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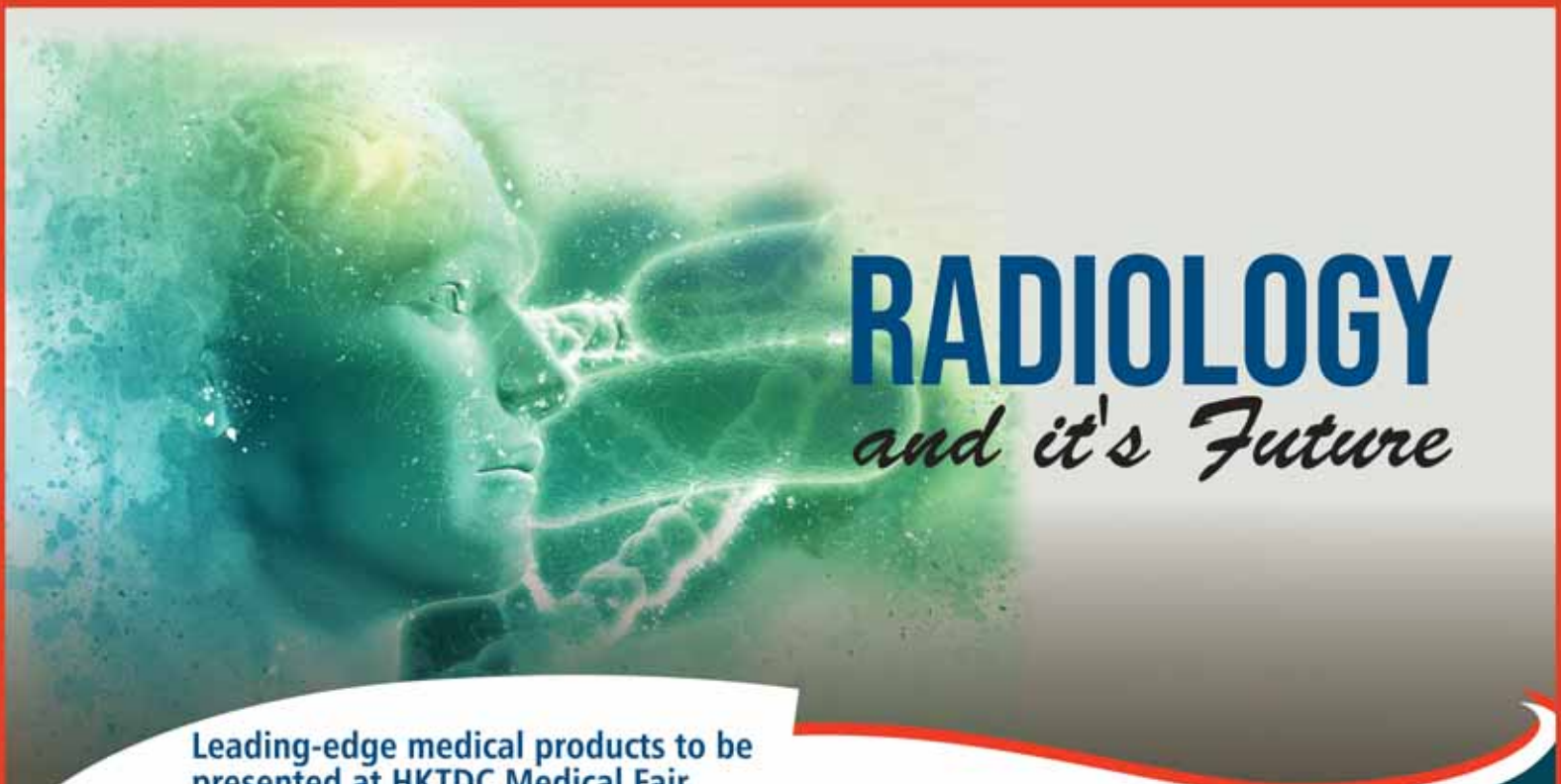

RADIOLOGY *and it's Future*

Leading-edge medical products to be presented at HKTDC Medical Fair

Hospital Update

Sikkim gets India's 2nd largest government hospital

India's first Sci-Fi hospital at Chandighar

FEHI celebrates 30-years of path-breaking work

A breast centre launched for women by CK Birla

India's 'first women hospital' inaugurated in Delhi

- Technology in Neurology
- A touch of AI in Cardiology
- How AI Transforming Healthcare
- Infrastructure – the backbone of a hospital

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Publisher's Note

Focus on Healthcare Infra

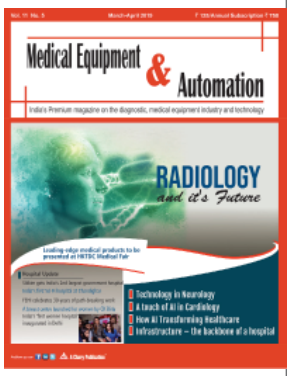
Healthcare is one of the largest sectors and employers in the world, worth over US$ 9 trillion globally and consuming an average 10 per cent of a country's GDP. In India, the healthcare sector stood as the fourth largest employer in 2017 as it employed a total of 319,780 people. The sector is expected to reach US$ 372 bn by 2022. However, the primary challenge that plagues the Indian healthcare infrastructure sector is the gap between the supply and demand. Studies estimate that, Indian healthcare system has only 1.3 hospital beds per 1,000 people, which is significantly lower than the 3.5 beds defined by the World Health Organization. This time, we present to you a critical analysis on Indian hospital infrastructure market highlighting how the schemes like AAYUSH can propel the growth.

Medical diagnostic remains the integral part in healthcare ecosystem. According to a report by Transparency Market Research, the global diagnostic imaging market, valued at around US$ 28 billion in 2017, is estimated to reach a value of more than US$ 47 billion by 2026, expanding at a CAGR of 6 per cent whereas a report by MarketsandMarkets estimates that the global market of diagnostic imaging is expected to reach $36.43 billion by 2021, at a CAGR of 6.6 per cent from 2016 to 2021. Our report on radiology explains us the next big things in radiology.

Neurology remains one of the most dynamic areas of medicine with advances on various fronts including diagnostics, therapeutics and rehabilitation strategies. Rise in incidence of cerebral stroke and other severe disorders such as Alzheimer's disease, epilepsy, and Parkinsonism is expected to fuel demand of neurology devices thereby driving industry growth. According to a report by Grand View Research, global neurology devices market is expected to reach US$ 10.8 billion by 2022. Here, experts from the industry examine the recent technological advancements in the field of neurology.

I hope you will enjoy reading this issue as always. Please send your comments at **pravita@charypublications.in**

Pravita Iyer
Publisher



Special focus on:

Hospital Infrastructure, Radiology, and Neurology

Editorial

AI - The Game-changer

Artificial Intelligence (AI) has been the talk of the town for a while, and today it has emerged as the new game-changer. Globally, the rise of AI is transforming businesses across the spectrum. According to a report from PwC, AI could contribute up to $15.7 trillion to the global economy in 2030, more than the current output of China and India combined.

AI is increasingly being adopted in healthcare sectors to improve patient care and improve process efficiencies. Today, AI is being used to detect diseases more accurately and in their early stages. For example, the use of AI has shown remarkable result in the field of breast cancer. According to the American Cancer Society, a high proportion of mammograms yield false results, leading to 1 in 2 healthy women being told they have cancer whereas the use of AI is enabling the review and translation of mammograms 30 times faster and with 99 per cent accuracy, reducing the need for unnecessary biopsies.

> "Use of AI is enabling the review and translation of mammograms 30 times faster and with 99 per cent accuracy, reducing the need for unnecessary biopsies."

Also, a new study by experts at the University of Nottingham reveals that AI can predict premature death. The team of healthcare data scientists and doctors have developed and tested a system of computer-based machine learning algorithms to predict the risk of early death due to chronic disease in a large middle-aged population. They observed that the AI system was very accurate in its predictions and performed better than the current standard approach to prediction developed by human experts.

Further, the Nottingham researchers predict that AI will play a vital part in the development of future tools capable of delivering personalised medicine, tailoring risk management to individual patients.

As per the reports by Frost & Sullivan, the healthcare AI market is estimated to be $6,662.2 million in 2021 at a CAGR of 40 per cent, and it has the potential to improve healthcare outcomes by 30-40 per cent while cutting treatment costs by as much as 50 per cent. Also, an analysis by Accenture predicts, AI applications in healthcare can create $150 billion dollars in annual savings for the US healthcare economy by 2026. Therefore, AI is all set to transform healthcare in a big way.

Subhajit Roy
Group Editor

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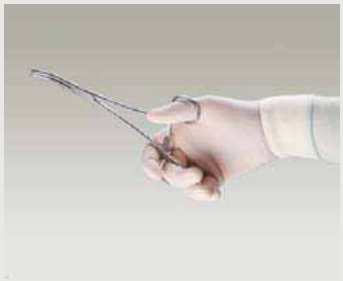

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Editor: Mahadevan Iyer

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New bike service for emergency medical care

Indian Council of Medical Research (ICMR) recently launched an emergency medical service 'Mission DELHI', as part of which an assistance unit on a motorcycle can be quickly summoned for emergencies like a heart attack or chest pain. The pilot project has been launched in a radius of three kilometres around the All India Institute of Medical Sciences (AIIMS).

Under Mission DELHI (Delhi Emergency Life Heart-Attack Initiative), a pair of trained paramedic nurses would be the first responders to treat heart attack patients. On getting a call, the pair would rush to the spot on motorcycles, gather basic information on the patient's medical history, conduct a quick medical examination, take the ECG, and establish a virtual connect with the cardiologists at AIIMS and deliver expert medical advice and treatment. While the emergency treatment is being provided, a CATS ambulance will arrive and take the patient for further treatment.

Even as the patient is on way to the hospital, doctors at AIIMS control centre will evaluate the data received from the nurses to establish further course of treatment. ICMR has signed a memorandum with CATS for this project.

Rajiv Nath of AIMED receives 'Award of Appreciation'

Ashwini Kumar Choubey, Minister of State for Health and Family Welfare conferred prestigious 'Award of Appreciation' to Rajiv Nath for his contribution to the global public healthcare sector at The Award of Appreciation Ceremony held recently at Ministry of Health and Family Welfare, Nirman Bhawan, New Delhi, organised by Diaspora Foundation.

Nath was honoured for his valuable, remarkable and outstanding achievements in the field of healthcare and community services for affordable MedTech access and patients safety initiatives. His eminence and dynamic leadership to drive innovations and contributions in medical devices for healthcare has helped India to carve out a niche for itself in the global map. He has demonstrated remarkable and exceptional performances in setting the agenda and road maps for the future healthcare by setting an exemplary entrepreneurial competency and leadership in the healthcare industry not only by his own manufacturing company Hindustan Syringes & Medical Devices Ltd but also for the entire MedTech industry segment to realise his vision to position India among the top five manufacturing global hubs of medical devices.

As the Founder and Forum Coordinator of Association of Indian Medical Device Industry (AiMeD), with over 350 members nationwide, Nath has taken many initiatives of establishing a collaborative framework with various departments of the Government and media to bring to their attention issues troubling the industry and attract investments into India in his quest to make India as the Global Manufacturing Hub of Medical Devices – Make in India, preferred manufacturing destination and the leading supplier of medical device worldwide.

Selecting the right implants is important

Right implant selection, adoption of global best practices, quality and skill of a surgeon plays a key role in making an orthopedic surgery successful and long-lasting, according to Orthopaedic experts.

Use of technology especially in the medical field comes after prolonged R&D. Nearly 10 years of clinical trials are the norm in case such an orthopedic implant. There is a need to educate patients about a critical fact that implants cannot replace the original knee or hip, however by following certain protocols one can make the best use of it for long. According to experts, instead of brand of implants, it is the selection of right implants, use of technology and expertise of a surgeon counts the most, results largely depend on the skill and experience of a surgeon.

It is roughly estimated that over one lakh joint replacement surgeries are carried out in the country every year. Of these, an estimated 70,000 to 80,000 are knee replacements, and 20,000 to 30,000 are hip replacements surgeries. However, the joint registry established by the Indian Society of Hip and Knee Surgeons (ISHKS) has recorded only 1.71 lakh knee and 14,000 hip replacement surgeries since it began collecting data in 2007. With rising awareness about the efficacy of orthopedic implants, those suffering from such problems are consulting experts to get rid of the pain by undergoing replacement surgeries.

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Maxflow Nasal Cannula For High flow Breathing Circuit (BC 580)

Types Of Air Oxygen Blender

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OPTION –2
nice 5010 - 30 LPM

OPTION –3
nice 5010 - 60 LPM

(nice 8050 & nice 5010 / nice 5005)

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Notification for regulating medical devices sales

A notification was issued recently by CDSCO. Rajiv Nath, Forum Coordinator, Association of Indian Medical Device Industry (AiMeD) said, "We are baffled to see notification same evening in conflict with our discussion at the first meeting held by the Central Drugs Standard Control Organisation regarding the "road map" for regulating the sale and manufacture of all medical devices in India in a phased step by step approach. We wonder what's the logic and rationale behind this random pick and choose approach?"

Voicing Industry's concern Nath said, "Until 2020 is too short, at least 5 years transition period is needed to build infrastructure and capability and capacity of regulators, auditors, testing facilities and also of manufactures or you will have a case of non-enforced/ non-enforceable regulations and inadvertently building market access barriers to home grown manufacturers."

Similar opinion was given by Anil Jauhri, CEO of QCI - NABCB who had given a presentation to regulate all medical devices at the Department of Commerce Conclave on Standards at Mumbai last week. "Device by device regulations will not work." He has suggested following a hierarchy of standards to regulate categories of devices - e.g., initially using horizontal risk management and quality management standards common to all products followed by semi horizontal standards that are applicable on specific categories of devices.

Another expert, Dr. Jitendar Sharma, MD, Andhra Medtech Zone opined, "Better than item by item regulations it's prudent to regulate devices by category in a phased manner. It's better to regulate by category e.g. non-ionising diagnostic equipment, ionising diagnostic equipment, all medical electronics with power extrusion, all medical electronic equipment with / without motors, all IVD consumables & all IVD disposables, all medical disposables, all medical consumables etc. With listed examples with common validation and testing needs".

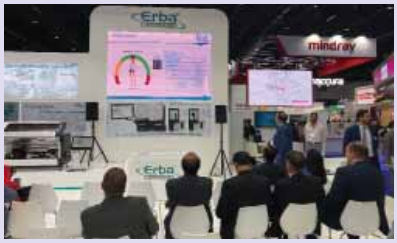
Siemens Healthineers enables India's largest cancer institute

Narendra Modi, inaugurated AIIMS, New Delhi's National Cancer Institute (NCI), Jhajjar, Haryana on 12th February wherein India's first fully Robotic Core Clinical Laboratory has been commissioned. The NCI is regarded as one of the largest public health investment projects in India; intended to reduce the deficit of tertiary cancer care in the northern region and will also take care of preventive and curative aspects of the disease. The 710-bed NCI, is comprised of an OPD serving free medicines along with the diagnostics block comprising of laboratory space for microbiology, central instrumentation facility, haemato-pathology, histo-pathology, cytopathology, tumor immunology and an advanced diagnostics centre.

Laboratories today need to be prepared for a workforce shortage and increased testing workload and cost pressures. The clinical core laboratory at NCI is a revolutionary initiative built to anticipate the rising challenges in the industry, and is creating a prototype for the next generation of hospitals in India.

The robotic core clinical laboratory at NCI is built over 4,500 square feet and represents India's first robotic core clinical laboratory in the government set up. The laboratory is powered by Siemens Healthineers and includes laboratory automation and IT solutions. It is the laboratory automation and digitalisation solutions that will together contribute in optimising and standardising the workflow processes at the NCI.

ERBA Group showcases its latest technologies at MEDLAB 2019



At the recently concluded MEDLAB expo, the ERBA Group, launched their latest hematology analyzers, H 360 and H 560. Designed for improving lab efficiency, these systems are paving the way for better healthcare outcomes in over 100 emerging market countries.

These latest additions are targeted at small to medium laboratories and complement the larger automatic Elite 580 hematology analyzer launched at MEDLAB 2018. The newly launched, H 360 3-part differential analyzer can run up to 60 samples/hour and requires only 9 microlitres of blood. The H 560 5-part differential analyzer also runs 60 samples/ hour and requires only 15 microlitres, which is highly beneficial in pediatric cases. In both systems, interpretation of results is aided using an advanced 3D scattergram.

ERBA also displayed the latest version of its powerful Laura XL platform, which is a fully automated urine chemistry and sediment analyzer. Using digital microscopy and AI technology, it auto-recognises 16 urine sediment elements. Moreover, the photometric urine strip reader aids in precise determination of 10 analytes using ERBA's standardised test strips DekaPHAN®.

The ERBA group also hosted an education session by Dr. Mir Majid Mossalaeie, Vice President of Iranian Association of Clinical Laboratory Doctors on the effectiveness of AMH ELISA test kits, which helps childless couples conceive though better estimation of ovarian age. Dr. Mossalaeie commented on the high quality of ERBA's AMH kit which is made by its US subsidiary, Calbiotech Inc., along with 200 other immunoassay products. The Director-General of Dubai Health Authority, His Excellency Humaid Al Quatami, visited the booth and was highly impressed by the wide range of technologies being offered by the group.

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Rare bilateral surgery performed in single session

Recognised for delivering exceptional patient care, Vimhans Nayati Super Specialty Hospital, Delhi recently announced a rare bilateral total knee replacement surgery performed in a single session on a 65-year-old lady from Baghdad, Iraq. Zainab Salen Mohammed Hasan – a morbidly-obese lady with a BMI of 44.5, weighing 100 kg – had difficulty in walking, eventually suffering severe back pain. She was diagnosed with advanced osteoarthritis (Stage 4), wherein patients experience pain and discomfort in moving their joints, preventing or hampering daily activities.

Speaking about her life-changing experience, Zainab said, "I consulted many doctors in seeking relief from pain. Finally, after consulting Dr. Rajeev Sharma at Vimhans Nayati Super Specialty Hospital, I consented to Bilateral Total Knee Replacement. I am extremely grateful to Vimhans Nayati for putting me back on my feet so quickly through its first-class treatment. Now, I perform daily activities without pain and I'm leading a normal, healthy life."

Being overweight or obese is a risk factor for progression of knee osteoarthritis. Since Zainab was in the Class 3 (high-risk) obese category, her obesity made it a rare case. With each BMI unit increase, the chances of rapid cartilage loss rise by 11 per cent. Moreover, she had comorbid symptoms such as diabetes and hypertension. As the high BMI makes the procedure strenuous for anaesthesia and surgery, it is done in multiple sessions.

Commenting on the demanding single-session surgery, Dr. Rajeev Kumar Sharma, Chairman – Institute of Orthopedics, Sports Medicine & Arthroplasty at Vimhans Nayati Super Specialty, said, "Due to the bad deformity of both knee joints, joint laxity and weak bones, Zainab was suffering painful knees for the past 15-20 years. In the past, we have observed that osteoarthritis worsens if rising obesity, past injuries and lack of muscle strength are not addressed. The alignment of limbs and quality of cartilage also affect the knee joints."

"Healthcare innovations to be backed by robust policy framework"

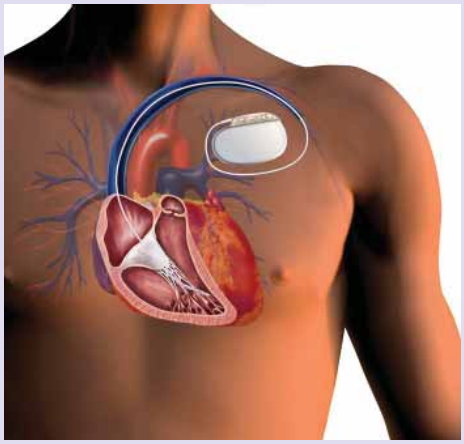
"Technology has become the backbone for Ayushman Bharat by making the entire system cashless and paperless. With over 50 crore population coming under the purview of healthcare, technology is going to become an even bigger market in healthcare," said Dr. Indu Bhushan, CEO, AB-PMJAY and NHA while speaking at the 2nd Health Tech India, 2019 held in New Delhi.

However, he also cautioned that technology would cost money and therefore, both healthcare providers and other stakeholders should be prepared to balance this high cost as financial allocation would be needed. "Technological innovations in healthcare need to be backed by a robust policy framework," he emphasised.

Lav Agarwal, Joint Secretary, Ministry of Health and Family Welfare, highlighted that the focus of Indian healthcare over the years has changed from being curative to slowly becoming preventive which has also led to an increase in scope for innovation. "The beneficial aspects of technology in India, lie in the fact that, in a country like India, it can overcome geographical and financial barriers to reach those who actually need it," he added.

Ms. Shobana Kamineni, Immediate Past President, CII & Executive Vice Chairperson, Apollo Hospitals Enterprise Limited emphasized on the importance of frugal health technology that is going to make high quality healthcare services both affordable and accessible

ICD therapy reduces all-cause mortality amongst patients



The results of the largest prospective study of patients-at-risk of Sudden Cardiac Arrest (SCA) in emerging countries – IMPROVE SCA – has revealed that primary prevention ICD patients at high-risk of SCA and implanted with ICDs had 49 per cent relative risk reduction in mortality, compared to those without ICD implant. SCA is an abrupt loss of heart function that might lead to death within minutes. Community based studies in India have shown that Sudden Cardiac Death (SCD) constitutes around 10 per cent of total mortality in India. Ventricular arrhythmia is reported to be the leading cause of SCD. The prevalence of Coronary Artery Disease (CAD) has been estimated to be 7-10 per cent in urban areas and 3-5 per cent in rural areas. Patients of acute coronary syndromes in India reported to be predominantly male (>70 per cent), relatively younger (mean age of 57 years) with more presence of additional risk factor like hypertension and diabetes compared to those of western countries.

The medical community has established guidelines endorsing the use of ICDs in patients who have survived an SCA episode (known as secondary prevention), as well as in those who have not previously experienced, but are at risk of, a life-threatening heart rhythm.

Despite the burden of SCD, ICDs are underutilised amongst eligible patients in emerging countries like India. Benefit of ICDs for secondary prevention of SCA is well recognised in the emerging countries; however, because they were not included in landmark studies of ICDs for primary prevention, the benefit in these patients is not well quantified.

According to Dr. B. Hygriv Rao, Senior Consultant Cardiologist and Electrophysiologist, Krishna Institute of Medical Sciences, Hyderabad and one of the principal investigators of the study, "In India, every year approximately 7 lakh individuals die suddenly, and this number is progressively increasing. Many of these individuals are around 60 years of age. It is important for physicians and cardiologists to identify patients who can be protected from sudden cardiac death by ICD therapy.

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Stent price hike shows commitment to quality healthcare: MTaI

Medical Technology Association of India (MTaI) recently said the increase in prices of stents in line with inflation is testimony of government's commitment to quality healthcare services in the country. "The increase in prices of stents indicates that NPPA is mindful of the operational pressures in the medical device industry. We continue to be hopeful that in the interest of Indian patients and quality of Indian healthcare, the Government will bring in a policy to differentially price the innovative generations of medical devices. We are also engaged with the NPPA to find a way to offset the exchange value depreciation and thus mitigate the economic threats in the system to the medical device industry," MTaI Chairman and Director General Pavan Choudary said.

Through a draft notification dated 29th March, national pharmaceutical pricing authority revised the prices of bare metal stents and drug eluting stents by 7.85 per cent. Recently, MTaI has apprised NPPA of the need to increase the prices of regulated medical devices by 11-16per cent to cushion the impact of high inflation and depreciation in the value of rupee vis-à-vis US dollar and Euro. This was required as the current regulatory framework in India mandates price ceiling in rupee terms for scheduled devices like stents and orthopedic knee implants and allows only upto 10 per cent increase per year in MRPs of regulated non-scheduled devices like catheters, heart valves, etc.

Transasia Bio-Medicals wins Best Brand 2019 award

Transasia Bio-Medicals Ltd., has been recognised as the 'Best Brand 2019' at a glittering ceremony recently held in Mumbai. The 'Best Brand Award 2019' is a recognition of the top 25 brands in the country from across different verticals. An extensive survey was conducted, across 15 industries in 12 tier I and II cities, spanning a sample size of 7500+ to identify the top brands. Transasia was the only In-vitro Diagnostic Company in the healthcare segment to win the award.

On receiving the award, Suresh Vazirani, Chairman and Managing Director, Transasia Bio-Medicals, stated, "This recognition comes at a time when we are celebrating our 40 years of dedicated service to doctors and patients in meeting their needs for quality and affordable diagnosis. Today, Transasia is not only a leader in its segment in India but also recognised as a global provider of quality diagnostic solutions. I am glad that we continue to live our legacy of Making in India for the world. I thank The Economic Times for this honor. We see it as an incentive to continually improve the brand by giving utmost satisfaction to our customers across the globe." In 2016 also, Transasia was bestowed with 'The Best Healthcare Brand Award'. Early this year, Transasia was also honored by other publications as the 'Best Company in Medical Devices.'

Mumbai hospital used stem cells to save premature baby

In what it claims is the first such documented case in the world, Surya Hospital, Mumbai said recently that it has used stem cells to save the life of a prematurely born 10-month-old baby suffering from chronic lung disease.

Though the Indian Council of Medical Research (ICMR) regulations doesn't approve of stem cell use in neonatal conditions, Mumbai's Surya Hospital claims it was performed to save a life and open newer research avenues.

The hospital said the son of Chandivali couple got a new lease of life from stem cells that "accelerated the development" of his lungs and helped him fight a severe form of bronchopulmonary dysplasia (BPD)—a condition that destroys lungs and majorly affects babies born before 28 weeks of gestation.

"As far as we know, it's the first time where mesenchymal stem cells have been successfully used to treat BPD in a micro preemie newborn," said Dr Nandkishore Kabra, Director, Neonatal ICU at Surya Hospital. The hospital claimed it started seeing improvement in the baby's lung function within two weeks of injecting the boy with 40 million stem cells directly in the organ. The baby went home in March after spending nearly nine months in the hospital. He now weighs nearly 5kg.

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Padma Shri bestowed to a visionary who has established a world-class Eye Care

Sankara Eye Foundation India is honoured to share that Dr Ramanathan V Ramani, the Founder and Managing Trustee, has been awarded the prestigious "Padma Shri" from the Government of India in recognition of his work in the field of medical services.

In 1977, Dr R.V. Ramani set up Sri Kanchi Kamakoti Medical Centre, which later became Sri Kanchi Kamakoti Medical Trust, a Registered Public Charitable Trust in India. Through this Trust, he established a network of 10 Super Specialty Eye Hospitals across 7 states of India with over 2200 beds for community eye care, which is one of the largest super speciality network eye hospitals in India.

Sankara Eye Hospitals work on an 80:20 ratio, providing world-class eye care with a social impact. 80 per cent of the beneficiaries are the underprivileged who receive completely free services, while the remaining 20 per cent are the patients who can afford to pay for their treatment, thereby cross-subsidizing and enabling the hospital to be self-sustaining.

Sankara Eye Hospitals have so far performed 1.8 million absolutely free eye surgeries, positively impacting beneficiaries' health and livelihood. The rural outreach eye care programme, Gift of Vision, was initiated in 1990 which serves to the rural population in 92 districts across 7 states in India.

Gift of Vision has so far conducted over 26,138 rural outreach camps, screened 4.8 million people and performed over 1.8 million free vision restoration surgeries. Rainbow, a preventive eye care programme for children started in the year 1996, has screened over 6 million school children for undetected visual defects and provided care – everything from spectacles to surgery – wherever required.

Dr R.V. Ramani is also the recipient of national and international awards including the Role Model of India Award, Lifetime Achievement Award from Kasturba Medical College, Heroes of Humanity Award from the Art of Living Foundation, and IAPB Regional Achievement Award.

"National Award, a high recognition, which has come out of thorough due diligence and transparent evaluation will further encourage me and team Sankara to reach greater heights and serve many more millions of needy people in our motherland. It will also set an example for many other like-minded individuals and organisations to take up similar activities in their chosen field," Dr R.V. Ramani said on being conferred the Padma Shri Award.

Padma Shri Awardee Dr Anoop Misra joins IJCP Group as Advisor

Dr Anoop Misra, Chairman of the Fortis Centre for Diabetes, Obesity and Cholesterol (C-DOC) and Head of the National Diabetes Obesity and Cholesterol Foundation (NDOC) recently joined the IJCP Group as Group Advisor. Dr Mishra is a known endocrinologist and a former honorary physician to the Prime Minister of India.

A former Fellow of the WHO at the Royal Free Hospital, UK, Dr Misra is a recipient of the Dr B C Roy Award, the highest Indian award in the medical category. The Government of India awarded him the fourth highest civilian honour of the Padma Shri, in 2007, for his contributions to Indian medicine.

IJCP is a leading medical communications group, aimed at strengthening medical education in the country and continuously upgrading a doctor's knowledge and has become a trusted brand for medical professionals across India and abroad in the past three decades.

Speaking about this, Padma Shri Awardee, Dr KK Aggarwal, Group Editor and Chief, IJCP Group & President, HCFI, said, "We are extremely happy and proud to have Dr Anoop Mishra as an advisor in the IJCP group. He is a multifaceted person with numerous achievements in clinical service, teaching, research, community health activities, and medical education. He also works towards uplifting the health of socially backward communities. Apart from this, Dr Misra has also contributed immensely to undergraduate and postgraduate medical education in various respects. We are sure that under his guidance and support, we will be able to strive better towards the path and goal we have set out to achieve as part of IJCP."

Dr Anoop Mishra, added, "I am happy to be a part of the IJCP group and contribute to furthering medical education in all respects. I believe, as doctors, we need to constantly keep ourselves updated with the current trends in the realm of medicine. The IJCP group has been doing commendable work in this aspect and I look forward to sharing my knowledge and learnings with them."

What began with a single journal called 'The Indian Journal of Clinical Practice' launched by Dr S D Sharma, former Vice President of India, has today matured into a comprehensive medical communications agency offering various products and services. Some of these include multi-speciality journals, customised books and publications, events, consulting, *et al*.

RADIOLOGY *and it's Future*

The radiology services are being provided and served by the radiologists and experts who have unique advanced medical education in radiation. This article takes you to the advances and the next big thing in radiology.

Since its invention in the 19th century, the field of radiology has rapidly grown for millions of people to enhance treatment. Better technologies and new techniques have made the medical field more efficient, less expensive and safer for the users and the patients. Although some imaging procedures may have their risks, doctors are now performing invasive surgeries at a decreasing rate for the last 15 years. MRI scans, CT scans and ultrasound have grown transparent enough for diagnostics in a much safer way.

Doctors are currently seeing things in an exceedingly new perspective by the elaborated imaging. Imaging will offer early and additional correct diagnoses. In some cases, it'd even result in higher and a lot of successful treatment. There are several enhancements to imaging technology in recent years. Here are a couple of that specialists singled out as particularly important. Computerised Tomography (CT) X-ray photography, PET/CT Scans, Digital diagnostic technique and plenty of a lot of.

Advances in Radiology

Radiology is not any exception to the current trend. The increasing integration of digital technologies in imaging not solely disclosed new ways

of operating, however additionally brings in newer responsibilities. For many decades, medical images have been generated and archived in digital form. Chandrasekharannair Suraj Kumar, Head of Nosology Imaging, Siemens Healthineers, India says, "Now, breakthroughs in computer vision also offers the possibility for their automated interpretation. In the future, radiology will be available in every field which is able to be vastly benefitted with conversion. AI-powered solutions has potential to handle major challenges that the aid sector faces these days. Currently, the demand for diagnostic services exceeds the provision of specialists within the manpower. Whereas this gap is growing apace, nosology and treatment also are changing into a lot of uncomplicated things."

Chander Shekhar Sibal, Sr. Vice President, Fujifilm India says, "Fujifilm has leveraged its imaging and information technology to become a global presence known for innovation in healthcare, photo imaging, graphic arts, recording media, industrial products, optical devices, highly functional materials and other high-tech areas. Fujifilm is continuously innovating-creating new technologies, products and services that inspire and excite people everywhere." He further adds, "Our products are best in terms of image quality. Major difference is quality and reliability of our products. We have CR (computed radiography), DR (digital radiography) and digital mammography, Synapse PACS (Picture Archiving and communication system), Endoscopy, Dry Chemistry analyser. We have over 30,000 plus installation base across India."

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Fujifilm is continuously innovating-creating new technologies, products and services that inspire and excite people everywhere."

Chander Shekhar Sibal
Sr. Vice President, Fujifilm India

Developing solutions to manage this ever-increasing offer demand gap and quality is vital for the aid sector. Diagnostic specialists and radiologists would like a replacement set of tools that may handle massive volumes of medical information quickly and accurately. This may change a lot of objective treatment, supported quantitative information tailored to the requirements of each patient.

Siemens Healthineers has been one of the pioneers in AI development for over 20 years and therefore the new deep learning technologies change The United States to change complicated diagnosing and support optimum treatment. Kumar said, "One such example is that the most up-to-date introduction of Siemens Healthineers' intelligent computer code assistant for radiology - AI-Rad Companion Chest CT. A computer code assistant that brings AI to computerised tomography (CT) and helps radiologists by dashing up workflows, increasing exactitude, reducing the time for interpretation and reportage, all this by integration with the imaging interpretation advancement. In an exceedingly shell, AI-Rad Companion may be a vendor-neutral, multi-organ increased reading resolution that mechanically prepares clinical input to be understood by radiologists, pathologists and/or clinicians. Through automation, this resolution aims to require away the burden of basic, repetitive tasks, so full-fledged employees will concentrate on delivering value-based care."

AI is gaining more power in respect and growth among radiology professionals. There is heaps of publicity and many of concern around AI and its impact on the long run of trending. There are several signs that inform towards the actual fact that AI can fully move the globe of medication. As deep learning algorithms and slender AI began to buzz particularly round the field of medical imaging, several radiologists went into panic mode.

Talking about advances in radiology, Fujifilm's Full Field Digital Mammography - Amulet Innovality is the future of Mammography and certainly has much scope considering the rapid increase in the number of breast cancer cases going undetected in India. In order to

Figure 1: Siemens Healthineers' software assistant

With established AI expertise, future-oriented staff, vast medical data sets, and the exceptional computing power needed for creating algorithm-supported healthcare solutions; we are enabling healthcare organisations in their journey towards digital transformation and transforming care delivery.

Chandrasekharannair Suraj Kumar
Head of Nosology Imaging, Siemens Healthineers, India

provide timely diagnosis, Fujifilm has installed Amulet Innovality in several healthcare centers across the country. In addition, the development of Tomo biopsies has a fundamental role in early detection the disease. Tomo-guided biopsy can be beneficial in situations such as lesions can only be seen on tomosynthesis, lesions visible in only one view, and presence of subtle masses and asymmetries.

With rising cases of breast cancer in women, there is a pressing need to raise awareness about early cancer detection at grass-roots level. "While innovations in healthcare technologies will definitely empower and strengthen our efforts, the imperative today is to strengthen our reach with a shared vision of helping people fight this growing menace,'' Sibal added.

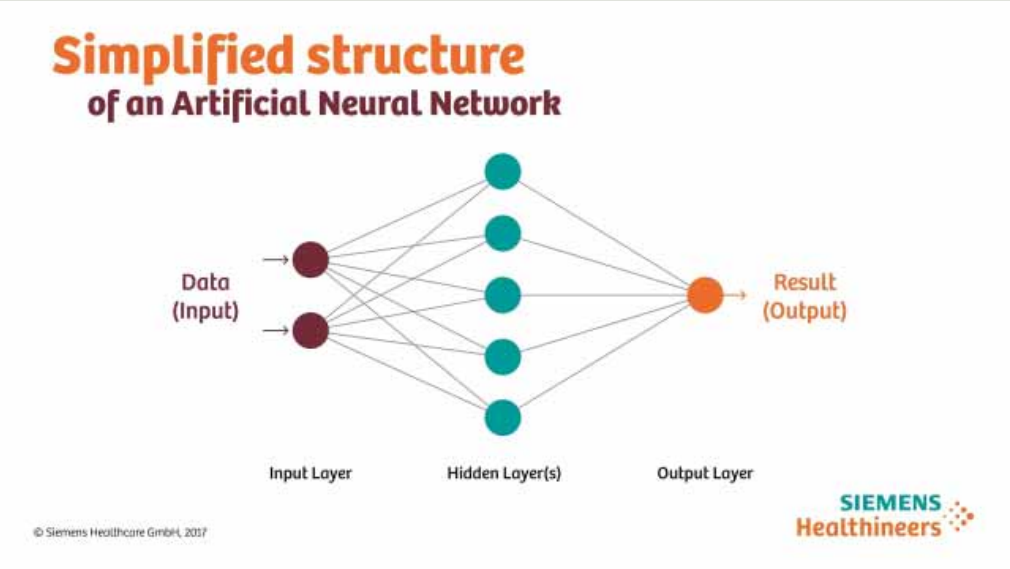
Fujifilm has been making concerted effort to raise awareness and promote early detection and treatment of breast cancer in India. It had held several roadshows across the country to create awareness of the disease and consistently supported the pink ribbon campaign via Pinkathon. Fujifilm also has tie up with more than 25 hospitals to raise awareness and promote early detection facilities. Fujifilm firmly believe that with precise treatment and correct knowledge India can save many lives.

The next big thing in Radiology

More such upcoming technologies will help radiologists read images more efficiently and produce better reports. One such technology will be computer-aided diagnostics, which will partially automate findings detection in imaging exams. As a radiologist reads an imaging exam, the computer will automatically scan its database for patients with similar findings and similar histories and then suggest diagnoses based on that information. Another development that will help radiologists produce better products is structured reporting. Standardised reports will make it possible to capture currently unattainable analytics, including outcome and quality trends. Applications are also expected to emerge that will modernise radiology workstations. Instead of using a mouse or track ball, radiologists will begin using touch screens and even gesture-sensing technologies to navigate and explain imaging exams.

On commenting about the next big thing in Radiology, Kumar said, "AI-based algorithms could soon establish themselves as virtual 'second readers' thereby advancing radiology. With established AI expertise, future-oriented staff, vast medical data sets, and the exceptional computing power needed for creating algorithm-supported healthcare solutions; we are enabling healthcare organisations in their journey towards digital transformation and transforming care delivery."

In this new storm of developing deep learning algorithms and artificial neural networks, along with the explosion of big data and the acceleration of processing power, experts have witnessed the beginning of a new world of AI. There has been an increasing focus of AI in radiology even to the point that some experts in the field are saying that someday AI might even replace radiology experts. These suggestions are very thought provoking and should give reason to look more closely at this technology so people can better understand its potential, understand the drivers, and



begin to understand where and how one can employ the exciting technology to discover new ways to improve the care of patients. AI in radiology will likely emerge in stages. The first stage is already happening and involves AI systems performing automatic segmentation of various structures on digital CT or MR images. Segmentation of structures is that the opening in any effort to isolate and analyse organs or pathologic lesions for analysis. Although segmentation of structures appears simple and without delay apparent to human operators, it will take huge amounts (hours) of your time to perform by humans.

While sharing his thoughts on the next big thing, Sibal said, "Fujifilm had recently organised a symposium with the message 'Evolving Trends in Breast Imaging' in association with IGMC, Shimla and Government Medical College, Aurangabad. The event reached and impacted the minds of more than 300 Radiologists/Oncologist across North and West region." Fujifilm has also partnered with the Indian Cancer Society to provide practical knowledge and quality screening for women of Delhi and NCR who cannot afford quality treatment. Under the partnership Fujifilm is conducting medical camps to generate awareness about breast cancer and breast self-examination. "Free breast cancer screenings will be organised for women above 40 years. It is an endeavor to utilise Fujifilm's state-of-the-art technology for the betterment of people at large," Sibal shared.

Conclusion

Though latest advancements in Radiology and Imaging have increased patient care, the world isn't barren of challenges jeopardising health care delivery in totality. With a population of over one billion people, India has radiologist strength of only 10,000, which means the doctor and patient ratio being just 1:100,000. This can make anyone understand how difficult it is for the radiologists to diagnose diseases with precision, which is first step in the direction of providing right treatment to a patient.

Radiology has proved to be a big boon to fill the gap in the field existing due to mismatch between the availability of the radiologists and the number of images being generated. Radiology gains relevance in the context of diagnosis, which decides the road ahead for treatment and hence the world is ready to accept the advances in radiology and is eager to see the next big things in the field of radiology.

Key features of AI-Rad Companion Chest CT

- **Speeds up workflows – It** unlocks the potential to reduce the time of interpretation and reporting through software, that automatically performs measurements and prepares results for reports, thereby reducing the prolonged working hour pressure for the radiologists.
- **Raises precision-** It provides the possibility to increase accuracy in interpretation and reporting through software that automatically highlights abnormalities, characterizes anatomies, and matches results with reference values.
- **Reduces time of interpretation and reporting -**The AI-Rad Companion Chest CT automatically measures relevant anatomies and abnormalities and transfers results into the reporting environment.
- **Integrates with your imaging interpretation workflow**- With AI-Rad Companion Chest CT seamlessly integrating into the department's workflows and standards, images and supporting information can automatically be made available to any PACS, for individual reporting requirements.

Fingernail Sensor Provides Health Insights

Fingernail sensors and AI can help clinicians to monitor health and disease progression

Grip strength is a useful metric in a surprisingly broad set of health issues. It has been associated with the effectiveness of medication in individuals with Parkinson's disease, the degree of cognitive function in schizophrenics, the state of an individual's cardiovascular health, and all-cause mortality in geriatrics.

Researchers at IBM developed a first-of-a-kind "fingernail sensor" prototype that helps monitor human health. The wearable, wireless device continuously measures how a person's fingernail bends and moves, which is a key indicator of grip strength.

The project began as an attempt to capture the medication state of people with Parkinson's disease. Getting a new therapy approved requires quantifying how people on the therapy are doing in relation to controls. The majority of people with Parkinson's are older, an age group with increasingly brittle, friable skin.

Comprised of skin, nails and hair, the integumentary system covers most of our bodies. Its primary purpose is to protect our internal components from pathogens, toxins, ultraviolet radiation, dehydration, and changes in temperature. It also provides a structure for sensory receptors of the somatosensory system of neurons across our bodies.

One method to measure a disease's progression is to attach skin-based sensors to capture things like motion, the health of muscles and nerve cells, or changes in sweat gland activity, which can reflect the intensity of a person's emotional state. But with older patients, such skin-based sensors can often cause problems, including infection.

This is where the potential of a fingernail sensor comes into play. We interact with objects throughout the day using our hands, such as the tactile sensing of pressure, temperature, surface textures and more. Researchers realised it might be possible to derive interesting signals from how the fingernail bends throughout the course of a day, as we use our fingers to interact with our environment, and tap into the power of AI and machine learning to analyse and derive valuable insights from that data.

One of the functions of human fingernails is to focus the finger-tip pulp on the object being manipulated. It turns out that our fingernails deform – bend and move — in stereotypic ways when we use them for gripping, grasping, and even flexing and extending our fingers. This deformation is usually on the order of single digit microns and not visible to the naked eye. However, it can easily detect with strain gauge sensors. For context, a typical human hair is between 50 and 100 microns across and a red blood cell is usually less than 10 microns across.

"Since nails are so tough, we decided to glue a sensor system to a fingernail without worrying about any of the issues associated with attaching to skin. Our dynamometer experiments demonstrated we could extract a consistent enough signal from the nail to give good grip force prediction in a variety of grip types," the researchers said.

They add: "We also found it is possible to deconvolve subtle finger movements from nail deformation. We were able to differentiate typical daily activities which all involve pronation and supination such as turning a key, opening a doorknob or using a screwdriver. An even more subtle activity is finger writing, and we trained a neural network to produce a very good accuracy (.94) at detecting digits written by a finger wearing the sensor."

IBM's system consists of strain gauges attached to the fingernail and a small computer that samples strain values, collects accelerometer data and communicates with a smart watch. The watch also runs machine learning models to rate bradykinesia, tremor, and dyskinesia which are all symptoms of Parkinson's disease.

By pushing computation to the end of fingers, researchers have found a new use for nails by detecting and characterising their subtle movements. "With the sensor, we can derive health state insights and enable a new type of user interface. This work has also served as the inspiration for a new device modelled on the structure of the fingertip that could one day help quadriplegics communicate," IBM researchers said.

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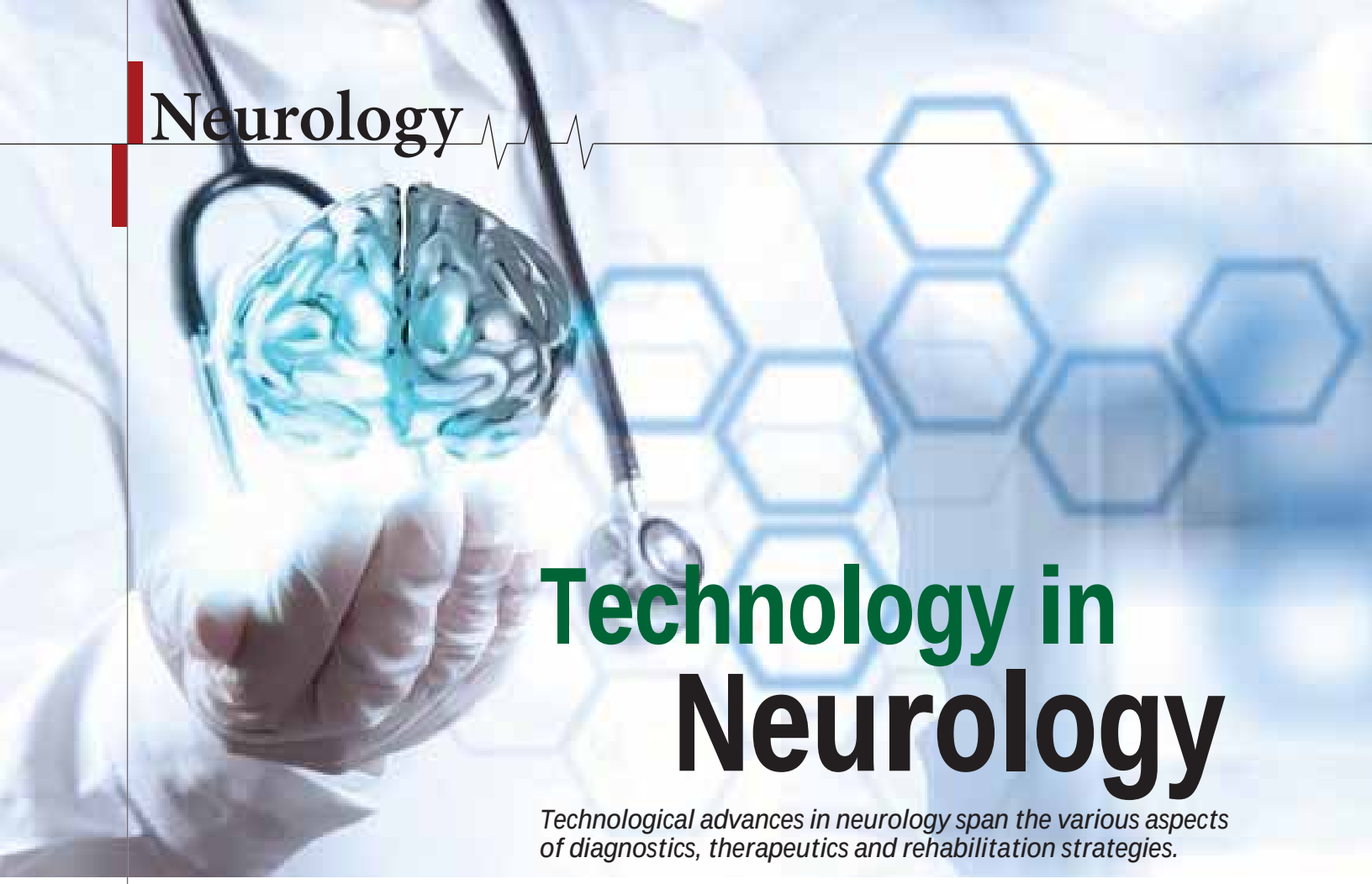


Technology in Neurology

Technological advances in neurology span the various aspects of diagnostics, therapeutics and rehabilitation strategies.

This decade has seen fascinating developments in the field of Neurology. New drugs, new interventional procedures, new investigations, cutting edge research and newer & faster machines have transformed the field entirely. What was once considered as more of a palliative treatment field with no hopes for cure, has been changed to an ever-expanding medical field which is advancing at breathtaking speed. Older diseases in Neurology like Stroke have newer treatments now and there are newer diseases like 'Antibody Mediated Autoimmune Diseases' being discovered almost every few days! What has made a vast difference in the ever-expanding field of Neurology is none other than advances in technology.

Advances in Neurological Diagnostics

Imaging techniques

Advanced imaging methodologies in CT and MRI have revolutionised the neurological treatments, especially in the field of acute stroke. There is increasing analysis to support a physiology-based approach designed on advanced imaging, instead of merely a time-based determination of whether or not or not a patient with acute stroke would profit from reperfusion. Advanced imaging such as CT-Perfusion and MR DWI-FLAIR can be used to establish the age of the lesion and determine the extent of the brain tissue that is salvageable. If Physicians could identify those patients with wake-up strokes that are candidates for intervention, there may be opportunity to treat more people, reducing long term disability and healthcare expenditures.

MRI is a powerful imaging technique that produces detailed, high quality, and high-resolution images of the brain's anatomical structure without radiation using magnetic field. Within the field of MRI, two new imaging techniques are proving particularly valuable: Functional MRI and Diffusion Tensor Imaging (DTI). Functional MRI can observe brain structures and scan the brain while patients perform cognitive tasks, such as solving math problems or responding to stimuli such as sounds or flashing lights. It visualises neural activity in the brain and spinal cord and is a popular imaging technology for neuroscience research. Functional MRI can determine the specific location in the brain where a certain function, such as speech or memory, occurs, which varies slightly for each patient. Knowing where these functional areas are located is critical in planning surgery or other treatments for diseases such as Epilepsy.

Since its introduction, MRI technology has been constantly advancing, producing sharper, clearer images in less time. The most powerful MRI scanners offer ultra-high magnetic fields of 7T which can visualise the brain in unprecedented detail through enhanced contrast mechanisms, such

as Blood Oxygen Level-Dependent (BOLD) and flow-dependent contrast. At 7T, MRI increases lesion visibility and more accurately characterises brain abnormalities. For example, it can help delineate the brain area where epileptic seizures originate, visualise brain tumor pathology, measure metabolic markers in tumor tissue, identify neuron loss in the hippocampus in Alzheimer's disease, and detail the pathologic features of multiple sclerosis.

Other advances in MRI technology are improving brain scan speed, ease, and accuracy:

- 3D volume scans offer thin-slice, SNR-rich studies with exquisite detail to help visualise small and subtle lesions
- 3D Arterial Spin Labeling (ASL) delivers quantitative perfusion assessment to reliably rule out focal or global perfusion defects and evaluate tumor, stroke and other cerebrovascular diseases
- Automated brain exams help reduce workload and improve consistency
- Real time acquisition, processing, and display of functional results enables a single technician to manage all aspects of BOLD MRI studies acquired with synchronised stimuli.

Also, Susceptibility-Weighted Imaging (SWI) can detect substances with different susceptibilities, such as deoxygenated blood, better than conventional MRI techniques. In future, AI will play an increasingly important role in neuroimaging. Artificial neural networks may reduce perceptual and interpretive errors through computer analysis of images augmented by artificial intelligence.

Advances in neurological therapeutics

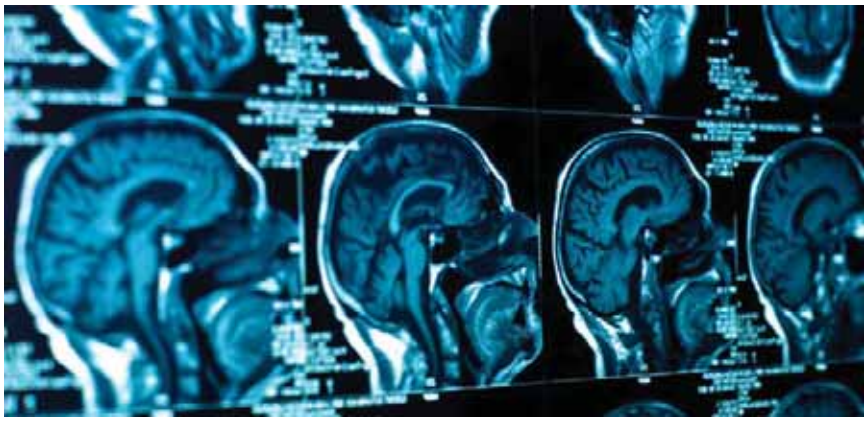
With the breakneck speed of advances in neurological diagnostics, therapeutic advances in every subspecialty of neurology are also on the horizon. Increased sophistication and technological advances have paved a new path for treatment of acute and chronic neurological diseases. In addition to drugs a whole new field of devices in neurology has been opened up.

Neurological devices include CSF management devices, interventional neurology devices, neurosurgical devices and neurostimulation devices. CSF shunts and CSF drainage devices like Ommaya reservoir have been used since long for management of hydrocephalus and increased intracranial tension. Advent of programmable shunts has refined these neurosurgical procedures giving better results.

Advances in the field of interventional neurology have been mind boggling. Various devices used in neurointerventional procedures include embolisation coils, balloon occlusion devices and flow diverters used in treatment of cerebral aneurysms and arteriovenous malformations, various types of stents and microcatheters used in treatment of arterial stenosis as well as clot retrievers and neurothrombectomy devices used in treatment of acute ischemic stroke. The ischemic strokes segment is poised to be the fastest growing segment with very significant reduction in morbidity due to acute stroke.

Neurostimulation devices

Neurostimulation therapies embody invasive and noninvasive approaches that involve the applying of electrical stimulation to drive neural operate inside a circuit. Recent advances in neurotechnologies and neuroimaging, in conjunction with associate degree enlarged understanding of neurocircuitry, are factors contributive to the speedy rise within the use of neurostimulation therapies to treat associate degree increasingly wide range of neurologic and psychiatric disorders. Established neurostimulation methods include Deep Brain Stimulation (DBS), Motor



Cortex Stimulation (MCS), Responsive Neuro Stimulation (RNS), Spinal cord Stimulation (SCS), and Vagus Nerve Stimulation (VNS). All these implantable neurostimulation systems include 3 primary components: stimulating electrode(s), an Internalised Pulse Generator (IPG) that serves as a battery pack, and electrode extender(s) to subcutaneously connect the electrode(s) to the pulse generator. Responsive neurostimulation therapies to treat medically uncontrollable encephalopathy continuing to evolve as advances in neurotechnologies have enabled an additional complete understanding of the pathological brain electronic equipment. Neurostimulatory approach is the only effective treatment option for several refractory neurologic disorders and is rapidly expanding to other clinical application domains.

Advances in NeuroRehabilation

There is a plethora of neurorehabilitation devices available at present. Erigo system for bed ridden patients, Lokomat robot for lower limb training, Armeo power, Armeo spring and Amadeo for upper limb training are the major ones being used especially in hemiplegia and paraplegia patients. Also, functional electrical stimulation devices, advanced orthotics, virtual reality-based rehabilitation devices, telerehabilitation devices, various gait analysis machines, body weight supported treadmill training, EMG biofeedback devices and mirror therapy are being increasingly used in neurorehabilitation. Trascranial magnetic stimulation field is also increasingly expanding for therapeutic as well as rehabilitation purposes.

A Brain–Computer Interface (BCI) could be a direct communication pathway between an increased or wired brain and an external device. BCI differs from neuromodulation therein it permits for two-way data flow. BCI has applications in disorders of impaired consciousness and aiding motor as well as sensory recovery in paralysed patients.

Technological advances in various fields of neurology have been quite mind-boggling. Translating these advances to better patient care in a cost-effective way would be quite challenging. But these advances would definitely change the way various neurological disorders are diagnosed and treated in future.

Dr Kavita Barhate
Consultant Neurologist,
Fortis Hospital, Kalyan

New medical wizards in making

An electronics engineer by profession **Nitesh Jangir**, developed two medical devices - one that assists babies in breathing and another that helps prevent ventilator-related infections. In an interview with **ME&A**, **Nitesh Jangir, Co-Founder, Coeo Labs** talks about the invention of both these devices and their uses.

What is Coeo Labs and how did it come into existence?

Coeo Lab is a medical technology company based in Bangalore, here we develop cutting edge devices to address critical unmet healthcare needs in India and emerging markets. We develop products that are one-of-the-kind in the field of emergency and critical care. Coeo Lab was formed in October 2014. The idea of starting this came when we did a clinical program with InnAccel. InnAccel has developed a portfolio of novel medical devices designed engineered and priced for global emerging markets. InnAccel was running a medical device innovation program called AIM fellowship (Affordable Innovation in Medical Devices). We attended this fellowship program. During this program, we had to spend three months in hospital at the critical care department with doctors to observe and understand what are the biggest challenges faced by doctors while treating the critical patients. Also, we had to observe what are the techniques used by these doctors for the critical patients and also observe the current clinical practices they follow. While our observation at the hospital and critical care units, we invented two devices which can be used in critical situations and can be a boon to the medical device industry and that is how Coeo Labs came into existence.

What are those two devices and what are the uses?

During our observation at the critical unit at the hospital, we saw a patient - a 30-year old male, who was critical and was kept in ICU. He was supposed to be out of the ICU within 48-hours of admission. But due to few medical hazards, he was not out of the critical unit. The doctors said that they need to keep him under observation but the family could not afford the maintenance of keeping him in the ICU for longer duration. The patient had hospital-acquired pneumonia and hence took longer to get back to normal. After doing research and being at the hospital with doctors to know more about hospital-acquired pneumonia, we invented this product which is called VAPCare.

Ventilator-Associated Pneumonia (VAP) is the leading nosocomial cause of mortality in the ICU. The occurrence happens after 48-hours after endotracheal intubation of patients. As a result, mortality rates are 15-50 per cent higher in patients with VAP. Aspiration of colonised pathogenic microorganisms on the oropharynx and gastrointestinal tract is the main route for the development of VAP. This is a global problem faced by both developed and developing countries. VAPCare is a patented product from the US, China, Japan and India. This product took four-years to be available in the market. We started working on this product in

Saans

Vap-Care

December 2014 and we launched it in December 2018. VAPCare reduces chances of obtaining VAP by key functions as: Artificial Intelligence and sensor-based secretion management from three locations: Oral, Oropharyngeal, and Subglottic regions. Independent suction pressure control in each line. Automatic detection and management of port block. Automatic regular mouthwash and lavage and is compatible with all ET Tubes.

The second device is really close to our heart and it is called Saans: A neonatal CPAP device. This device is for premature babies and can work in any kind of environment. It is low-cost, multi powers, infrastructure independent. This device is designed in a pattern where it can work in the worst environment just for babies. Even in a low-income country, a well-designed bubble CPAP improves survival by 24 to 65 per cent. Unfortunately, a significant number of newborns especially premature babies do not have access to this technology during transport nor is electricity and skilled manpower widely available at these critical care units. Currently, all neonatal transport CPAP machines (including bubble CPAPs) require electrical power or compressed gases to function - neither of which is easily available in low-resource settings. But Saans can work with electricity and without electricity. It has got an in-built battery backup. This device can also work on a purely manual mode.

Talking about how Saans was invented, while on our observation in the critical care units, we found one premature baby who had severe brain-damage injuries and had breathing problems. The doctors tried all possible ways to save the baby, but could not save her. That is when we thought of inventing a product which will help babies to breathe properly in worst situations so that when babies are being bought to the hospital, at least the doctors can try to save that life. This device can stand alone and work in any given situation. The complete idea of inventing Saans was no baby in this world should be deprived of the medical facilities or die in any given situation or lack of breathing support device. We started working on Saans project same as the VAPCare in December 2014 and we launched it recently with VAPCare in December 2018. After the launch of Saans, we had a case in the suburban area of Bangalore, where premature babies are brought for treatment. That hospital does not have enough infrastructure for treating babies. They lack compressed oxygen availability. After the invention of our Saans, they purchased this product from Coeo Lab and later they send us a message stating that because of Saans, they had saved a life. This hospital told us that the electric power had been cut off and that's when the nurses started the manual mode of Saans and the baby was saved.

Coeo Labs' product Saans is designed to provide CPAP in resource-constrained settings by multi-power mode including manual, minimum skill needed i.e. only one attender, aligned with various transport mode in India, user determined oxygen + air mixture and Passive humidification and such key functions.

Where are these devices available and what is the cost of each device?

Both these devices, Saans and VapCare are available in markets for commercialisation. Till now we have sold a few devices from Coeo Labs to hospitals and clinics where intensive care is available for patients. The cost of both the devices is different when purchased from the market and different when purchased from our lab. We cannot share the exact amount or cost of the products. A proper marketing plan was made to sell these products. Currently, all the marketing skills are on top and these devices are generating good revenue.

Do you plan to make this device available for all PHC? What are your future plans?

Yes, we do have plans to make both Saans and VapCare available for all PHC and as we are an Indian company, so we have to first expand and scale up in India. We have to be present in all states of India and make sure that public and private healthcare providers know about the devices invented by Coeo Labs. Our plan includes making these devices available all over India till 2020 and then expand our base in the markets of Europe and the USA. Also, to make a firm base, we have planned a few more devices to help the healthcare sector which will be launched soon.

Infrastructure – the backbone of a hospital

This article talks about the critical analysis of Indian hospital infrastructure and the scheme by Indian Government to boost the medical industry of the country.

Image by KoalaParkLaundromat from Pixabay

Healthcare sector is rapidly growing in India, when we talk about healthcare, it includes hospitals, medical devices, medical equipment, clinical trials et al. Healthcare is one of the India's largest sectors in terms of employment and revenue. At least more than half of the rural population in India visit private facilities for healthcare, with a majority of them citing quality concern, unavailability of doctors and equipment in public hospitals. There is lack of effective gate-keeping and referral, leading to fragmentation of healthcare services.

For Indians, the cost of private healthcare is about four times greater than the country's public healthcare. About 72 per cent of residents of rural areas and 79 per cent of residents of urban areas use private healthcare services.

Status of hospital infrastructure in India

In India, there is one government allopathic doctor for every 10,189 people, one government hospital bed for every 2,046 people and one state-run hospital for every 90,343 people. Harshad Thakkar, Partner, Esperti Services and Solutions LLP says, "Medical education infrastructure in the country has shown rapid growth during the last 20 years. The country has 476 medical colleges, 313 colleges for BDS courses and 249 colleges which conduct MDS courses. There has been a total admission of 52,646 in 476 medical colleges, 27,060 in BDS and 6,233 in MDS during 2017-18."

There are 3,215 institutions for general nurse midwives with admission capacity of 129,926 and 777 colleges for Pharmacy (Diploma) with an intake capacity of 46,795 as on 31st October, 2017. There are 23,582 government hospitals having 710,761 beds in the country. 19,810 hospitals are in rural areas with 279,588 beds and 3,772 hospitals are in urban areas with 431,173 beds. "Around 70 per cent of the population of India lives in rural areas and to cater to their needs there are 156,231 sub centres, 25,650 primary health centres and 5,624 community health centres in India as on 31st March 2017," shared Thakkar.

The two main categories of healthcare infrastructure are public and private hospitals. Public hospitals account not more than 1/3rd of healthcare infrastructure while the rest is served by

private healthcare. It is no surprising to know that the quality of services is by far the biggest differentiator between these two categories of infrastructure.

Dr. Vinod Singh, Founder & Consultant, Hospitech Healthcare Consultancy said, "With mere setting up of public hospitals, one cannot satisfactorily say that the hospital infrastructure in that region is improved. Along with the physical infrastructure, equipping the doctors and skilling the staff is equally important in order to achieve the benefits of the infrastructure. Hence unless there is overall improvement in the infrastructure, there can be no measurable output or impact."

Singh further comments, "Private hospitals are the major contributors of Indian healthcare system. The number and quality of services offered by smaller private set ups in the semi urban and rural India form the backbone of the healthcare needs of the country." He adds, "They are further complimented by the presence of bigger hospitals in the neighbourhood towns which provide round the clock specialist care. In this scenario, public sector hospitals settling down to having a negligible say which ultimately get restricted to primary care and obstetrics cases."

The public expenditure on health as a percentage of GDP in India is just 1 per cent against the average of 1.4 per cent in case of low-income countries. Thus, there is a lot that can be done to improve the health and hospital infrastructure in the country. India doesn't have enough hospitals, doctors, nurses and health workers, and since health is a state subject, disparities and inequities in the quality of care and access to health varies widely not just between states but also between urban and rural areas.

Singh says, "Apart from poor quality care, insufficient access to care caused a major share of deaths from cancer, mental, neurological and chronic respiratory conditions. Families are forced to incur high out of pocket expenditure thereby leading to impoverishment and poverty on account of medical and hospitalisation."

"Private hospitals are the major contributors of Indian healthcare system. The number and quality of services offered by smaller private set ups in the semi urban and rural India form the backbone of the healthcare needs of the country."

Dr. Vinod Singh
Founder & Consultant, Hospitech Healthcare Consultancy

In India, the private sector is becoming the preferred source of healthcare as government spending on health remains low, forcing people to seek private services. "One way to improve the quality and reach of the healthcare is to make optimum use of technology to bring doctors / health caregivers and patients together. A simple solution like Telemedicine deployed at rural healthcare centres could make a world of a difference. The best of the breed doctors would be available to treat the rural patients using a Video call. As it is, the availability of internet has spread across the country at a very fast pace. Why not make the most of it?" Thakkar said.

In fact, rural healthcare workers and even doctors can monitor and consult with patients virtually, with all of the required records, scans, and pathology images at their fingertips. Thakkar added, "The idea is simple - To give everyone the best possible care, wherever they are, whenever they need it."

Schemes propelling the growth of Indian health sector

For progressive results of the country, the government's initiative of Ayushman Bharat is the resolution to the urging need of health issues in India. This has advanced the healthcare scenario and will open the horizons for the underprivileged population of our country. This act seeks to resolve the widening gaps between the rich and the poor. With Ayushman Bharat initiative, the government has attempted to fulfill various shortfalls that have been plaguing our country.

"Millions of Indians are pushed to poverty because of high out-of-pocket expenditure on healthcare each year and millions of others do not have access to healthcare for non-financial reasons. It is these segments of the population who stand to benefit most significantly from the implementation of the policy. In this context, Ayushman Bharat could be a step in the right direction for Indian healthcare system. However, implementation of such massive schemes also comes with a unique set of challenges," commented Singh.

"The Ayushman Bharat scheme is a National Health Protection Scheme, which will cover over 10 crore poor and vulnerable families (approximately 50

"Medical education infrastructure in the country has shown rapid growth during the last 20 years. The country has 476 medical colleges, 313 colleges for BDS courses and 249 colleges which conduct MDS courses."

Harshad Thakkar
Partner, Esperti Services and Solutions LLP

crore beneficiaries) providing coverage upto 5 lakh rupees per family per year for secondary and tertiary care hospitalisation. This will be the world's largest government funded healthcare program. The beneficiaries can avail benefits in both public and empaneled private facilities. To control costs, the payments for treatment will be done on package rate basis," Thakkar said.

Singh points out few benefits to the doctors under this project, they are: Allotting land to private hospitals, providing funding for projects (Upto 40 per cent) which are deemed unviable by the private sector and speeding up clearances. The private sector will be allowed to 'build, design, finance, manage, operate and maintain' these hospitals in Tier 2 and Tier 3 cities. The component, pertains to creation of 1,50,000 health and wellness centres which will bring healthcare closer to the homes of the people. These centres will provide Comprehensive Primary Health Care (CPHC), covering both maternal and child health services and non-communicable diseases, including free essential drugs and diagnostic services especially focusing on preventive and promotive services and saving the cost in future from related complications.

Commenting about the Ayushman Bharat Scheme, Thakkar says, "While the intent of Ayushman Bharat is to get quality healthcare facilities to the poorest of the poor people, its implementation could be challenging. Why would a private hospital give the services for a predetermined package rate to the people? That would lead to a lot of bickering as the infrastructure costs of setting up a quality healthcare centre far outweigh the revenues especially when catering to the weaker section with a fixed revenue package."

With Ayushman Bharat, the government seeks to change the face of healthcare industry of our country. With an increase in inflation, the government must cater to the needs of the entire population. Thus, the proposed initiative must benefit the whole nation. If implemented in the right direction along with fulfilling its purpose, Ayushman Bharat can definitely be a turning point in the health sector.

12th India Med Expo 2019 to be held at Bengaluru

India Med Expo 2019 Bengaluru one of India's No. 1 trade fair for hospitals, health care centers and clinics, will be held at Manpho Convention Center, Manyata Tech Park Road, Bengaluru from 28th-30th June 2019.

This expo provides best opportunities to cover the enormous Indian healthcare market as well as considering the special potential of the big metropolitan areas with its growing demand and rising investments in the public and private healthcare sector.

More than 200 exhibitors will be participating at 12th India Med Expo 2019. The displayed products consist of hospital equipment, medical technology and surgical equipment, hospital furniture, home healthcare products, medical gas pipe line laboratory equipment, diagnostics physiotherapy, disposable, orthopedic technology commodities and consumer goods for hospitals.

Information and communication technology in healthcare, surgical products and services, facility management, medical disposable, healthcare building technology, medical services radiology, imaging and diagnostics cardiology, medical publications consulting services in healthcare, rehabilitation components supplying industry services and lot more will also be exhibited in this show.

India Med Expo is one of the leading exhibitions and conference for healthcare, which act as a platform where connections are made and business relationships are nurtured. With participation from over 10 countries, India Med Expo 2019 will provide an opportunity to position the brand among competitors and further increase the level of visibility. The Expo is well known for its ability to detect trends and respond to market impulse. Find diverse solutions to the diverse healthcare needs. At the expo visitors will explore how the latest digital technologies and new approaches shaping healthcare.

Hong Kong Medical and Healthcare Fair presents cutting-edge solutions

Highlighted Products

Wandering Prevention System
Company: Venture Global Limited
Booth: 3F-E22

PIEXO Nanotechnology Air Freshener Dispensing System
Company: New Choice (HK) Ltd
Booth: 3F-C05

Testo Saveris 2 Medical Refrigerator Monitoring System
Company: Appleone Solution Limited
Booth: 3G-B22

ROOM Shampoo
Company: L.O.M. International Limited
Booth: 3G-C10

The HKTDC Hong Kong International Medical and Healthcare Fair (Medical Fair) will take place at the Hong Kong Convention and Exhibition Centre (HKCEC) from 14 to 16 May. Organised by the Hong Kong Trade Development Council (HKTDC) and co-organised by the Hong Kong Medical and Healthcare Device Industries Association (HKMHDIA), the 10th edition will gather over 280 exhibitors from 8 countries and regions, showcasing the latest medical devices and technologies, medical supplies as well as healthcare products. In 2018, the fair attracted more than 11,500 buyers from 70 countries and regions.

Specialist Zones for Easy Sourcing

The fair will feature six specialist zones to facilitate buyers' sourcing needs. Ageing populations and increased health awareness continue to boost the demands for medical products. The World of Health & Wellness presents lifestyle, cosmetology and fitness products, as well as functional foods and health supplements.

The Rehabilitation and Elderly Care zone showcases products and services tailored to elderly care and rehabilitation. A Hong Kong exhibitor has developed a wandering prevention system, which will notify the caregiver or family member immediately if the elderly with dementia run away from home unexpectedly. This helps ease the pressure on family members or caregivers.

The zone also hosts exhibitors serving not only the silver market but also the younger market prone to sports injuries, including mobility aids like wheel chairs, orthopaedic equipment, monitoring devices, and more. Another highlight zone, the Medical Supplies and Disposables zone provides such medical supplies as antiseptics, alcohol and medical gloves while the Hospital Equipment zone gathers ultrasound, other imaging equipment, anesthetic equipment and surgical instruments.

Building Technology and Hospital Furniture zone displays hospital construction and design service.

Tech Exchange and Startup Zones to Showcase Innovation

To help start-ups gain exposure and meet potential investors, the fair once again featured the Startup zone, where cutting-edge medical products and ideas will be presented by start-ups. The Tech Exchange zone gathers a number of higher education institutions, displaying their latest innovations. It offers matching opportunities for buyers and exhibitors to transform concepts to be applicable.

Concurrent Hospital Authority Convention

The Hospital Authority Convention 2019 (14-15 May), another influential event for medical professionals in the Asia Pacific region, will be held on the first two days of the Medical Fair at the HKCEC, creating strong synergy with the fair. Over 5,000 delegates are expected to attend, with some 90 distinguished overseas and local speakers to share their research studies and insights, as well as interact with delegates.

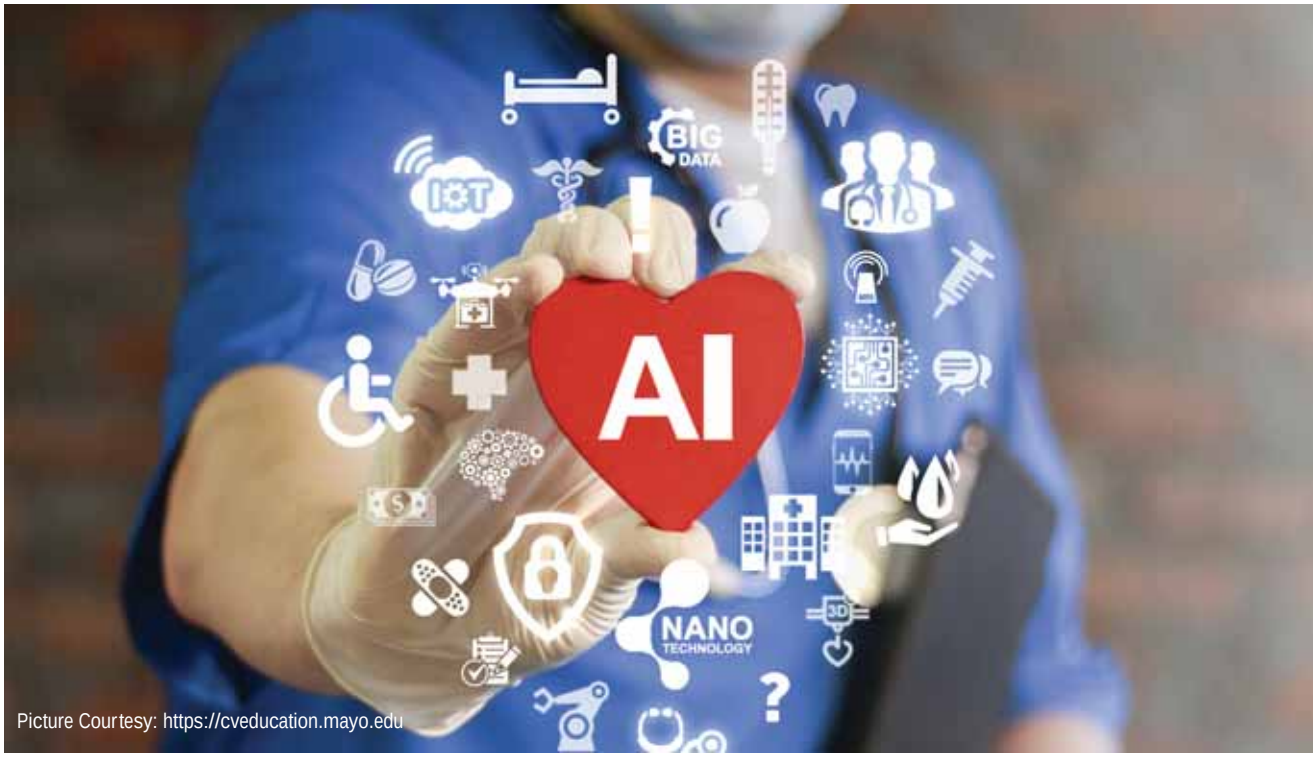
Websites: www.hktdc.com/hkmedicalfair

A touch of AI in Cardiology

This article will walk you through the latest advancements in the field of Cardiology

Artificial intelligence (AI) refers to computers programmed in a way to mimic the human brain. It finds applications in speech and image recognition, robotics, smart homes and our very own smart phones to name a few. Machine Learning (ML) which is another AI related terminology is the study of computer algorithms to improve automatically through experience much like an archer trying to hit the "bulls eye" with repeated attempts and improving at every attempt until the target is achieved. Like in other fields, AI and ML have slowly started invading the medical world. A good example is Watson which is rather increasingly used by oncologists to manage almost everything related to cancer.

Today a cardiologist is flooded with biometric data from live streaming mobile devices, genetic profile of cardiac diseases, clinical data form Electronic Health Records (EHR) and ongoing trials



Picture Courtesy: https://cveducation.mayo.edu

and lab research results. Piecing the data together and prioritising the variables for better patient outcomes is a Herculean task. AI and ML can better solve this puzzle and augment the cardiologist's effort to provide a more meaningful and personalised care.

ML strategies are broadly classified as supervised and unsupervised learning involving algorithms like regularised regression, tree based methods, support vector machines, neural networks and deep learning. Earliest commercial application of deep learning in medicine was for analysis of images (e.g. to detect diabetic retinopathy from a database of 1.28 lakh images). Similar success was also achieved in detecting skin cancer. Deep learning in cardiology has shown potential in hearts pumping function assessment and image assistance in percutaneous coronary angioplasty which is programmed into the machinery. Their use in such niche areas is so common today that we fail to appreciate them. Another algorithm called "reinforced learning" which is more nascent help tailor the treatment based on patient characteristics. It can be incorporated into the electronic health records of patients and help them get a more personalised care. In the near future, AI and ML in cardiovascular medicine will positively influence the following in a big way:

- **Research and development:** Novel therapeutic agent discovery and precision disease stratification.
- **Clinical practise:** Aiding in accurate diagnosis and assisted therapy selection by integrating multi-omic data.
- **Public health:** By way of optimising manpower and economic resource allocation for uplifting the general health of masses. AI can help in continuous remote monitoring and corrective action which will reduce the time taken to get medical help when needed and may be even avert a medical emergency by early predictive intervention.

Currently the developed world employs trained personnel to incorporate AI methodology in medical practise but soon they will be increasingly easy and commoditised much like installing the windows operating system on your desktop. This will lead to automation of interaction with medical records helping the doctor to make more meaningful treatment decisions. AI and ML should not be considered as a substitute for doctors but rather a powerful tool for the health delivery system to provide better medical care. Today we live in an age of information with mounting pressure on doctors and health infrastructure for efficient, effective, quicker and personalised care for patients and AI has come by as a boon.

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Cardiology - Interventional,
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HOW AI TRANSFORMING HEALTHCARE

Artificial Intelligence has immense potential to improve healthcare delivery. The article describes why it is going to be a game-changer.

The milestones achieved by Artificial Intelligence (AI) have the world on its toes. Apart from all the industries, it has been touching, the modern healthcare industry has been receiving paramount importance. There has been an exemplary shift in the way patients are diagnosed by doctors because they now have a good amount of actionable data that can be put to good use.

AI is the game changer in the healthcare industry. As per the reports by Frost & Sullivan, the consulting firm, the healthcare AI market is likely to experience a compound annual growth rate of 40 per cent by 2021, and it can change healthcare out¬comes by 30-40 per cent and cut treatment costs in half.

According to an analysis conducted by Accenture, AI applications in healthcare can create $150 billion dollars in annual savings for the US healthcare economy by 2026.

How AI is Changing Healthcare

The decisions made by medical practitioners can now be augmented by the extra layer of AI over the data. Training the code using this data reduces the likelihood of errors in the field of healthcare.

Electronic Health Records

Electronic Health Records are basically digital patient chart including information from multiple hospital encounters contained in an account which can be accessed across hospitals and facilities. EHR has all information including the disease, type of medicine and tests prescribed, results of the tests etc. Most of this data is fed manual at some point of time. But we can change it using AI by doing data extraction from free text (documents) using AI. We can also capture the clinical data by natural language processing.

Medical Imaging Diagnostics

AI plays a major role in enabling intelligence in the radiology images obtained through scanning machines. X-rays, CT scans and MRIs tells us about the body's inner workings. The diagnostic imaging team, the pathologist and the doctors can reach a unanimous decision on the mode of treatment, and the chances of overcoming hurdles are very high. By making use of deep learning algorithms, it is now possible to distinguish between cancerous and non-cancerous cells in a much more precise way.

The radiologists and surgeons can now zoom into the problem, and study accurately, and do something more than what the human eyes could do.

Virtual Health Assistance

It is likely to increase patient engagement to the next level through Intelligent Virtual Assistant (IVA) and Medical Virtual Assistant (MVA). Today medical support has gone beyond wearables by advising patients to not just handle their goals,

but also to actually assist them look after their health like a real assistant would such as medication reminders, provide medical advice for common ailments or complaints, suggest diet and eating habits, reminder for medication refill, remind doctor appointments and manage bookings, allow virtual interaction with doctors, chatbots to provide primary health and many such.

Robotic Assistance

The AI assistant can immediately deliver information on the patient's past and present health and make recommendations that would help in the diagnosis. Surgeries have become minimally invasive techniques whereby hospital stay is considerably reduced, and thereby recovery of the patient. There are surgical bots that make use of computer vision to do surgeries after calculating the measurements of the human body precisely.

And the best part of all, the AI assisted equipment monitor the patients and their health levels, after the doctors, nurses and care takers have gone to rest or sleep. Human limitations will never be a problem in generating commendable patient outcome.

Proactive Medical Care

In conventional medical treatment, the drift was to treat the patient after the disease is identified. Now with AI, reactive medical care became proactive medical care. In this kind of care, the patient's comprehensive medical history is studied and high-risk markers for several diseases are emphasised. At risk patients are then monitored for any variation in their conditions, and if anything seems alarming, the app can suggest medical intervention.

Benefits of Incorporating AI in Healthcare

Predictive medical care: A developing treatment model wherein the patient data is reviewed constantly to check for any anomalies, trailed by suggestions of medical intervention.

Personalised medication: AI makes it likely for patients to have custom-made care based on their body composition and past medical history.

Better diagnosis: Fast research and cross-referencing of data leads to improved diagnosis of diseases. The data also comprises handwritten notes, geospatial and sensor data and test results. Environment (both human and natural) influences are also considered.

Advanced treatment plans: New treatment means are generated and familiarised, including robotic surgery, cell biology, eye drops to dissolve cataracts instead of eye surgeries, wound healing by printing skin cells, 3D printing, artificial pancreas to balance blood glucose levels and administer insulin, and many such.

Non-stop monitoring: Uninterrupted monitoring of patients would make sure of timely care and treatment and even reduced hospital stay for the patients. The AI based app can check for the patient's health and important signs in case of critically sick patients before notifying for medical intervention.

Economical for both patient and medical care provider: AI can make healthcare both effective and inexpensive as it helps in guiding treatment choice, making precise diagnosis, helps the patients in taking better decisions concerning their health and makes important decisions in drug development.

Virinchi AI ML Healthcare

Virinchi is currently using Machine Learning (ML) to improve the patient care in Virinchi Hospitals. With the help of its effective HIS software, the hospitals collect the patient data and analyse it. They have developed and trained the software for that analysis, which is trained with years of data. This software keeps on training itself as the data keeps on adding. Also, the patients are categorised into different depending upon their health reports and response to various events.

Uses

Emergency Decision: Using the current data on patients, even the nurses can comment on the criticality of the patient which is predicted by the software which tells us about the future situation of the patient by studying his/her present vitals. It helps them to judge what kind of primary care does the patient need and tells them beforehand about the immediate challenges they might face resulting into more time to act on those challenges. Depending on the same, if the software predicts that the patient is going to be in a critical situation or need some specific care/type of doctor in some time, he/she can be shifted to a better equipped hospital.

Preventive Medicines: By using data, the Patient Similarity Index is decided which gives information about the relative similarities and differences in patients. Using PSI, such data are divided into various cohorts. The patients in these particular cohorts show particular symptoms at a certain age or react in a similar way. This categorisation also tells about their lifestyle. Depending on these predictions, the patients are advised medications/precautions and also advised for regular check-ups related to symptoms of those predictions.

Radiology: The data of certain X-rays and scans are collected and mapped the irregularities with physical irregularities after carefully analysing them. Then the code is trained with the data and make predictions on future X-rays and scans. These predictions help the radiologists to generate the reports which help the nurses to understand what kind of primary care does the patient needs and also assists the doctors. These kind of AI/ML predictions are very helpful in complicated brain deceases like Alzheimer's etc. ✚

Vishal Ranjan,
Group Head,
Virinchi Hospital

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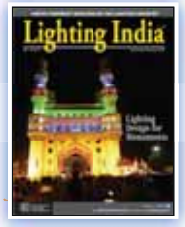

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Surgical operating theatre: The 'Heart' of hospital

Operating rooms (ORs) are specialised workspaces that require highly functional equipment of the highest quality, which surgeons and other OR personnel use to perform lifesaving procedures.

Without this equipment in place, OR professionals may struggle to deliver the care that patients need. There is a definite number of essential operating room equipment that OR professionals need on a per case basis. Each piece of equipment serves a distinct purpose and makes it easier for OR personnel to get the job done. Here's a closer look at some of the most common required OR equipment that serve the needs of OR staff and patients every day.

Overview of necessary operating room equipment-reduced

1. Utility columns
2. Surgical and exam lights
3. Stretchers and stretcher accessories
4. Cushions and mattresses
5. Space management booms
6. Sterilisation and cleaning equipment
7. Disposables and consumables
8. Gel pads and positioners.

An operation theatre complex is the "heart" of any major surgical hospital. An operating theatre, operating room, surgery suite or a surgery centre is a room within a hospital, within which surgical and other operations are carried out. Operating theatres were so-called in the United Kingdom, because they traditionally consisted of semi-circular amphitheatres to allow students to observe the medical procedures. The Old Operating Theatre in London is one of the oldest, dating back to 1822.

Artificial Intelligence: Coming soon to a hospital operating theatre near you

Human intelligence has long powered hospitals and health care. People rely on doctors, nurses, and a variety of other clinicians to solve problems and create new solutions. Advances in artificial intelligence are now making it possible to apply this form of computer-based "thinking" to health care.

There are many developments in artificial intelligence. Here are three areas — training, surgical robots, and data mining — in which, people believe

it will begin making a difference sooner rather than later.

Games for surgeons

Inside their operating rooms, surgeons are the captains of the ship. They possess extensive medical training and the skills to apply it. But they rely on the co-operation and contributions of the entire team to make the most of those skills. Unfortunately, few surgeons get training in how to effectively lead people with different educational and skill backgrounds.

Intelligent robots

Major advances in robotic surgery let doctors perform many types of complex procedures with more precision, flexibility, and control than is possible with other conventional techniques. Robots like the Da Vinci Surgical System provide a platform for translating a surgeon's movements into precise actions with advanced instruments. Current robots, however, are not aware of the anatomy they show the surgeon, the procedures they are being used to perform, or what the surgeon intends to do. They are fantastic tools, but they aren't yet intelligent assistants.

Future generations of robotic surgery platforms will be more aware of the procedure being performed and use that knowledge and perception to give the surgeon intelligent assistance.

Alexa, Siri, and Cortana can not only understand your music preferences and other wishes, they can also listen to questions asked in the work environment. For doctors, that means the operating room—and for the patient, it means that operating surgeon is not alone. Here's why it's so useful.

Thanks to AI, there is a world of data out there that can instantly respond to everyone's curiosity and influence our decision making. The medical database version of IBM's Watson—and similar knowledge repositories from Google, Apple, and even Amazon—are now available at the tip of any surgeon's tongue. These tools are called "voice agents." They listen passively and are available to answer any question one may have. Anyone may ask for a reminder of a patient's surgical history, for the data on a specific type of meniscus tear, or for a suggestion on how to remove a broken screw that resists the techniques one has used before or a latest technique available in journals regarding heart valve repairs.

While much of the information is accessible before one even enter the operating room, the surprises doctor's encounter in surgery are still enormous. Why? Because there are wide variations in each patient's tissues, where they insert, how they interact, and how they are injured or having infective endocarditis on heart valves. No two people are exactly alike— yet the similarities are what permit us to aggregate this data into AI's voice agents.

Before, surgeons usually had to do it alone. Today, everyone is empowered with the world's knowledge of each case, each technique's outcome, and with the many surgical variations that have been tried. While our head may hold a career's worth of knowledge, and hands skilled by practice, it was just one individual. But now we are alone no more.

Digital Surgery, a health tech company shaping the future of surgery through the convergence of surgical expertise and technology, announced that it has developed and successfully demonstrated the world's first real-time, dynamic AI system designed for the OR. The company is building the data to power the future of surgery through its world-class and proprietary surgical procedure road maps, which aim to aid the surgical team in the OR, reducing risk and making surgery safer. Digital Surgery is the first patented AI platform bringing this scale of knowledge to the surgical community.

This is a huge milestone for the future of surgery because it lays the foundation for how AI and computer vision will support surgical teams to deliver safer surgeries. It also enables the next generation of robotic surgery, giving these future systems the capability to function more intelligently and safely. ✚

Dr K. M. Mandana
Director- Department of Cardiac Sciences and Chief Heart Transplant Surgeon, Fortis Hospitals, Kolkata

Perfectly positioned
A laser shows the way

Every surgical operation has inherent risks. New technologies help to minimise these risks, for example with high-precision 3D navigation for computer tomography.

The radiology department at the University Hospital of Basel has state-of-the-art equipment. In addition to the world's first 3D X-ray device, the hospital also relies on a new laser navigation system for CT scanning – guided minimally invasive surgery. "It offers a lot of advantages for image-guided operations," explains Dr Christoph Zech, Head of the Interventional Radiology Department at the University Hospital of Basel.

Visualising the invisible

Since 1974, CT scans have been used to create detailed cross-sectional X-ray images of the human body. Doctors use these high-resolution images in their decision making, e.g., on where to take a tumor sample. But how do they reach that target? Where exactly do they place the needle tip, and what is the correct angle? Until now, this used to be a difficult challenge – every millimeter count. Here's where the fully automated laser navigation system made by the company Amedo comes in. The device consists of a ceiling-mounted, arc-shaped rail on which a motorised laser positioning unit is mounted. That's all – a simple system that makes a big difference for doctors and patients alike.

Lower radiation exposure

The navigation system uses a laser beam to project the needle's point of entry on the patient's skin and visualise the needle path along which the radiologist needs to move the instrument. Dr Zech uses a foot switch to adjust the exact position of the needle. This triggers an imaging sequence to monitor the ongoing operation, the infiltration of a nerve root. The monitor of the CT scanner shows the position of the 0.7-millimeter-thin needle. It is already in the correct position in the first set of frames. "Here's where the new laser navigation system is extremely helpful," says Zech. The intrusion depth of the needle is also displayed.

Additional CT scans to determine the position are hardly necessary any longer, which significantly reduces the radiation exposure for the patient. With traditional technology, the position of the needle had to be checked at least two or three times.

Maxon Motors position the laser

Brushless Maxon drive systems are used to ensure that the laser unit moves precisely on the device's rail. The unit is equipped with a brushless flat motor with a 45-millimeter diameter, combined with the GS45 planetary gearhead and an MR encoder. Via a synchronising pulley, they drive an endless belt that moves the carriage along the arc. The rotating laser pointer is installed in this carriage.

Two more Maxon Motors control the mechanical rotation of the laser mirrors: brushless EC-max 16. Combined with GP 16A planetary gearheads and MR encoders, they enable a precise positioning of the laser beam to show any angle as required for the operation. The motors are controlled using three EPOS2 Module 36/2, taking into account all process parameters as well as the communication with the control computer. According to Volker Trösken, Managing Partner at Amedo, the small-form factor and reliability were the main points in favour of the Maxon drive systems. ✚

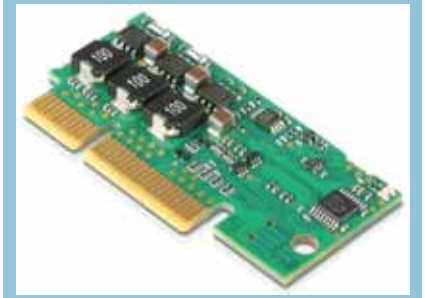
Maxon Products

Maxon EC 45 flat

Maxon flat motors are especially suitable for installation in confined spaces.

Maxon EC-max 16 motor

Maxon EC-max stands for an optimal price/performance ratio, with all of the advantages offered by a brushless DC motor.



Maxon EPOS2 module 36/2

For brushed DC motors with encoders and brushless DC (Maxon EC) motors with hall sensors and encoders up to 72 W.

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Explore and Connect

Sikkim gets India's 2nd largest government hospital

The people of Sikkim will be able to access free state-sponsored healthcare in the new 10-storied Sir Thutob Namgyal Memorial Multi-Speciality Hospital (STNM) in Sochaygang, which is three kilometres away from Gangktok. It will be the second largest government hospital in India. The 1002-bed hospital will come only second behind the prestigious All India Institute of Medical Sciences (AIIMS), New Delhi. The original 100-year-old STNM Hospital, once situated in the centre of Gangtok, will now shift its premises to the new hospital. Few things you should know about the hospital: It took nine years and a mammoth Rs 1,281 Crore to construct this hospital, spread across 15 acres of land. Taking the geography of the area into account, the main block of the hospital has been constructed with earthquake-resistant material. As per reports, the hospital can withstand an earthquake measuring up to eight on the richter scale. The hospital is expected to be on par with global standards. Besides a separate general, surgical and speciality departments, the hospital has 23 operation theatres that can all function together at the same time.

Besides, the hospital is equipped with highly sophisticated equipment, including MRI, CT scanners, orthopantomogram machine and Doppler fetal monitor, among others. Since the hospital is situated three kilometres away from Gangtok, the state government has commissioned eight buses that will run around the clock to transport patients and hospital attendants back and to the hospital for free. For the time being, the hospital has recruited 47 expert doctors and 261 nurses full time. Many more are expected to be appointed in the coming months. Those accompanying the patients can stay over at a 119-bed Yatri Niwas lodging facility set up on the hospital premises which will also offer meals. Besides residents of Sikkim, the hospital has the potential to take in patients from the Northeast and the Darjeeling district of West Bengal. This is indeed a landmark moment for the people of Sikkim.

India's first Sci-fi hospital at Chandighar

PGI's new 334-bedded futuristic hospital has jumped out of the science fiction world of Star Trek and its 23rd century. For the patients to get undisturbed sleep, the hospital has circadian lighting system that synchronises with the body's biological clock. The central public works department claimed the Post Graduate Institute of Medical Education and Research (PGIMER) as first of its kind in India. The interiors have got fewer lights and the fixtures that adjust according to the amount of natural sunlight. This saves patients the jetlag kind of disturbed sleep they experience in ususal hospitals where natural

light doesn't filter in. Under those ordinary lights, the patients used to feel gloomy. The new lights and air circulation system will improve their condition and the health of the staff and visitors.

This hospital has many other futuristic technologies such as pneumatic tube transport for propelling container to labs. The attendants and patients do not have to carry samples of urine and blood to the testing centre physically, since a network of tubes will take it there within 30 seconds. The fire-safe, infection-free environment is another design level. At the time of blaze, fire curtains drop and work like a chimney to expel the smoke. The wards have calling systems for nurses and the walls and switches have antibacterial coating. The monitors display real-time air quality. The cost of making this is Rs 170 crore, and covers 10 modular operating theatres for the department of ENT, hepatology, endocrinology, surgical oncology. Optimised designing has cut down the cost. Many technologies are borrowed from Germany and Switzerland but every system is designed in-house.

FEHI celebrates 30-years of path-breaking work

Fortis Escorts Heart Institute (FEHI), Delhi, one of the pioneer and centre of excellence in cardiac care, is celebrating 30 years of path-breaking work and service to the numerous heart patients, who have benefitted from treatment, at this outstanding facility. Armed with clinical expertise and cutting-edge medical technology, the hospital has set enviable benchmarks in Cardiac Bypass Surgery, Minimally Invasive Surgery, Interventional Cardiology, Non-invasive Cardiology, Pediatric Cardiology and Pediatric Cardiac Surgery. Till date, FEHI has successfully completed over 1,79,000 Coronary Angiographies, over 97,000 Cardiac Surgeries and almost 62,000 Coronary Angioplasties, in addition to several life-saving procedures.

The hospital also performed India's first Trans Catheter Aortic Valve Implantation (TAVI) and Bioresorable Vascular Scaffold (BVS); Asia Pacific's first Directional Atherectomy, Angioscopy, Drug Eluting Stenting, etc. Over the years, FEHI has cloned a Heart Care Network of 19 hospitals and Heart Command Centers in India and abroad. It has also launched the revolutionary e-ICU program, enabling remote and timely access to critical care. Fortis Escorts Heart Institute has won numerous awards and accolades, the most recent among them being the 'Best Cardiology Hospital' at the ICICI Lombard & CNBC TV18 India Healthcare Awards for 2012 and many more awards as such.

A breast centre launched for women by CK Birla

The CK Birla Hospital for women recently announced the launch of one of India's most comprehensive breast health facilities, 'The Breast Centre' in Gurugram. It offers a full spectrum of breast health services including prevention and genomics, screening (breast exams, ultrasound and mammogram) breast surgeries, breast reconstruction and conservation, chemotherapy and post-treatment support in the form of rehabilitation and counselling services.

The hospital has also partnered with the National Association for the Blind (NAB) to offer a unique breast screening technique - Medical Tactile Examination which uses the highly developed sense of touch of blind women in the early detection of any abnormalities which could be indicative of breast cancer. With this, the hospital becomes the only hospital in Gurugram to offer this unique service.

It is believed that one of the biggest reasons for the high mortality rate is the late diagnosis which is primarily due to lack of awareness and the absence of a proper breast cancer screening programme.

The CK Birla Hospital for women has developed a very comprehensive programme for breast cancer prevention and screening. Under the programme, it is offering a free comprehensive breast cancer screening package worth Rs. 5000/-. The package includes a clinical breast examination, a radiology screening in the form of an Ultrasound or Mammogram depending on the age and risk factor of the woman and a consultation with a breast specialist.

India's 'first women hospital' inaugurated in Delhi

Touted as India's first women hospital, Gaudium Women Hospital was inaugurated on March 8, International Women's Day, at Janakpuri in New Delhi by Bollywood Actress, Shilpa Shetty. The inauguration ceremony was held in the presence of Bollywood Actress, Shilpa Shetty, Delhi BJP President, Manoj Tiwari, and Dr. Manika Khanna, Founder and CEO Gaudium IVF and Gynae Solutions, Dr. Peeyush Khanna, renowned Jagran singer Narendra Chanchal, Secretary BJP Delhi, and Parvesh Sharma, MP.Gaudium Woman is a first-of-its-kind dedicated Women Health specialist facility in India with an exclusive focus on not just providing tertiary services in women healthcare, but on preventive and holistic health, too.

Hon'ble Union Finance Minister Shri Arun Jaitley wished the Gaudium Hospital, "I am happy to note that Gaudium is celebrating International Women's Day by inaugurating Gaudium Women Hospital, exclusively dedicated for women. I wish the hospital to work hard and provide the best possible treatment and healthcare facilities. I extend my best wishes for the success of the hospital".

Dr. Manika Khanna welcomed all for the inauguration of Gaudium Women Hospital and reflected her vision for empowering women saying that "Not just woman health, I wish to uplift entire women gender to a level where all are empowered, independent and in the best of health."

Intelligent Gas Chromatography Systems

Agilent Technologies Inc. launches two new gas chromatography systems Agilent 8890 and 8860 GC that will incorporate innovative and intelligent 'self-aware' predictive technology, expanding their suite of smart-connected GC instruments.

The company has also introduced Cary 3500 UV-Vis system which is an innovative spectrophotometer designed to help life science, pharma and biopharma research communities simplify their analyses, optimise laboratory productivity, and ultimately help bring new therapeutics to market faster.

The 8890 and 8860 GCs are built on a next-generation electronic architecture platform, based on the innovative technologies of the Intuvo 9000 GC, Agilent's flagship existing GC system. Continuous system monitoring, automated diagnostics and built-in troubleshooting routines will help labs avoid unplanned downtime and increase lab efficiency – both top goals of lab managers today. Remote connectivity through mobile devices such as tablets and laptops, allows operators and managers to securely access instrument status and function while away from the lab.

Agilent also introduced two powerful Blank and Detector Evaluation smart routines on the 8890 and 8860 GC systems, enabling automatic determination of system readiness. These new predictive functions will also be available for upgrade on Agilent's Intuvo 9000 GC systems.

The new GC systems have been designed to provide customers with continual expansion of system intelligence functions. These new functions are also available for Agilent's existing GC systems.

Automated diagnostics and troubleshooting routines will allow operators to attend to more high-value activities such as reviewing data and attending to new customer needs, helping them to grow their enterprises.

Implantable Micro-Devices for Self-Charging Pacemakers

The over one million pacemakers implanted each year worldwide currently require an additional surgical procedure every 5–10 years to replace the batteries. Dartmouth engineering researchers, along with clinicians at UT Health San Antonio, have published promising results of a new way to power these and other implantable medical devices.

The study investigates using a combination of thin-film energy conversion materials with a minimally-invasive mechanical design to enable self-charging batteries for a potentially wide-range of implantable devices including pacemakers and defibrillators.

"We're trying to solve the ultimate problem for any implantable biomedical device," says Dartmouth engineering professor John X.J. Zhang, a lead researcher on the study. "How do you create an effective energy source so the device will do its job during the entire life span of the patient, without the need for surgery to replace the battery?"

"Of equal importance is that the device not interfere with the body's function," adds Dartmouth research associate Lin Dong, first author on the paper. "We knew it had to be biocompatible, lightweight, flexible, and low profile, which also makes it not only fit into the current pacemaker structure but also scalable for future multi-functionality." Other key collaborators on the study include Dartmouth engineering professor Zi Chen, an expert on thin structure mechanics, and Dr. Marc Feldman, professor and clinical cardiologist at UT Health San Antonio.

The work proposes a modification to existing pacemaker design that would harness the kinetic energy of the lead wire that's attached to a beating heart and convert it into electricity to continually charge the batteries. The added material is a type of specialty polymer piezoelectric film called "PVDF" and, when designed with porous structures — either an array of small beams or a flexible cantilever — it can convert mechanical motion to electricity. The same modules could also be used as sensors which enable data collection for real-time monitoring of patients.

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Azurion- Image Guided Therapy

At the MWC 2019 mobile technology conference at Spain, Philips unveiled a new mixed reality concept to aid in minimally invasive surgeries, which it has developed with Microsoft. The new mixed reality concept intended for the surgeons of the future is based on the Philips Azurion image-guided therapy platform and Microsoft's HoloLens 2 holographic computing platform.

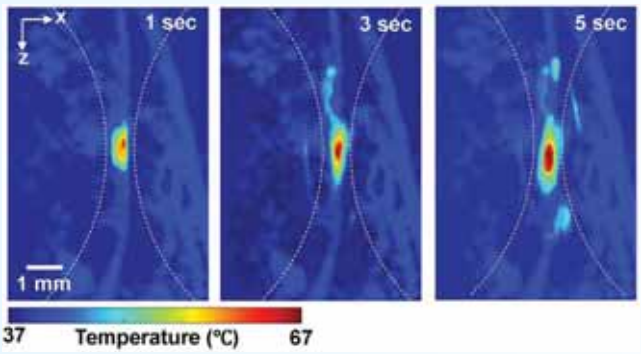
Current minimally invasive surgeries rely heavily on advanced medical imaging technologies such as ultra-low-dose X-ray imaging and ultrasound, to guide surgical actions inside a patient. Philips often provides high tech interventional suites and hybrid operating rooms for such procedures. The Philips and Microsoft augmented reality concept, built for HoloLens 2, has been designed to bring live imaging and other sources of vital data currently displayed on large 2D screens into a 3D holographic augmented reality environment that can be easily controlled by the physician.

ARTIS icono biplane

ARTIS icono biplane is the ideal solution for a wide range of disciplines and procedures. Neuro procedures – and particularly stroke treatment – benefit from revolutionised cone beam CT image quality with syngo DynaCT Sine Spin and syngo DynaCT Multiphase depicting 8 perfusion phases. Lateral Plane Switch enables multidisciplinary usage between cardiologists and radiologists without compromises. With full body (165 cm) lateral plane coverage, there's no need to compromise during abdominal procedures either. The system is particularly suited for neuroradiology procedures, such as removing stroke-causing blood clots, thanks to improved 2D and 3D imaging that can also lower the amount of radiation delivered to the patient.

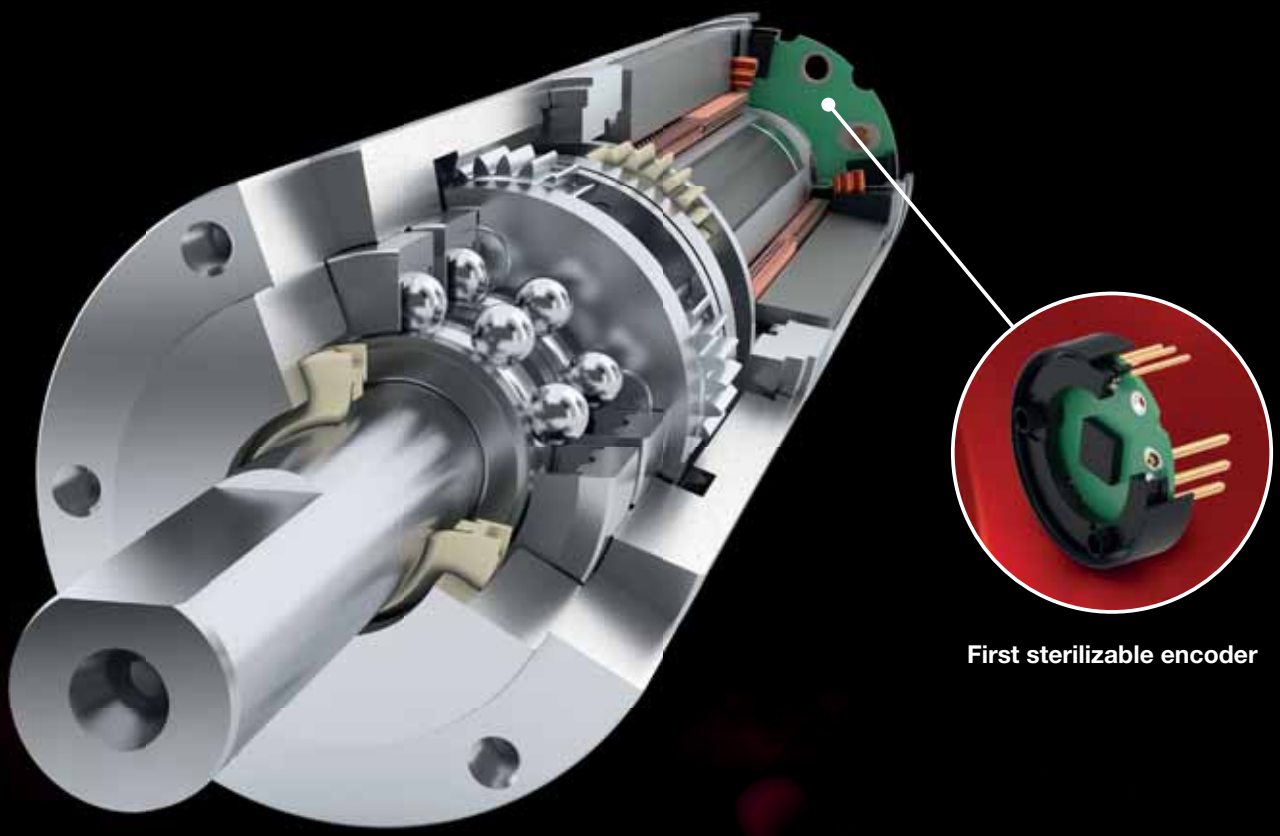
Moreover, quick switching between the 2D and volumetric modes can help to track procedural progression with greater ease. Because the imaging C-arm can now move quickly and in new ways, the company claims that "the areas of the cranial base and skull cap can now be represented with practically no artifacts in a 3D visualisation". The system is expected to be made available in Europe later this year. It is not yet for sale in the United States and there's no word on when that may happen.

Photoacoustic Imaging



When using heat and other forms of radiation to ablate tumors, it is usually difficult to know just how hot the tissues around your target are getting, particularly when working deep within the body. MRI and ultrasound can be useful in many cases, but they have limitations and can produce misleading readings. To have a better option, researchers at Duke University have been working on using photoacoustic imaging as a tool to remotely measure the temperature of deep-seated tissues.

Photoacoustic imaging involves shining light onto an object, heating it ever-so-slightly, and then using ultrasound to detect the waves that result from the thermal expansion of the tissue. What's interesting for this research is that the conversion of light via heat into sound waves is dependent on the temperature of the tissue being studied. The researchers used this fact to create a highly sensitive phototoacoustic system that can detect the differences in signals that the ultrasound measures when the tissue temperature changes.



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