylor St Luke's
Medical Center/Texas
Heart Institute*

childhood, they instilled in us the value of hard work and education, and I believe my work ethic comes from them. They had walked away from a comfortable life with just the clothes on their back, but their sheer determination and resilience helped them survive some very tough times. Working hard and challenging myself were traits ingrained in me from a very young age."

His wife, Shay, a nursing practitioner who assists him in his work, has been the perfect anchor to balance his personal and professional lives, he adds. "We have been working together for more than 20 years, and as she knows exactly what to look for in a patient before and after the surgery, her assistance is truly invaluable in the work I do. In fact, even over the dinner table, our conversations center around our patients!"

Dr Lamelas obtained his medical degree in the Dominican Republic and completed his general surgery residency at The Brooklyn Hospital Center in Brooklyn, New York, and his Cardiovascular and Thoracic Surgery residency at The State University of New York Health Science Center in Brooklyn, New York. After his training, he moved to Miami, Florida where he was in practice for 26 years. From 2008-2016 he served as the Chief of Cardiac Surgery

at Mount Sinai Medical Center in Miami Beach, Florida. It was in January 2017 that Dr Lamelas moved to Houston, Texas to join the Baylor College of Medicine, Baylor St Luke's Medical Center, Texas Heart Institute as the Associate Chief of the Division of Cardiothoracic Surgery.

"To serve in the same department once headed by Dr Michael DeBakey, the pioneer of modern cardiac surgery, is an extremely great honour," he says. "Together with my colleagues, I hope to be able to continue the legacy of the Texas Heart Institute and further develop my surgical techniques and pass on unique ideas and new skills to the next generation of surgeons."

Dedication to one's work is the most important quality of a surgeon, he adds. "Team it up with compassion and continuous education, and you have the perfect recipe for success in this profession."

His passion for cardiac surgery, explains Dr Lamelas, stems from the fact that "this is one of the few specialties where you can perform an extensive operation on a patient, and you see an immediate result the very next day. This, for me, ranks as the most immediate return on investment and definitely the biggest reward a surgeon can ever hope to achieve." **AH**

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EVOLUTION OF **RADIOLOGY**

By Dr Dinesh Chinchure, Consultant, Department of Diagnostic Radiology, Khoo Teck Puat Hospital, Singapore

Radiology is amongst one of the younger branches of medicine with a history of just over a century. Nevertheless, it has plenty to celebrate. The remarkable changes which it has brought to the medical field has revolutionised the way

medicine is practiced today. This article aims to look back at the evolution of this speciality and its initial interesting years. The rapid evolution in the field during the last few decades is also highlighted briefly.

It all began more than 120 years ago on 8th November 1895 in Wurzburg, Germany.

At the Physical Institute of the University of Würzburg, now the University of Applied Sciences Würzburg, Prof Wilhelm Conrad Röntgen (1845-1923) who was working with cathode ray tubes discovered a new type of rays that caused a fluorescent glow in crystals on an adjacent table.

For the next six weeks, he worked all alone cancelling all his other assignments to study this phenomenon. He called these unknown rays as "X-rays". Röntgen observed that these rays could pass through many objects including human tissues but not metal and bone. One of the first films obtained using X-rays was that of the hand of Röntgen's wife Bertha, who later remarked that she had a vague premonition of death after looking at the image of her bones seen through flesh. After completing his experiments with these new rays and documenting its basic properties, Prof Röntgen submitted his findings in a paper to the Physical Medical Society in Wurzburg and remarked: "Now, all hell can break loose."

Röntgen's prediction indeed came true and both the scientific community and media took a fancy to these new rays. Many scientists changed their research interests to study X-rays further. On the other hand, a few notable physicists in Europe doubted the existence of X-rays. Once the scientific community was convinced of its properties and with the German Physics Society affirming the experiments, the news soon spread wide and fast.

By January 1896, all the major newspapers and journals of repute including *Nature*, *Science* and *The New York Times* covered this remarkable discovery. In fact, *The New York Times* report dated 16 January 1896, predicted the "transformation of modern surgery by enabling the surgeon to detect the presence of foreign bodies."

Dr Henry Cattell, an American anatomist found applications of these rays in kidney stones and liver cirrhosis. He commented: "The surgical imagination can pleasurably lose itself in devising endless applications of this wonderful process." Many other newspapers and magazines soon started reporting about this new magical discovery. X-rays became part of popular culture with people from all walks of life including artists evincing keen interest. It was then thought that X-rays had supernatural power to see through things. A few enterprising businessmen cashed in on the people's anxiety and fear to market absurd products such as X-ray proof undergarments. As a value-added customer service, shoe shops in America began to use X-rays as a shoe-fitting aid. During the early decades of the 20th century, many people thought that X-rays could be used to detect human thoughts! Probably this is how the term 'X-ray

vision' to denote someone having foresight and acumen came into use.

Soon by 1897, however, the harmful effects of X-rays such as hair loss and skin burns came to be recognised. But the X-ray euphoria continued for a few more decades. Many scientists and physicians lost their lives studying ionising radiation and inadvertently getting exposed to these rays for prolonged periods. These radiation martyrs have contributed tremendously to the knowledge of X-rays and its effects. In later years the adverse effects were studied and protection devices were introduced. With improvement in technology, currently X-rays are very safe for diagnostic use when used appropriately.

As the scientific community continued the experiments with these rays, the medical community started using X-rays in clinical practice. One of the first uses reported was for the diagnosis of bone sarcoma in the leg of a young German boy and detections of bullets in the arms of wounded soldiers in Italy in early 1896. Later, in the first decade of the 20th century, the gastrointestinal system was studied using Bismuth as radio-opaque dye. This was further refined using barium compounds which revolutionised the practice of digestive system medicine for a very long time until in the last couple of decades when endoscopy came into practice.

Initially, X-rays were used only to detect dense structures such as foreign bodies and stones and in evaluation of bones. With improvement in X-ray equipment, soft tissues such as the breast began to be imaged using X-rays. Thus, mammography originated which is now an indispensable tool in screening for breast cancer.

The radio opaque dyes or contrast media, as they are appropriately called, were initially used to study the digestive system. The development of intra vascular contrast media was a major game changer in the field of radiology. This led to the use of X-rays in evaluation of the urinary system and blood vessels in different parts of the human body. Thus, a huge new field of angiography was born. Further evolution in this field led to the growth of catheter-based interventions. Stenting to dilate a diseased artery and embolization or blocking of a bleeding vessel are part of this field. This minimally invasive way to diagnose and treat pathologies is called interventional radiology and is applied in both vascular and many non-vascular body parts.

Another big development in the field of radiology was the use of X-rays and other rays in treatment of cancers. This field is called as radio therapy or radiation oncology whose origin can be ascribed to the discovery of X-rays by Röntgen. Another closely related branch and an off shoot of radiology is Nuclear Medicine which uses radio pharmaceuticals to image and get functional information from the human body. In recent years, the lines are getting blurred between these two specialities with the trend of fusion imaging such as PET-CT scanner.

The growth of modern imaging modalities

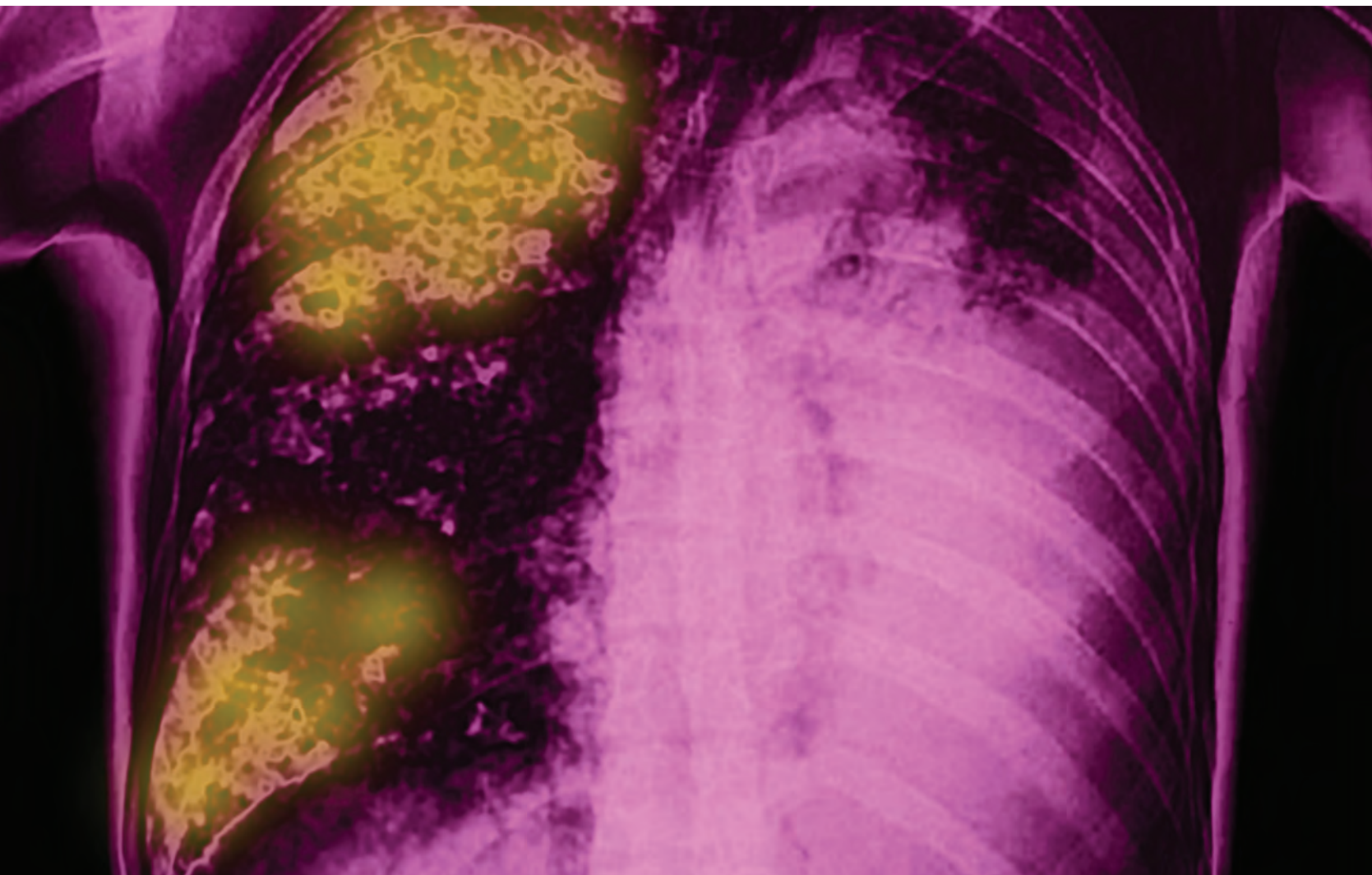
In the second half of the 20th century, particularly in the last three decades, there has been a paradigm shift in the practice of radiology with the advent of Ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) in clinical practice.

Ultrasound was a known scientific fact for many years before its first clinical use in 1970s. It is a safe imaging tool without the use of ionising radiation that images almost the whole body and also the foetus in a mother's womb. The latter use is one of the most important application of ultrasound or sonography. One of the key advantages of ultrasound is that it can be used at the patient's bed side.

The CT scan also came into clinical use during the 1970s in the UK. It was initially dedicated to head imaging only but with improvements in technology, imaging for "whole body systems" became available. The CT scan uses X-rays to create cross-sectional images of the body. One of the chief advantages of CT scan is its speed with the new generation scanners imaging large body parts in just few seconds.

Magnetic Resonance Imaging (MRI) came into wide clinical use in the 1980s. It is an advanced imaging modality with excellent resolution of different structures in the body and does not use potentially harmful ionising radiation.

This sums up, in short, the discovery of X-rays, its initial turbulent but eventful years and later growth of radiology as an important medical branch. The various imaging modalities are now central to patient care and have become so routine in modern clinical practice that now we cannot imagine a hospital without a radiology department. **AH**



ONCOLOGIC IMAGING IN CLINICAL CARE: A GLIMPSE INTO THE FUTURE

By Hedvig Hricak, MD, PhD, and Dr(hc) Ada Muellner, MS; Department of Radiology, Memorial Sloan Kettering Cancer Center, New York, NY, USA; and Michael Fuchsjäger, MD, Department of Radiology, Medical University of Graz, Graz, Austria

The role of imaging in clinical decision-making for cancer patients has been growing steadily for decades. However, the pace of change in imaging—as in all areas of medicine and science—is accelerating rapidly. Now, with emerging opportunities in the field, imaging is poised to become even more integral not only to cancer detection, diagnosis, treatment planning and follow-up, but to cancer treatment itself.

Here, we would like to highlight the need to develop the following key areas of imaging to help achieve value-based, precision cancer

care: molecular (primarily nuclear) imaging and therapy, interventional radiology, and radiology informatics.

The ability to image not just anatomy but actual molecular and cellular processes as they occur has long tantalised the medical community. Molecular imaging has existed for decades, but until recently, its growth has remained frustratingly slow. For many years after the advent of clinical positron emission tomography (PET), 18F-FDG remained the only PET tracer approved by the United States Food and Drug Administration (FDA) for clinical use.

For a number of reasons, however, progress in molecular imaging has recently begun to speed up, giving much cause for optimism that the field will fulfill its potential. A number of new tracers have recently received FDA approval, and dozens more are in clinical or pre-clinical trials. Unlike 18F-FDG—which is a marker for the elevated glycolysis that is a hallmark of cancer but not specific to it—many of the newer PET tracers are highly specific, targeting molecular entities such as prostate-specific membrane antigen (PSMA, which is over expressed in

prostate cancer) or estrogen receptors.

In addition, new probes and approaches for optical imaging, as well as the advent of combined PET/MRI and clinical hyperpolarized MRI (a technique that allows in-vivo assessment of chains of metabolic events), are adding still more dimensions to molecular imaging for pre-clinical research and clinical use. As a result, we are seeing more and more potential applications of molecular imaging in clinical decision-making for oncology, including selection of conventional as well as molecularly targeted treatments; dose-finding; and early assessment of treatment response.

With regard to the selection of treatments for precision cancer care, interventional radiology has a key role to play, particularly given its capacity to allow targeted biopsies. Acquisition of tissue samples adequate for complex molecular analyses is crucial for the appropriate selection of targeted therapies but is far from a given in many cases. For example, in the United States, analysis of the interim results of the National Cancer Institute Molecular Analysis for Therapy Choice (MATCH) trial of targeted therapies, in which patients were matched to treatments based on in-depth molecular analyses, found that around 13% of patients' biopsies were inadequate for this purpose. This realisation has catalysed research efforts to improve the quality of biopsies, bringing together tools and expertise from interventional radiology and other disciplines, including computer science. By enabling consistent, high-quality biopsies, interventional radiologists will have an opportunity to make their work increasingly central to value-driven, precision cancer care, particularly as the number of molecularly targeted treatments available grows.

Advanced interventional radiology suites now feature not only fluoroscopy but also hybrid imaging equipment, including combinations of cross-sectional imaging modalities such as CT, MRI or in some cases even PET/CT with single- or bi-planar angiography. Expanding the ability to characterise tissue biology via these modalities should enhance the capacity of interventional radiologists not only to perform optimal, biologically targeted biopsies but also to provide effective treatments. The use of molecular imaging in the IR suite has already been shown to aid target localisation and facilitate immediate assessment of treatment,

before the patient leaves the operating table. Because of its focus on minimal invasiveness, IR is ideally suited to address the goals of achieving precision and value/efficiency in cancer care. To ensure that IR contributes as much as possible to precision oncology, it is essential that we aim to integrate cross-sectional and molecular imaging modalities into IR suites whenever possible and that we develop IR physicians with the capacity to interpret these modalities.

Alongside the development of molecular imaging probes, the development of novel targeted radionuclide therapies and of theranostic agents that allow both targeted imaging and treatment has also been picking up speed. Examples include the development of Lutetium-177 (¹⁷⁷Lu)-DOTATATE, which has been found to lengthen progression-free survival in patients with advanced midgut neuroendocrine tumours; and the development of radiolabeled ligands of PSMA, which, in early clinical studies, have yielded highly promising results for the treatment of metastatic prostate cancer.

To fulfill the potential of radionuclide therapies and theranostics and maintain progress in these areas, it will be critical to dramatically increase the recruitment of physicians for training in molecular imaging and nuclear medicine and the availability of training programmes in these fields. Furthermore, we must work to increase both the supply of radiochemists and other personnel and the maintenance and expansion of the complex infrastructure necessary for advancing these fields.

Last, but not least, we would like to highlight the growing importance of radiology informatics to the success and advancement of oncologic imaging as well as biomedical imaging as a whole. Rather than being a source of support in scattered areas, it is destined to become a pillar of radiology practice. We are now in the era of the "fourth industrial revolution," in which the integration of disciplines and technologies, including machine learning and artificial intelligence, is leading to increasingly rapid innovation and the weaving of computer tools more and more deeply into the fabric of daily life.

Informatics tools for gathering and analysing data have the potential to monitor various aspects of daily radiological practice, facilitating efforts to improve both quality and efficiency. Furthermore, machine

learning and artificial intelligence can be used to extract additional, clinically relevant data from images and enable faster identification and characterisation of abnormalities. Therefore, informatics tools will clearly be indispensable for helping radiology practices make the transition from volume-based healthcare to value-based healthcare that maximises both quality and efficiency.

Turning away from machine learning and AI out of fear that they will replace us is not an option. Rather, radiologists must embrace these new tools, remembering that our ultimate purpose is not to "decode" image patterns or analyse texture in images but to integrate all imaging findings with clinical and other findings and help solve clinical problems. We need to participate in developing machine learning and AI tools that will help us, and we need to become masters in their application to clinical care.

At present, the value that radiologists provide is, unfortunately, often overlooked. In the predominant value-based healthcare models, a correct diagnosis is taken for granted: Measurement of value begins only with the start of therapy, and the impact of radiology on value is calculated solely in negative terms (i.e., when radiology is a source of diagnostic error).

However, anyone who has been through residency training in radiology knows that being a good radiologist requires a great deal of learning and practice. Numerous studies have shown that sub-specialisation further improves radiologists' interpretive abilities and that direct consultations between radiologists and referring physicians affect clinical decision-making. Moreover, radiologists carry out many other demanding responsibilities, from assessing the appropriateness of imaging requests, to adjusting imaging protocols, attending to radiation protection needs, communicating with patients, managing radiology personnel and performing research to move the field forward.

Thus, we already know that radiologists add value, but we need to make this clear to policymakers and the broader public. In addition to enabling us to contribute even more value to clinical care, informatics tools will be essential to develop metrics that demonstrate our work's value. In short, if we embrace change, the future of radiology—and especially oncologic imaging—will shine more brightly than ever. **AH**

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A helping hand in the fight against hospital acquired infections

Article provided by TEAL

For the past 60 years, the overuse of antibiotics has dramatically increased, reducing their efficacy. The practice of traditional hand washing has also declined and is one of the major causes for the rise of new and, more virulent, healthcare acquired infections (HAIs), for which there is now growing concern throughout the medical and healthcare sector.

To resolve this worsening problem, TEAL Patents – the world’s leading manufacturer of portable hand washing units – has developed the Hygienius MediWash™, an innovative, portable hand washing device.

Medical professionals, hospital patients and visitors alike should have easy access to hot running water and soap, so they can properly wash their hands.

TEAL is looking for international medical equipment distributors worldwide.

Manty Stanley, managing director at TEAL Patents, explains: “HAIs continue to affect one in 15 hospital patients which prolongs patient stays and increases operational costs. However, this threat is especially true for the elderly, who have a reduced ability to fight these new infections which often lead to preventable early deaths.

“Washing hands with soap under running hot water is recognised as the most effective method to kill superbugs - both bacterial and viral. Many of these infections can no longer be cured by antibiotics. Surviving them relies on a strong immune system. By nature of being hospitalised, patients are already weakened, so many end up fighting for their lives. By placing TEAL’s Hygienius MediWash™ in strategic locations, the risk posed by 80% of diseases which are spread



by touch, can be eliminated.

“Exports to the Middle East are thriving because those countries have always relied on hand washing and shunned alcohol rubs for religious reasons. But there are many other countries now realising handwashing is the route to the gold standard in hygiene and we need international distributors who understand how to help the healthcare sector address the problem and present the TEAL solution.”

The Hygienius MediWash™ includes an instructional digital display that encourages

users to wash their hands following the World Health Organization’s, ‘seven, hand rubbing routines’. The video display is synchronised with the hot water delivery system so that hygienically clean hands can be achieved in 37 seconds.

The MediWash™ has also been designed on medical-style castors to guarantee maximum portability. Furthermore, the unit requires no access to plumbing or drainage, so it can be taken to the most critical points of need.

To learn more about the Hygienius MediWash™, please contact TEAL’s representative for UAE, Bahrain, Kuwait, Oman and Qatar, GID Medical at www.gidtechnologies.com.

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“Through medicine and medical education, we can build bridges across the globe”

Q&A with Electrophysiologist Khaldoun Tarakji, Director of Cleveland Clinic’s Center for International Medical Education, on training physicians worldwide

Article provided by Cleveland Clinic

In 1998, during his final year of medical school at Damascus University in Syria, Khaldoun Tarakji, MD, MPH, realized how hard it would be to get advanced medical training in the U.S.

“I contacted multiple programs, seeking an observership or internship opportunity, but many were not available to me as a foreign graduate,” he says. “I finally found one at a small hospital in Michigan. After a few months, I applied for a medicine residency and matched at Cleveland Clinic.”

Dr Tarakji completed his residency and multiple fellowships at Cleveland Clinic, and is now an electrophysiologist in its Sydell and Arnold Miller Family Heart & Vascular Institute. In addition to directing the electrophysiology outpatient department and cardiac remote monitoring, he serves as primary investigator of several national and international clinical trials. He has published more than 45 manuscripts in higher tier medical journals. He also serves as an assistant professor at Cleveland Clinic Lerner College of Medicine.

“I am who I am because of Cleveland Clinic, but I owe it all to that small hospital in Michigan that gave me the opportunity,” he says.

In this Q&A, Dr Tarakji explains more about the value of offering education programs to physicians around the world.

Q: Why does Cleveland Clinic have a Center for International Medical Education?

Dr Tarakji: We live in a world that’s constantly reminding us of our differences, but medicine reminds us of our similarities. At international medical meetings, our goals are similar. Our medical language is similar, and the



challenges are shared. There’s no question that through medicine and medical education we can build bridges across the globe.

CIME is an extension of Cleveland Clinic’s mission to care for the sick, investigate their problems and educate those who serve. We’re now doing all of that globally.

Q: How are CIME’s offerings distinct?

Dr Tarakji: Clinically, we at Cleveland Clinic regularly handle patient cases that other centers may never encounter. We have medical professionals with a wealth of skills, using the most innovative technologies and advanced techniques. And we work with a unique spirit of teamwork, collegiality and putting patients first. All of that makes the experience of a CIME program quite distinctive.

Q: What are your goals for CIME in the months and years ahead?

Dr Tarakji: Over the past decade, 9,000 physicians from 123 countries have come through CIME. We’d like to study where CIME visitors are two or three years after completing one of our programs and how Cleveland Clinic impacted their careers. For caregivers, there is no larger reward than a message or a thank-you card from a grateful patient, and for educators there is no bigger satisfaction than seeing the career of someone you have helped evolve,

blossom and mature.

Just recently, a cardiologist in Peru was telling us how he’d come to Cleveland Clinic 27 years ago to learn about echocardiography, a new technology at the time. He’s now working in a leadership role at his medical center. A colorectal surgeon in Turkey came to Cleveland Clinic for a one- or two-month educational program and now is chair of his department. We’d like to track and report outcomes like these – and, of course, continue to connect international audiences with educational opportunities at Cleveland Clinic.

Q: How has your personal experience prepared you to serve as Medical Director of CIME?

Dr Tarakji: As an electrophysiologist, I’ve witnessed the advent of subcutaneous defibrillators, leadless pacemakers, smartphone-based heart monitors and many other innovations – all since completing my fellowship training. Medical technology is progressing at an unprecedented rate. I’ve seen firsthand how continuing medical education is not just valuable, but necessary.

At Cleveland Clinic, we’ve been at the forefront, helping lead clinical trials and spearheading new developments in various specialties. We have a lot to share with other medical professionals. However, when you travel and interact with physicians internationally, you realize that even leading centers like Cleveland Clinic can learn from healthcare systems in other parts of the world. Hospitals in less advanced areas can teach us new ways to improve efficiency, increase cost savings and minimize waste. We have a great incentive to build professional relationships and help each other.

i-gel[®] supraglottic airway from Intersurgical

Article provided by Intersurgical



i-gel[®] is a truly unique, single use, second generation supraglottic airway with a soft, gel-like non-inflatable cuff.

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Ospedale San Raffaele is a **clinical-research-university hospital part of Gruppo ospedaliero San Donato**, the leading hospital group in Italy. It has **more than 50 clinical specialties** and over 1,300 beds, and its emergency department counts 67,000 annual accesses. Research at Ospedale San Raffaele focuses on integrating basic, translational and clinical activities to provide the most advanced treatments to patients. The hospital counts on over 1,800 medical doctors, scientists and technicians and on state-of-the-art facilities and technology platforms. Ospedale San Raffaele is recognized as a **global authority in molecular medicine and gene therapy**, and is at the forefront of research in many other fields, standing out for the **deep interaction between clinical and scientific area** – this makes the transfer of scientific results from the laboratories to the patient's bed easier. Its mission is to improve knowledge of diseases, identify new therapies and encourage young scientists and doctors to grow professionally.

Ospedale San Raffaele is among the few centers in the world which **perform pancreatic islet transplantation** (i.e. the cells in the pancreas that produce insulin) to treat type 1 diabetes patients who do not respond to conventional therapies. The transplant aims at recreating the function of insulin-producing cells in a host organ (e.g. the liver). This technique has made huge progress along the years, but it still has some limits, involving immunosuppressive regimens and rejection risks like all transplants. Our researchers at **San Raffaele Diabetes**

Research Institute (DRI) are currently studying new treatment perspectives using stem cells, differentiating insulin-producing from pluripotent stem cells. In the future, this may allow to rely on an endless source of cells that produce insulin and to modify such cells so that the immune system does not recognize and attack them.

Our research stands out to find **treatments for genetic blood diseases**, too. Our Hematology and bone marrow transplantation unit works side by side with the San Raffaele Telethon Institute for Gene Therapy (SR-Tiget) to **find a cure to thalassemia major**, the most serious form of the disease, causing chronic anemia and provoked by a defect in the production of hemoglobin. At the time being, conventional treatment consists in regular transfusions of red blood cells associated to iron chelation therapy. Patients who can rely on a bone marrow donor and are in good condition can undergo transplantation – that is currently the unique curative therapy. Our doctors and researchers are trying to **set up a treatment to correct the defective gene causing the disease** – first, stem cells are extracted from the blood of the patient, then they are provided with the corrected gene and infused back into the patient's bone marrow. The healthy gene is carried into the cells by a genetically engineered virus which is modified so it becomes harmless. Once corrected stem cells are in the bone marrow, they start producing healthy and functional red blood cells. The treatment is currently an experimental protocol involving ten patients which showed encouraging preliminary results.

Villa Sistemi Medicali uses Augmented Reality in new mobile application

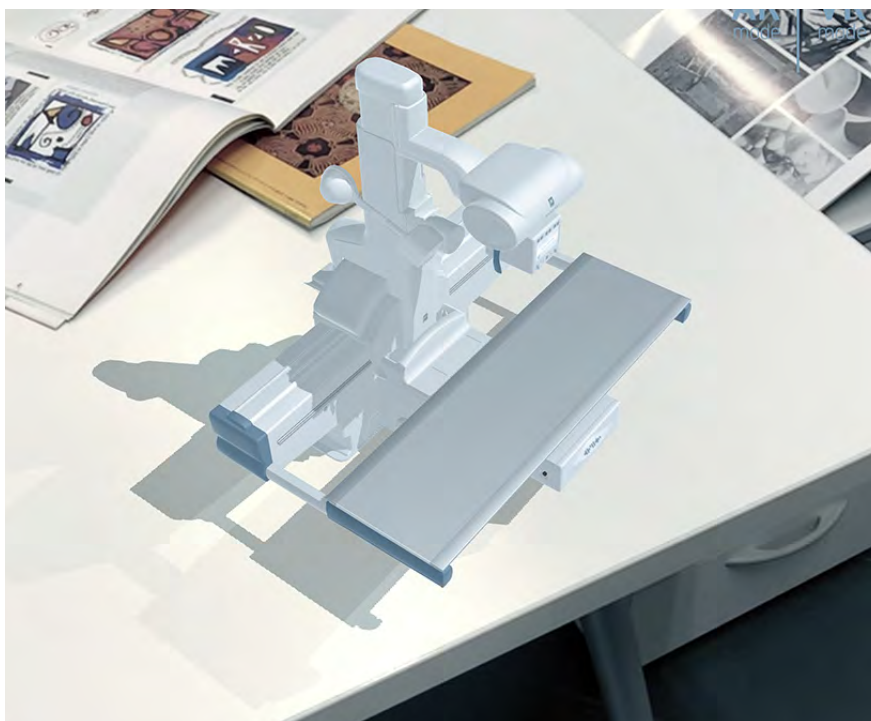
Article provided by Villa Sistemi Medicali

Villa Sistemi Medicali has announced the new mobile application "RAD/AR", a revolutionary promotional and sales tool that uses Augmented Reality to show the functioning and applications of its radiology systems in the real environment.

Villa Sistemi Medicali, characterized by its strong propensity for innovation, has invested in the use of the latest augmented reality technologies - and is the first in the industry to do - to promote its products in an unprecedented and effective way. In collaboration with Reamore (business unit of Equent Media Group) and MCommunication, Villa Sistemi Medicali has developed "RAD/AR", an application for smartphones and tablets that uses these technologies in an original way to visualize and integrate in the real environment the three-dimensional models of its equipment, showing their functionalities and possible applications.

RAD/AR is therefore a powerful information tool for customers, and a revolutionary working tool for the commercial network, supporting in a simple and intuitive way the communication, sales and staff training activities, allowing also to work remotely, with consequent reduction in costs and working times. The "RAD/AR" app, premiered at the European Congress of Radiology 2018 in Vienna, is already available for download from the AppStore™ and Google Play™.

Villa Sistemi Medicali SpA, an Italian company founded in 1958, is one of the leading manufacturers of radiological systems in the world, both in the medical



and dental industry, with a sales network in more than 100 countries. Leveraging more than 50 years of experience in X-ray field, the company's know-how covers all technologies which can create either a modern radiographic examination room as well as an efficient imaging integration of a comprehensive dental practice. From full-digital Radiographic/Fluoroscopic rooms up to dental 3D systems featuring innovative "Cone Beam" technology, it can cater to a complete and flexible configuration of all systems, while its preventive maintenance programs and service contracts, totally adapted to customer's needs, are assuring a regular and qualified support for its partners worldwide.

Traditionally, Villa Sistemi Medicali

has developed and maintained high level partnerships with other leading companies in the market, with whom it has established an ongoing commitment in technical development projects, in a synergic exchange of know-how and products. Villa's ability to interpret and anticipate the trends and demands of a market in continuous evolution is the fruit of these relationships and of a strongly rooted presence in radiology.

The Company successfully invests over 4% of total annual revenues in Research & Development, to incorporate in its systems the state-of-the-art technologies to be used in diagnostic radiology.

For more information, please visit www.villasm.com

New Study Investigates the Clinical Utility of ORi™, Masimo Oxygen Reserve Index™, in Obese Patients

Article provided by Masimo

In a new study presented at the annual meeting of the Society for Technology in Anesthesia (STA) in Miami, Florida, researchers at the UC Davis School of Medicine evaluated the potential clinical utility of Masimo Oxygen Reserve Index™ (ORi™) as an early warning of impending arterial hemoglobin desaturation in obese patients.¹ This is the first published research investigating the utility of ORi in this particular population group.

ORi is a relative indicator of a patient's oxygen reserve in the moderate hyperoxic region (partial pressure of oxygen in arterial blood [PaO₂] in the range of 100 to 200 mmHg). As an "index" parameter with a unitless scale between 0 and 1, ORi can be trended

and has optional alarms to notify clinicians of changes in a patient's oxygen reserve.

In the prospective, observational study, Dr. Ayala and colleagues analyzed data from 36 adult patients with BMI between 30 and 40 kg/m² who were scheduled for elective surgical procedures requiring general anesthesia and endotracheal intubation. The patients' ORi values were measured using a Masimo Root® Patient Monitoring and Connectivity Platform with Radical-7® Pulse CO-Oximeter®. The researchers recorded the time elapsed from the start of ORi alarming (triggered by decrease in the absolute value and rate of change in ORi) to 98% oxygen saturation, and considered this interval to be the average increase in warning

time provided by ORi.

The researchers found that among the patients, the average time from the start of ORi alarming to 98% oxygen saturation was 42 ± 49 seconds (ranging from 5 to 255 seconds). Excluding two outliers, the average increase in warning time provided by ORi was 33 ± 23 seconds (ranging from 5 to 107 seconds).

The researchers concluded that the study "demonstrates the ability of ORi to provide advanced warning of arterial desaturation as an adjunct to SpO₂ in this high risk patient population. This additional warning time can potentially translate to improved patient safety by allowing earlier calls for help, assistance from a more experienced person, or modification of airway management. For this analysis we defined the advance warning to end at 98% SpO₂, with a defined trigger for intervention at 94% SpO₂."

In another study, researchers at Children's Medical Center in Dallas, Texas concluded that ORi could provide clinicians with a median of 31.5 seconds advanced warning of impending desaturation in pediatric patients with induced apnea after pre-oxygenation.²

UC Davis received funding from Masimo for the ORi study.

ORi has not received FDA 510(k) clearance and is not available for sale in the United States.

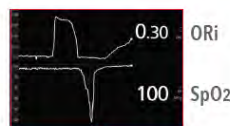
For more information, please visit www.masimo.co.uk

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> Advanced warning of impending desaturation, which may allow clinicians to intervene sooner



> Insight into oxygen reserve when titrating patients who are receiving supplemental oxygen

Clinical Application

> In a study of 25 paediatric patients undergoing general anaesthesia with orotracheal intubation, researchers found that ORi detected impending desaturation a median of 31.5 seconds before noticeable changes in SpO₂ occurred.¹

> In a study of 106 patients undergoing scheduled surgery in which arterial catheterization and intraoperative arterial blood gas analyses were planned, researchers found that decreases in ORi to near 0.24 may provide advance indication of falling PaO₂ approaching 100 mm Hg when SpO₂ is >98%.²

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Knee joint pain finds relief in stem cells

Article provided by RAK Hospital

Contrary to general perception, the victims of knee joint pain are not always the elderly or those involved in sports. The condition can occur to many others, depending on their bone health. Traditionally, surgical intervention was believed to be the antidote for knee pain, but of late, more and more people are exploring other non-surgical options, including the very successful stem cell therapy.

In January this year, RAK Hospital became one of the few healthcare institutions in the UAE to offer stem cell therapy for arthritis. The hospital is proud to have on board world-renowned Knee Regenerative and Reconstruction Specialist Dr William Andrew Hodge, who is the patent holder of the 'Arabic Knee' in the Middle East.

The Arabic Knee has a specifically shaped knee surface designed to replace arthritis! This novel technique provides better range of motion and long term (>20 years) durability. For example, common activities like running, climbing, squatting and sitting become easy following this new technique. The treatment is particularly important in this region since Arabs appear to injure knees earlier and more often than people in other parts of the world.

Stem cell therapy is a regenerative healing treatment of arthritis involving joints, especially knee issues that can dramatically reduce a person's need for surgery. The treatment uses the patient's own stem cells to re-grow new and healthy tissues that have been damaged or are degenerating. The therapy is particularly useful for patients suffering from rheumatoid arthritis, osteoporosis, knee injury, torn cartilage, ligament or tendons, rotator cuffs and degenerative conditions of bones. Those suffering from knee injury or experiencing chronic knee pain due to a past injury, can all benefit from this regenerative and healing treatment.

The benefits of the regenerative stem cell treatment are 'Life Changing' and the costs involved are reasonable since with one batch of Stem Cell production, the patient receives

over 20 doses of individual Stem Cells which can be stored and used when needed. The procedure and recovery after obtaining the Stem Cell production is relatively quick, compared to surgery and the outpatient procedure can be done in a single day (a few hours, to be more precise). Moreover, the recovery time is minimal as patients walk in and walk out of the procedure on their own, while the daily routine stays the same.

"RAK Hospital, in its position as a complete solutions provider to bone and joint problems, is among the pioneers of knee joint treatments in the UAE," said Dr Raza Siddiqui, CEO, Arabian Healthcare Group and Executive Director, RAK Hospital, adding, "Besides stem cell therapy, we introduced in the country the unique gyroscope-based technology for partial & total knee resurfacing, a revolutionary technique that promises a far more accurate knee implantation than ever before, particularly significant for patients suffering from severe knee deformities & disorders. The procedure is quick and enhances recovery as well.

"Last year in December, a 50-year-old Canadian national, Ms Rachel Poff, flew in from Azerbaijan complaining of bilateral

knee joint pain, resulting in an inability to walk and morning stiffness for two years. Despite excessive medical intervention, including steroids, her condition remained the same, and eventually she was referred to Dr William Hodge at RAK Hospital. Under Dr Hodge's expert eye, she underwent Total Knee Replacement surgery and the very next day she was able to walk without any assistance. Within four days of surgery, Ms Poff was able to fly back to Azerbaijan. This is but one of the many successful knee-joint cases that we have treated at RAK Hospital," recounted Dr Siddiqui.

For post-surgical care, RAK Hospital's advanced Rehabilitation and Physiotherapy Centre uses cutting-edge technology to literally allow patients to get back to their active lifestyles quickly. Some of the specialised rehab services include patients with sports injury, spinal & neurologic injury, joint pathologies, and post-surgery. The RAK Rehab Centre also offers Hydrotherapy, Robowalk system for the analysis and treatment of gait disorders, and David Spine Concept as a comprehensive evaluation and treatment concept for back disorders.

For more information, please visit www.rakhospital.com



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