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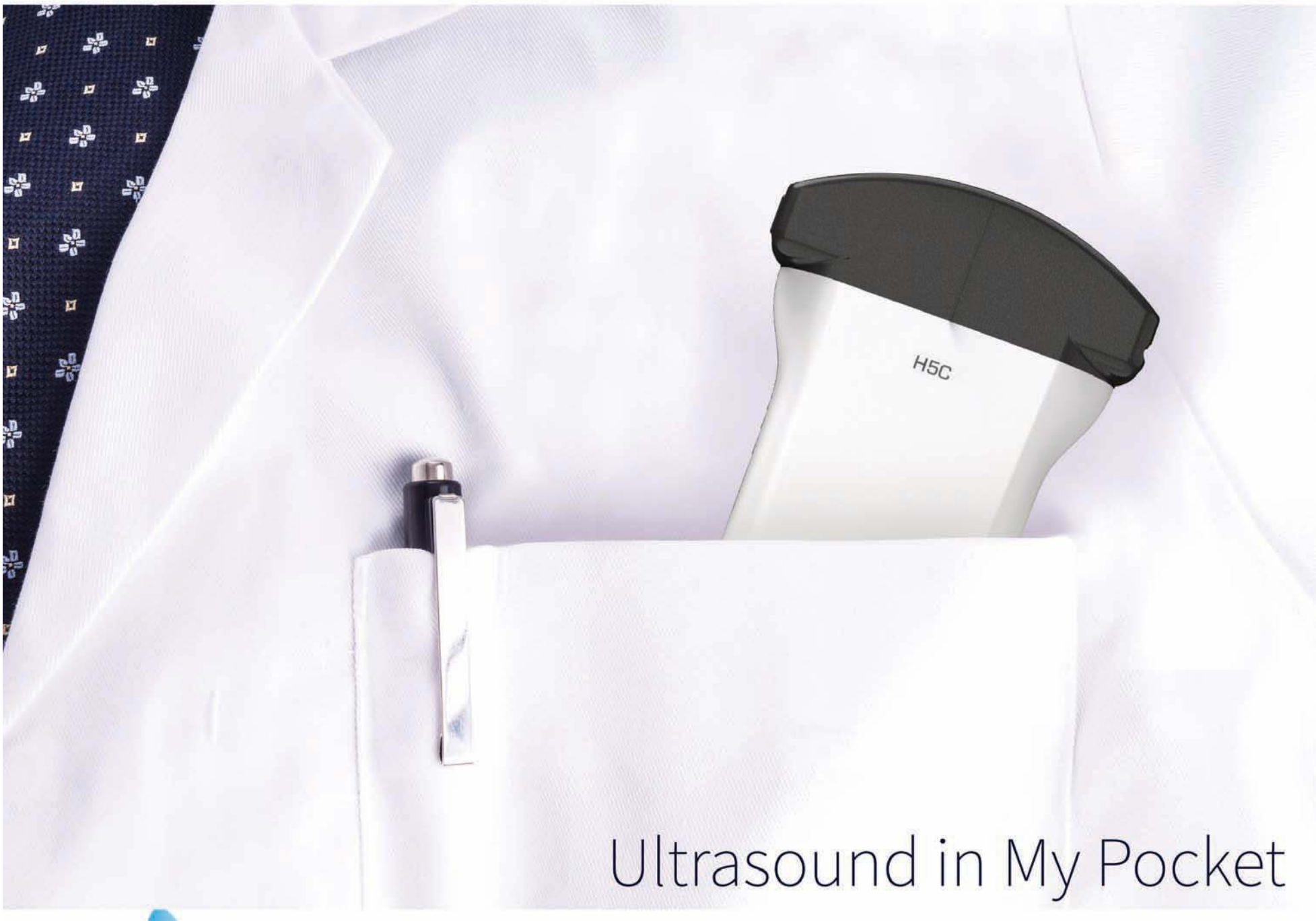

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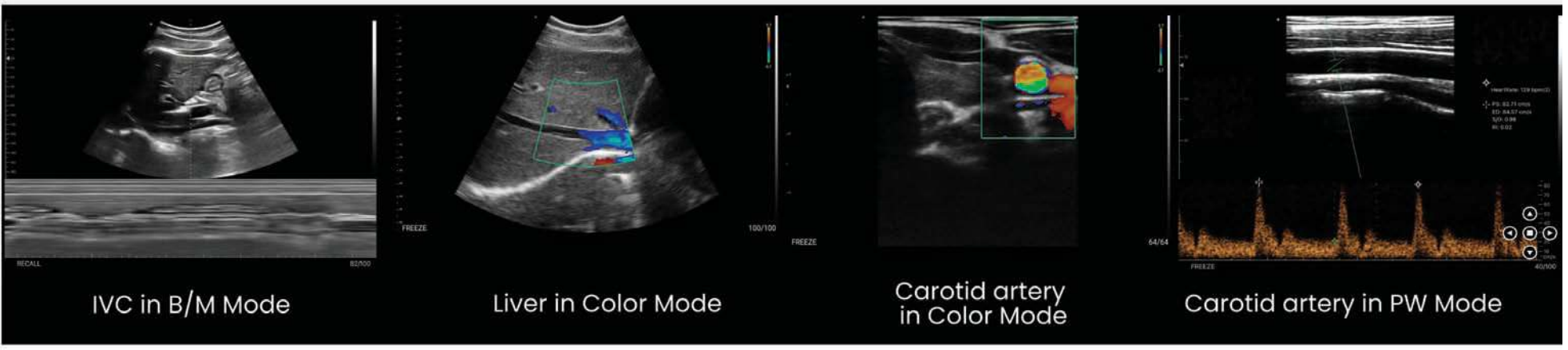

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* Responsible for selection of news under the PRB Act.

The indirect cost of COVID-19

Even as we start 2022 with the welcome approval of precautionary/booster shots for frontline workers and senior citizens with co-morbidities, and shots for adolescents as well, one has to wonder if we are any closer to the end of the COVID-19 pandemic.

The Omicron variant of SARS-CoV-2 will probably not be the last salvo. How many booster shots will we need to feel safe? Safe enough to address the indirect cost of the COVID-19 pandemic on other health indicators?

For instance, the fifth round of National Family Health Survey (NFHS-5) results showed that while institutional births significantly increased to 89 per cent from 79 per cent in NFHS-4, breastfeeding within one hour of birth has not seen proportionate improvement. More so, caesarean sections have substantially increased from 17.2 per cent in NFHS-4 to 21.5 per cent at population level.

To Dr Ashutosh Sarwa, National Program Manager, Newborn Care and Infant Young Child Nutrition, Nutrition International, India, this data means that increased institutional delivery has seen no proportionate increase in skilled human resources. Due to this, quality of care for safe deliveries is affected, borne out by the poor status around breastfeeding within one hour, which continues to be stagnant since the NFHS-4 report.

Pointing out that absence of early initiation of breastfeeding also means that newborns through caesarean sections, pre-term babies, and low birth weight infants are at a higher risk of malnutrition and mortality, he recommends the strengthening of health infrastructure with the deployment of adequate skilled human resources. Further, improvement in pregnant women receiving at least four ante-natal care check-ups, which is at 58 per cent currently, can reduce complications and the need for caesarean delivery and promote improved birth outcomes.

If the first and second waves' biggest learnings were to plugs the gaps in healthcare infrastructure, the third wave will expose the sparseness of skilled human resources. Even if healthcare infrastructure has been ramped up, unlike oxygen plants or ICU beds, skilled healthcare personnel cannot be bought off the shelf or ordered online. Yet, we have resident doctors resorting to strikes, to get the government to expedite the NEET-PG counselling process, which has already been considerably delayed due to COVID-19. Worse, there are reports that some of the doctors on strike were 'man-handled' by police officers.

On a positive note, there have been efforts to expand and upskill healthcare workers at all levels. The pandemic saw the blooming of online medical education, though there are now concerns on the quality, depth and credibility as not all courses are backed by reputed organisations. This situation underlines the importance of setting standards in medical education for all levels, not just for doctors.

Unlike oxygen plants or ICU beds, skilled healthcare personnel cannot be bought off the shelf or ordered online

The National Commission for Allied and Healthcare Professions Act, 2021, which was passed by the Lok Sabha and Rajya Sabha in early 2021 and came into force on May 25, 2021, is an important first step in this direction. The Act intends to provide standards for education and services performed by allied and healthcare professionals, and includes compiling a list of recognised qualifications relevant to these sections and the creation of a central register of allied and healthcare professions where personnel who have obtained recognised qualifications may enrol themselves prior to commencing practice. This adds up to the much needed standardisation of education and services of allied and healthcare professionals, providing better growth paths and credibility.

But we also have to guard against too much regulation. At our recently held virtual Radiology & Imaging Conclave, experts rued the fact that India had become the "laughingstock" globally as some states had added a clause including CT scans in the Pre-conception & Pre-natal Diagnostics Techniques (PC & PNDT) Act, 1994. The regulation was enacted to tackle the decline in sex ratio in India, which deteriorated from 972 in 1901 to 927 in 1991.

While no one faults the intention of the Act (to prevent the use of imaging techniques, most often ultrasound, as a sex determination tool leading to female foeticide) including CT machines under this Act is "ridiculous". Experts pointed out the fallacy of using the blind logic that both ultrasound and CT scans are imaging techniques! But a CT scan would "fry the foetus" causing permanent genetic damage and which gynaecologist or parent would want that, asked an irate radiologist?

Senior radiologists' reason that the clause including CTs under this Act needs to be omitted as soon as possible. They point out that chest CTs play a major role in determining disease severity and correct line of treatment in COVID-19. Unfortunately, new installations are being delayed due to red tape associated with the process. An unfortunate fallout of this stand-off is that access to legitimate medical procedures with proven benefits might remain poor, which could prove crucial in tackling the impending Omicron-driven third SARS-CoV-2 wave.

As *Express Healthcare's* 21st anniversary edition presents predictions of trends to watch out for in the year ahead, we hope 2022 will be a year when we succeed in living beyond COVID-19, even as we learn from a virus that mutates to survive. Just as business models change, our laws must mutate in tandem. Else we will all meet the same fate as the dodo.

VIVEKA ROYCHOWDHURY *Editor*
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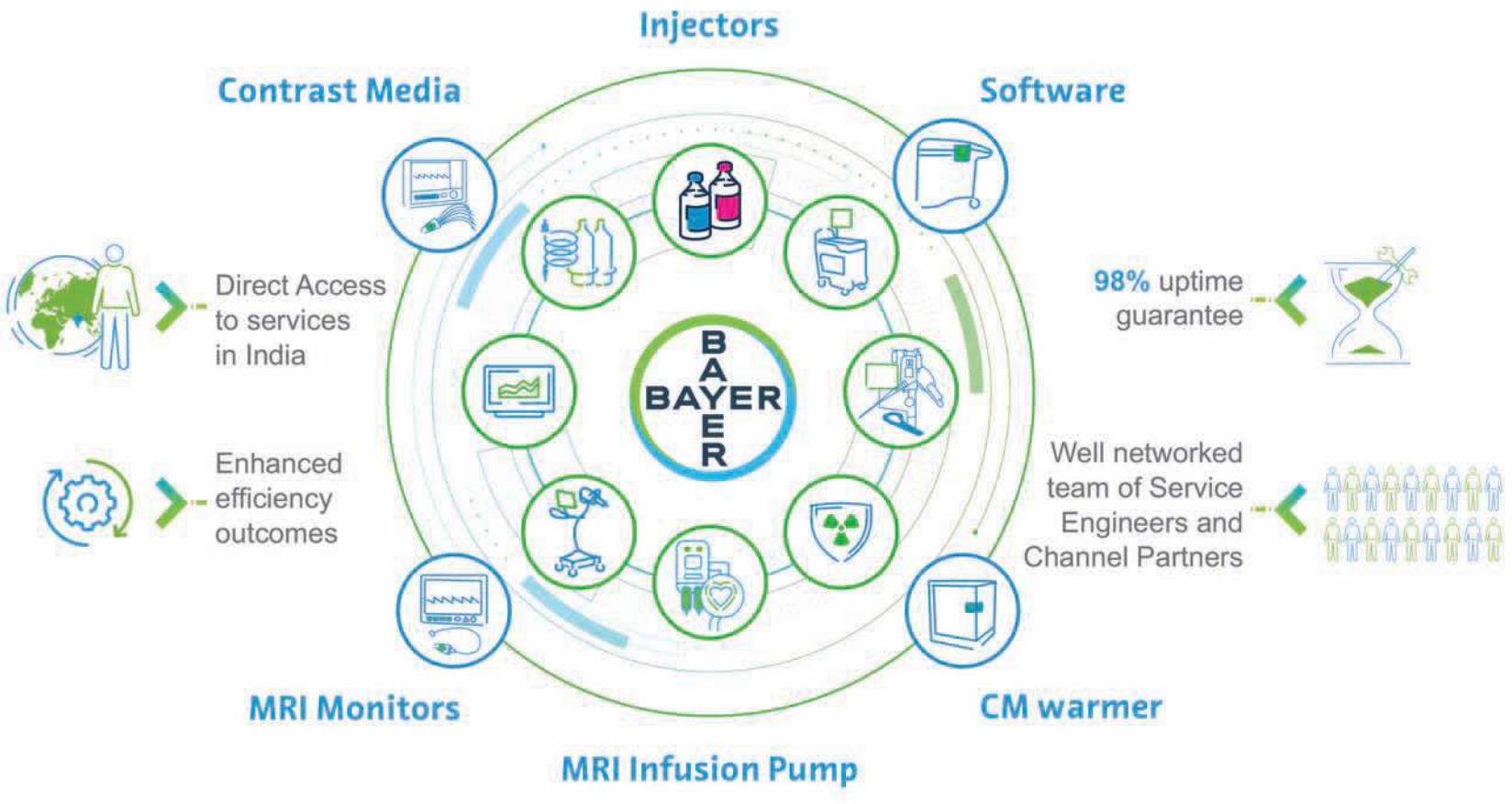

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- Dr Mitusha Verma, Consultant Radiologist, MRI, PET-CT and CT, Department of Imaging, Nanavati Max Super Speciality Hospital, Mumbai
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PANEL DISCUSSION: New Frontiers in Radiology and Imaging
- Dr Vidur Mahajan, Associate Director, Mahajan Imaging & Head (R&D), CARING **(Moderator)**
- Dr. Arjun Arunachalam, Founder, Voxelgrids Innovations
- Dr Arjun Kalyanpur, CEO and Founder, Chief Radiologist, Teleradiology Solutions
- Dr Namita Sinha Verma, Head, Global Teleradiology, Aster Medical Imaging, Aster DM Healthcare

VOTE OF THANKS
- Ms Viveka Roychowdhury, Editor, Express Pharma & Express Healthcare

Radiology & Imaging Conclave 2021

Picking up from the previous two editions, the first digital Radiology and Imaging Conclave 2021 stirred up thought provoking discussions between business leaders and radiologists. Topics ranged from debating the new value proposition for radiology, analysing a successful PPP in this sector, discussing how radiology education needs to evolve to meet the aspirations of the next generation of radiology talent and concluded with some glimpses into the possible new frontiers in radiology and imaging.

The Radiology and Imaging Conclave 2021 kickstarted with a Welcome Address by Viveka Roychowdhury, Editor, *Express Healthcare*. Speaking to the virtual august audience, she said, "With the theme, Advance. Innovate. Integrate. Embracing The New Normal, the third edition aims to look at how this vital segment of the healthcare sector overcame the challenges and came into its own during the pandemic."

"This December we mark two years since the COVID-19 pandemic began and Radiology and Imaging Conclave 2021 will take stock of the sector's evolution over the past two years as a crucial component of diagnosis", she added.

Ayushman Bharat Digital Mission–Enabling digital health to leapfrog in India

The insightful keynote address by Dr RS Sharma, CEO, National Health Authority set the context for the sessions at Radiology & Imaging Conclave 2021.

He gave an overview of Ayushman Bharat Digital Mission (ABDM) and explained about its building blocks.

Dr R S SHARMA
CEO, NATIONAL HEALTH AUTHORITY

Talking about Ayushman Bharat Digital Mission, Dr Sharma said, "The whole purpose of this mission is to ensure as to how we can leverage the information & communication technologies to deliver quality, accessible and ubiquitous health services."

Stressing on some statistics on the scale of digitisation, he said, "Today we have 1.8 billion mobile connections, 8 billion internet connections and about 600 billion smart phones in the country. India has created a conducive environment for deployment of digitalisation, with good digital infrastructure and artefacts, for e.g, Aadhaar – a digital identity system and UPIs including others. These artefacts are a very good ground for initiating any digital mission in any sector. Health is just a starting sector. The COVID-19 pandemic has accelerated adoption and implementation of digital services across sectors, including healthcare."

Explaining about the building blocks of ABDM, Dr Sharma added, "In health space, we are building certain building blocks of this digital mission. One of the building block is registry of hospitals. Another one is registry of health profession i.e Health Professional Registry (HPR) which will essentially tell us as to which are the designated health professionals in every system. Most importantly, we are also building a Personal Health Repository of a person where one can access and share his/her digital health records via digital consent artifact that we are building which will be linked to the personal health ID of a person. With this health ID, the concerned person will have a horizontal view of all his health records. We will have the health record providers, users and consent managers. These are some of the components which have already been built."

"Our honorable Prime Minister launched this pilot project on August 15, 2020 and in the last one year of this pilot phase, we have perfected all these technologies. They are built, tried and piloted. We are now constructing and filling these registries with data so that people can start using it. This entire system will be a win-win for everybody including the patients, doctors, labs and service providers."

Dr Sharma also spoke about the recently announced e-rupee scheme which is a purpose-specific and person-specific voucher where government gives lot of subsidies. "In line with this, we are also working on providing a voucher through which they will be able to directly pay to the provider instead of raising bills. We provide healthcare to 40 per cent of India's bottom income population. They use hospitilisation and other kind of laboratories services. Any technology should be made for the people and people for not made for the technology. We are building digital platforms for health which are scalable, interoperable and patient-centric."

Appreciating the efforts of *Express Healthcare* to organise Radiology and Imaging Conclave 2021 he concluded by requesting the support of the sector for ABDM saying, "The broad philosophy of Ayushman Bharat Digital Mission is based on the principles of inclusiveness and ensuring that it is people-centric. I want to use this opportunity to call upon all the healthcare professionals to come together and build this platform so that we can provide ubiquitous, affordable and quality healthcare to our people."

A smarter way forward

After a brief background on the Rochester, NewYork-based Carestream Corporation which was incorporated in 2007, Edwin Pinto, XRS Business Manager-India Cluster, Carestream Health India gave an overview of the company's product range.

EDWIN PINTO
XRS BUSINESS MANAGER - INDIA CLUSTER, CARESTREAM HEALTH INDIA

While the company is headquartered out of Mumbai in India, there are regional teams across the country focused on providing technology innovations that can make customer workload easier and faster so that radiologists can spend more time with patients. Pinto then touched on the highlights of the product range.

CR systems are used across the hospitals, imaging centers and private practices as they are flexible, facilitating better patient care and productivity when moving from film imaging, with better reliability and service. Carestream's CR System category includes floor mounted DIRECTVIEW Classic CR which can perform all the radiology examinations including mammography and examination for intensive & emergency care. It is very compact and fast. From Classic point of view, all the company's cassettes are rigid in nature and are not in contact with the system while scanning to get the final image on the monitor.

One of the most recent CR System that Carestream launched is Vita Flex which was introduced four years back. It is one of the smallest and compact CR that is available in the market. It comes with two different speed options (45/60 PPH) and can be positioned for horizontal and vertical feeds. It can be easily installed and serviced by the end user. One of the most unique features of this CR System is its compact footprint. It can be easily used in extreme conditions like mobile applications, veterinary, military or disaster recovery applications.

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DRX Plus 35C Detector: It comes in smaller format for fast, easy positioning in pediatric trays. It is ideal for orthopedic tabletop imaging.

DRX Evolution Plus: It is customisable and DR solution designed to meet specific budget, room and workflow needs. It is designed for future advanced applications.

DRYVIEW Printers: Under this category, Carestream has DRYVIEW 6950, DRYVIEW 5950 and DRYVIEW 5700. Along with this, the company also has DRYVIEW Laser Imaging Films which comes in five different sizes.

The new value proposition for radiology: Balancing cost, quality, and safety

The first panel discussion at Radiology & Imaging Conclave 2021 was 'The New Value Proposition for Radiology: Balancing Cost, Quality, and Safety'. While COVID-19 temporarily disrupted the practice of radiology, it also became an opportunity to showcase the vital role of diagnostic imaging. And for the industry experts to introspect and reinvent business models. The panelist analysed and discussed some trends in the years ahead.

The esteemed panelists for this discussion were Dr Harsh Mahajan, Founder & Chief Radiologist, Mahajan Imaging & President, NATHEALTH (Moderator); Sunil Thakur, Partner, Quadria Capital Advisors; Vivek Kwatra, National Product Head, Healthcare & Education Finance Group, HDFC Bank and Niraj Arora, President, Operations, HealthMap Diagnostics.

Highlighting the impact of the pandemic on radiology sector, Dr Mahajan said, "During the pandemic we have seen that the digital nature of radiology helped in pushing the scan from one place to another. When hundreds of scans being done and very few radiologists to report them, their transfer was easy due to technological advancements. Radiologists by and large did not get effected by the pandemic because they were working remotely."

"COVID-19 has brought home the message that healthcare matters to everything, including the economy. To become a $5 trillion economy, we need renewed focus on healthcare. In future, collaborations will be key in healthcare. Be it public-private partnerships, private-private partnerships, or partnerships with aggregators, each of them will have their advantages", he added.

Talking about the challenges, Arora said, "While there is an India which is on the technology forefront with latest scanners coming up, there is Bharat which is striving on providing the right cost and right scans. Diagnostic services providers are trying to create the right mix of efficiencies, be it cost-effectiveness, technological prowess or quality of services.

Explaining HDFC Bank's value proposition for the healthcare sector, including the radiology segment, Kwatra explained, "COVID has taught us that as a bank it is time to spread our healthcare services to the entire world. Our schemes not only cover hospitals, clinics, doctors but also the companies that are into different types of healthcare services. We tied up with several players in the healthcare ecosystem and created an HDFC market space for healthcare."

Talking about the growth factors leading to the trends in radiology, Sunil Thakur, Partner, Quadria Capital Advisors said, "There is a secular growth drivers like ageing population, disposable income and innovation. There is a demand side trend and supply side. Government is in step now to create a demand narrative and the Ayushman Bharat initiative is the prime example of the same. The second trend is advancement in technology and analytics from equipment and software perspective. Third one is proliferation of digital platforms which are creating more avenues for patients and clinicians. Fourth trend is integration of whole continuum of wellness and preventive care where now government and corporates are looking at population health. Fifth is the need for specialised service in the form of a federated model which rings in specialisation, reduction of cost and viability of any model. The sixth trend is the increasing clinical use of radiology. Within these six trends, the one that we believe will have the highest impact is the use of artificial intelligence and increasing clinical use."

PANELISTS

Mr SUNIL THAKUR
PARTNER
QUADRIA CAPITAL ADVISORS

Mr VIVEK KWATRA
NATIONAL PRODUCT HEAD,
HEALTHCARE & EDUCATION FINANCE
GROUP, HDFC BANK

Mr NIRAJ ARORA
PRESIDENT, OPERATIONS,
HEALTHMAP DIAGNOSTICS PVT LTD

MODERATOR

Dr HARSH MAHAJAN
FOUNDER & CHIEF RADIOLOGIST
MAHAJAN IMAGING PRESIDENT,
NATHEALTH

KEY HIGHLIGHTS

In future, collaborations will be key in healthcare. Be it public-private partnerships, private-private partnerships, or partnerships with aggregators, each of them will have their advantages
Dr Harsh Mahajan, Founder & Chief Radiologist, Mahajan Imaging & President, NATHEALTH
Diagnostic services providers are trying to create the right mix of efficiencies, be it cost-effectiveness, technological prowess or quality of services.
Niraj Arora, President, Operations, HealthMapDiagnostics, COVID-19 taught us to expand our services in healthcare. We tied up with several players in the healthcare ecosystem and created an HDFC market space for healthcare.
Vivek Kwatra, National Product Head, Healthcare & Education Finance Group, HDFC Bank Any ideal business model will have to balance access, affordability, quality and efficiency. Right use of technology, right use of protocol and right partnerships will be key to building this model.
Sunil Thakur, Partner, Quadria Capital Advisors

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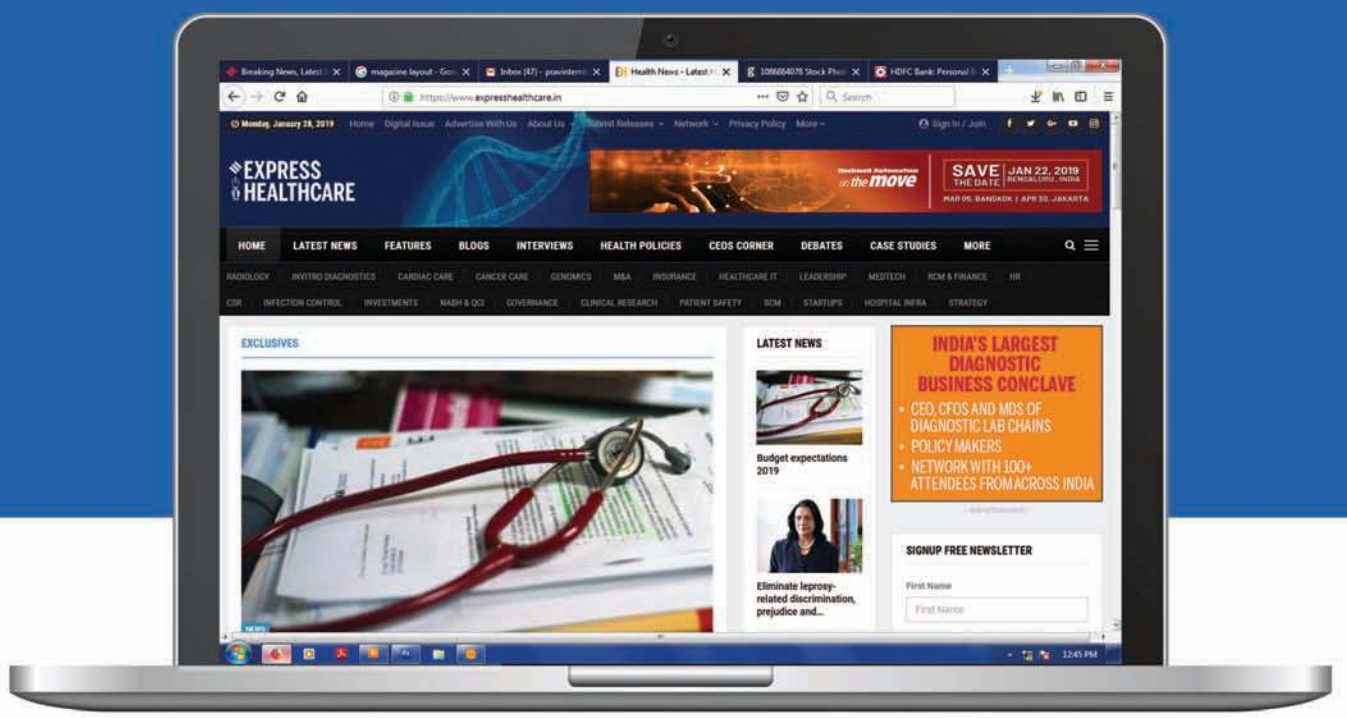

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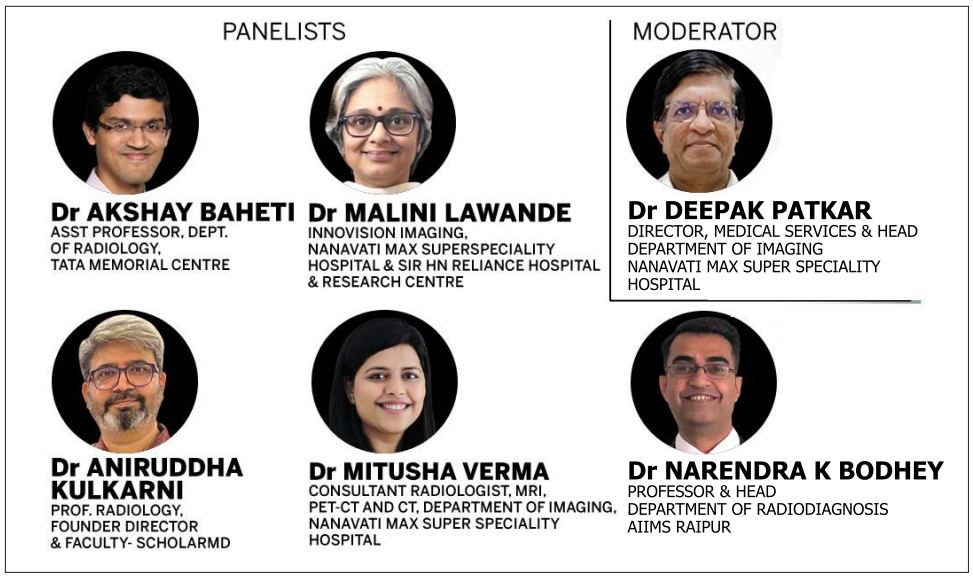
Training the next generation of radiologists, radiographers and nurses

The second panel discussion at Radiology & Imaging Conclave 2021 was 'Training the next generation of radiologists, radiographers, and nurses. The panelist analysed and discussed about the training of next generation of radiologist. All the relevant aspects of training and safety related issues faced by radiologist.

The esteemed panelists for this discussion were Dr Deepak Patkar, Director, Medical Services & Head, Department of Imaging, Nanavati Max Super Speciality Hospital, Mumbai (Moderator); Dr Akshay Baheti, Associate Professor, Dept of Radiology, Tata Memorial Centre, Mumbai; Dr Malini Lawande, Consulting Radiologist, Innovision Imaging, Nanavati Max Superspeciality Hospital & Sir HN Reliance Hospital & Research Centre, Mumbai; Dr Aniruddha Kulkarni, Professor Radiology, Founder Director & Faculty – ScholarMD; Dr Mitusha Verma, Consultant Radiologist, MRI, PET-CT & CT, Department of Imaging, Nanavati Max Super Speciality Hospital, Mumbai and Prof (Dr) Narendra K Bodhey, Professor & Head, Department of Radiodiagnosis, AIIMS Raipur.

The moderator Dr Patkar began the session by saying that, today radiology is the most sought-after branches and specialties of medicine not only in India but globally. With the increasing availability and advancements in medical imaging modalities, technology like CT and MRI has become an integral part of medicine today. As a result, radiology is becoming a key specialty not only for diagnosis but also in guiding and monitoring the treatments that the patient receives. With advancements in radiology, we have gradually moved from diagnostics to therapeutics and much more. New technologies like teleradiology and artificial intelligence have witnessed new level of acceptance and utility in COVID times.

"A strong foundation will be required for youth so that they become leaders of tomorrow. Our job as a teacher and a doctor is to impart the skills and knowledge we acquired in our long career. Our curriculum might need some radical changes in the years to come. Knowledge about radiation safety and MRI safety forms an integral part of our field and this aspect needs to be more focused in our current curriculum programme. Training of radiologists, radiographers, and nurses needs more standardization of protocols", he added.



Stressing on the need of the hour in radiology education in India, Dr Kulkarni said, "In India, unfortunately, apart from premium institutes like AIIMS and CMC Vellore, at all other places older themes are still being followed in terms of radiology teaching. NMC as well as medical council of Inda has given has given a specific guideline for postgraduate teaching and curriculum but the manner in which it is being implemented in various government institutes is entirely different. We need to look at the structured training programme of post-graduate radiology student has to be uniform all across the India so that we can have a standardised outcome out of that institute which is comparable to most of the peer heads who are doing better all over the India."

Talking about the importance of sub-specialty in radiology, Dr Bodhey said, "The moment there are sub-specialty branches from other subjects or departments, there is a feeling of insecurity and that's the reason even the teacher needs to be clinically better so that it expands the clinical interest of post-graduate resident. AI has a big input of data but validation is a big question. Incorporating AI as a part of radiology training is very important."

KEY HIGHLIGHTS

No amount of technological advancement can replace human needs. We should not restrict ourselves to diagnostics but also focus on clinical aspects of Radiology.

Dr Deepak Patkar, Director, Medical Services & Head, Department of Imaging, Nanavati Max Super Speciality Hospital, MumbaiPatient safety issues in Radiology needs more quality assessment. As far as Radiology education is concerned, cultural shift is the need of the hour

Dr Akshay Baheti, Asst Professor, Dept of Radiology, Tata Memorial Centre, MumbaiOur current Radiology curriculum is still not in complete sync with what we actually do and that is why we need to actively involve professionals from other branches as well. Democratisation and minimum competency level is the need of the hour

Dr Malini Lawande, Consulting Radiologist, Innovision Imaging, Nanavati Max Superspeciality Hospital & Sir HN Reliance Hospital & Research Centre, MumbaiWe need to work on formulating a structured training programme in Radiology and maintaining its uniformity all over India.

Dr Aniruddha Kulkarni, Professor Radiology, Founder Director & Faculty – ScholarMD, With technology on the rise in the field of Radiology, streamlining the young radiologists with focus on the sub-specialisations is very important

Dr Mitusha Verma, Consultant Radiologist, MRI, PET-CT and CT, Department of Imaging, Nanavati Max Super Speciality Hospital, MumbaiAI has a big input of data but validation is a big question and hence incorporating the knowledge of AI in the Radiology courses is very important.

Prof (Dr) Narendra K Bodhey, Professor & Head, Department of Radiodiagnosis, AIIMS Raipur

Stressing on the democratisation of radiology education, Dr Lawande said, "Our current curriculum has been changing over the years with some positive changes but it is still not in complete syn with what the actual practice is. And that is why, democratisation is indeed the need of the hour accompanied with the minimum competency level."

Talking about the safety aspects in radiology, DrBaheti, "The most obvious part of safety is preventing the direct harm to the patient. Some places implement it rigorously and some places need more standardisation of SOPs etc. Another aspect of safety is indirect harm like a diagnostic error or catching a diagnosis and not communicating accurately. All these issues are still not properly implemented in our system. Third aspect is staff safety which is now also a part of overall safety scenario especially due to COVID era like work-life balance and burn outs. We need a lot of ground to cover in this area as well. Patient safety issues in Radiology needs more quality assessment. As far as radiology education is concerned, cultural shift is the need of the hour."

Role of advances and research in radiology, Dr Verma said, "A three year-course in radiology is not enough to channelise the young radiologist. With technology advancements, proper sub-specialisation is also required. This could be the real differentiator along with streamlining of young radiologists for research. With technology on the rise in the field of radiology, streamlining young radiologists with focus on sub-specialisations is very important."

The discussion concluded with the consensus that investigations are important but prognostication are more important for better patient safety and satisfaction and helps in increasing the accuracy and precision of reports. It is important to inculcate an aptitude towards this in our future generation along with thorough knowledge of the subject.

Partnerships in radiology: Radiology models in public healthcare

At a session on 'PARTNERSHIPS IN RADIOLOGY: Radiology models in public healthcare' at Radiology & Imaging Conclave 2021, Niraj Arora, President, Operations, HealthMap Diagnostics gave an interesting glimpse into an evolving partnership between the state governments and other stakeholders.

Government partners with private healthcare providers to fulfill its commitment to provide healthcare services and relegating its (state's) role to be the payor of the service of a specialised standard. The use of PPP as a mode of partnership is essential for ensuring rapid expansion of healthcare services

Highlightening the objective of PPPs, he said that government partner with private

healthcare providers to fulfill its commitment to provide healthcare services and relegating its (state's) role to be the payor of the service of a specialised standard. It involves private enterprises to provide capital and professional clinical services, delivered in most economical, effective and efficient manner, benefitting the public at large. It also expands the bandwidth to focus on other public health priorities. The use of PPP as a mode of partnership is essential for ensuring rapid expansion of healthcare services.

Arora made the point that of the three key stakeholders of a PPP model, comprising the government, private sector and the consumer, the consumer is most important stakeholder. The end user or the patient or the consumer gets access to the top-grade clinical care investigation closer home. The government fulfills its commitment of providing healthcare and rapidly accelerate capacity to meet the growing need, without depending on upfront budgetary allocation. The private sector generates a profitable revenue stream and expand market access.

Mr NIRAJ ARORA
PRESIDENT, OPERATIONS
HEALTHMAP DIAGNOSTICS PVOT. LTD

Giving the example of Manipal HealthMap Diagnostics, Arora demonstrated the functioning of a successful PPPs, enabling accessibility, availability and affordability of healthcare services, helping to provide Universal Healthcare as well as offering a profitable revenue stream and expanded market access to the corporate partner. According to him, in the last two decades, the Indian healthcare sector has adapted well to PPPs to deliver services like radiology, pathology, oncology etc. Thus, inspite of pain points like delayed payments, he indicated that Manipal HealthMap Diagnostics is looking at creating better infrastructure in diagnostics and at larger engagements through PPPs.

Interventional Radiology: Aiding advancements in cancer detection

At a session on 'Interventional Radiology: Aiding Advancements in Cancer Detection' at Radiology & Imaging Conclave 2021', Dr MC Uthappa, Head-Interventional

Dr MC UTTAPPA
CONSULTANT - INTERVENTIONAL RADIOLOGY
MANIPAL HOSPITAL

Radiology, Manipal Group of Hospitals, Bangalore gave his insights on how Interventional Radiology is making Cancer Detection more accurate and safer for patients.

Talking about the key advantages of Interventional Radiology, he said that this branch of radiology involves no suture and no scars with minimal pain. They are image guided and have excellent clinical outcomes. Also, there are minimal complications. In many cases the life saving and emergency procedures are performed by the interventional radiologist. Interventional Radiology is complementing the other stakeholders by becoming the fourth pillar of cancer care.

He also highlighted that the Interventional Radiology has made great advances in the delivery of cure for many cancers. This specialisation plays a key role in cancer diagnosis and treatment planning and contributes in a big way when it comes to access to treatment, adjunct to surgery, ablation as cure, palliative, combination treatment and pain relief. It also plays a significant role in providing access to ports and lines like PICC Line, Permcath, Hickman Line, HD Catheter and Chemoport.

New frontiers in radiology and imaging

PANELISTS

Dr ARJUN ARUNACHALAM
FOUNDER
VOXELGRIDS INNOVATIONS

Dr ARJUN KALYANPUR
CEO AND FOUNDER, CHIEF RADIOLOGIST,
TELERADIOLOGY SOLUTIONS

Dr NAMITA SINHA VERMA
HEAD, GLOBAL TELERADIOLOGY, ASTER MEDICAL IMAGING,
ASTER DM HEALTHCARE

MODERATOR

Dr VIDUR MAHAJAN,
ASSOCIATE DIRECTOR
MAHAJAN IMAGING & HEAD (R&D)
CARING (MODERATOR)

The third panel discussion at Radiology & Imaging Conclave 2021 was 'New Frontiers in Radiology and Imaging'. The panelists analysed and discussed about future aspects and upcoming advancements in radiology.

The esteemed panelists for this discussion were Dr Vidur Mahajan, Associate Director, Mahajan Imaging & Head (R&D), CARING (Moderator); Dr Arjun Arunachalam, Founder & CEO, Voxelgrids Innovations; Dr Arjun Kalyanpur, Chief Radiologist & CEO, Teleradiology Solutions and Dr Namita Sinha Verma, Head, Global Teleradiology, Aster Medical Imaging, Aster DM Healthcare.

The moderator Dr Mahajan began the session by saying that, there are two kinds of AI that can be used in radiology, the ones that are administrative in nature and the clinical AI radiology solutions. Both can bring in better efficiencies, in business operations and the practice of radiology.

KEY HIGHLIGHTS

Radiologists of today have to delve into deep learning to prepare for an era of AI in radiology
Dr Namita Sinha Verma, Head, Global Teleradiology, Aster Medical Imaging, Aster DM Healthcare
Teleradiology has come a long way in the last 20 years. Today, teleradiology helps in better utilisation of workforce, provides good quality metrics and accelerates speed and accuracy of reporting.
Dr Arjun Kalyanpur, Chief Radiologist & CEO, Teleradiology Solutions
Devices will change, data will change and deep learning will become very powerful in the times to come.
Dr Arjun Arunachalam, Founder & CEO, Voxelgrids Innovations
There are two kinds of AI that can be used in Radiology, the ones that are administrative in nature and the clinical AI Radiology solutions. Both can bring in better efficiencies, in business operations and the practice of radiology.
Dr Vidur Mahajan, Associate Director, Mahajan Imaging & Head (R&D), CARING Research

Dr Arunachalam talked about issue of accessibility of MRIs, mentioning that one way to solve this issue is by mobile portability, which allows staff to load the system and transfer it to the various parts. He also highlighted that devices and data would change, and deep learning would become very powerful in the times to come.

Dr Verma highlighted that understanding the physics and chemistry of the machines is as important as interpretation and understanding of the images. The best radiologist is one who understands the machine as well as clinical aspects. Therefore, she opined that radiologist of today have to delve into deep learning to prepare for an era of AI in radiology. "We need smarter MRI equipment which are intraoperative, easy to install, give newer sequences, provide better clinical details and take less time for transit between patients etc. to improve safety and outcomes," said Dr Verma.

Dr Kalyanpur shared that teleradiology had come a long way in the last 20 years from fundamental value preposition that we scan in one place and transfer the image to other places. "I think it's become an all enveloping part of teleradiology practice and it straddles many different benefits in value preposition. Today, teleradiology helps in better utilisation of workforce, provides good quality metrics and accelerates speed and accuracy of reporting."

Highlighting that it was important for all the practices in teleradiology to focus on reducing the magnitude and frequency of error, Dr Kalyanpur said, "There are couple of things by which this can be done. One is by very stringent peer-reviewed process. The second way is to use the information collected from peer-review in training and feedback mechanisms throughout the organisations."

Challenges in teleradiology in India

The idea to address issues in teleradiology was triggered during the panel discussion on teleradiology during the Radiology & Imaging Conclave 2021 conducted by *Express Healthcare*. It culminated into an article written by **Dr Sona Pungavkar**. Dr Pungavkar is a medical director at SDRC; MR Consultant, Global Hospitals and S.L. Raheja Hospital. She is also the founder and ex-national co-ordinator, RAKSHA, IRIA

The term 'teleradiology' entails electronic transfer of the scan data of a patient, from the scanner on which it is performed, to a remote site, where a radiology team can download the scan on their system and review the scan and prepare a report, which is then similarly transferred to the centre where the scan was performed, within a stipulated time.

The need for teleradiology in India is evident, as there is a shortage of radiologists. The burden is increased due to the large rural patient population, which does not have access to specialised medical care.

Requirements of a client using teleradiology services need to be focused on, as it is now becoming an integral part of practice in the country, especially in the recent pandemic situations. These have been discussed below.

Emergency reporting with short turn around times: Cost benefit ratio of employing a radiologist for emergency reporting is skewed due to competition faced by the stand alone centres and small hospitals, which have in-house scanning facilities. Hence, for patients in need of urgent reports, a scan centre can provide a report with a short turnaround time (TAT) using teleradiology. This means that the teleradiology provider needs to systematically arrange back up radiologists, maintaining the skill levels, in addition to availability.

Maintaining quality: In India, there is a challenge of provision of satisfactory training programs for residents. In addition, there is limited awareness of quality assurance parameters in radiology. The teleradiology services are mushrooming across the country, adding freshly passed out, eager to work from home radiologists, who lack the clinical experience to dish out a meaningful report. The degrees possessed by these radiologists, duration of experience, interpretation skills etc. are not assessed either by the teleradiology service provider or the centres requesting for the services.

Subspecialty reporting: Also, a teleradiology service provider is in assumption, that the radiologist who has been engaged by them for the reporting, has enough experience to handle the broad spectrum of cases. The fact that a bigger team, with subspecialised radiologists, is required to provide accuracy across the various modalities within radiology and across the systems, has been majorly overlooked.

Communication with the clinician: Reporting of a radiology scan is enhanced when there is a dialogue between the clinician and the radiologist, which can be termed as a multidisciplinary interpretation or clinical radiology. This has not been found to be a necessity within the teleradiology service provisions in India and has been inadvertently ignored. A solution for this needs to be met.

Lack of accountability: Also, there is apathy in the deliverance of the report, with an attitude that in case of an error in the report is never going to be traced back, from the remote site, to the person reporting in view of the faceless nature of the service. This is even more rampant, when the centre, which requests the service does not have a radiologist on board to perform reviews of the reports. Most teleradiology services are also not owned by radiologists and hence, they cannot measure the quality of reports being provided by the radiologists engaged by them. No peer review system exists in these setups. To go one step further, they may not be aware that a peer review system is a necessity to ensure quality.

Fast report issuance used as a selling point by centres as a competitive advantage: In order to stifle competition, radiology set ups, especially those run by non-radiologists focus on fast reporting, ignoring the drop in quality expected due to less time provided to the person reporting the scan. This is even more important in complicated studies or follow up scans requiring comparison.

Lack of a standard reporting format: As the team members with teleradiology service provider have the liberty to use their own format for reporting, the centre availing the service, usually does not have a standard format for maintaining consistency and improving the end user's (i.e., the clinician's) confidence in the report, with the patient being the overall loser.

Hence, when a centre requests a teleradiology service to partner, they need to address these points and work on them to provide satisfactory quality and consistency. There have to be random peer review mechanisms, which the teleradiology service provider must be under compulsion to provide to the centre on a regular basis. Alternatively, the peer review could be initiated by the centre with few senior and subspecialised radiologists across various systems, keeping the teleradiology service provider in full knowledge of a periodic assessment with a feedback mechanism.

The teleradiology service provider should also have a very stringent selection process for the recruitment of radiologists. Cognitive and non cognitive skills should be taken into account, in addition to the duration of experience.

The cognitive aspects of selection would include the qualification and the hours of experience and add-on training as well as research and publications, as happens in recruitment of an onsite radiologist. The non – cognitive skill set is more important especially in remote setting and includes ability to interact effectively (orally and more so in writing) so that accuracy of the reports is high and the findings along with expected complications, are described properly. The radiologist should have a recognition of his / her limits of knowledge or skill, as well as a willingness to seek assistance when needed. Also, the team member needs to be conscientiousness with evidence of thoroughness in the work done and a willingness to go beyond the call of duty, as in teleradiology in a remote site, a lot could depend on the report provided by the radiologist. Moreover, the expectations need to be set correctly and the practice of maintaining high standards needs to be emphasised.

There is a very urgent need to bring teleradiology services under regulations, as in happening in the west. Accreditation is important and an annual assessment, as is done in other domains of radiology, such as radiation safety, can be necessitated for teleradiology service industry.

On top of everything, the service providers and the centres, engaging them need to put the patient as the first priority and business after that.

Five point mantra for quality in teleradiology reporting

Addressing what Dr Sona said in her previous article, **Dr Arjun Kalyanpur**, MD, CEO and Chief Radiologist, Teleradiology Solutions, Bangalore shares his insights on quality in teleradiology reporting

Teleradiology has become firmly established as a powerful clinical paradigm within healthcare delivery that permits radiology reporting to be performed rapidly and efficiently as well as providing access to radiologic expertise where/when it might otherwise not have been available, in an era of crippling radiologist shortages. However, for teleradiology to provide continuing benefit, it must be supported by quality reporting, or else its value proposition ceases to exist. How can teleradiology providers ensure that they deliver consistent quality to their clientele, and through them to their patients? And how can a hospital or imaging center that is looking for a teleradiology provider decide which service really and truly represents a quality performer? Here are five key processes that define quality in teleradiology, and can/will distinguish the quality teleradiology provider from the rest.

At the heart of any successful teleradiology practice is a strong peer review process. This essentially means review of both the examination and the report by an independent radiologist with a score assigned for error/discrepancy

Robust peer review: At the heart of any successful teleradiology practice is a strong peer review process. This essentially means review of both the examination and the report by an independent radiologist with a score assigned for error/discrepancy. Whether this is by way of external third party audit (as in the form of feedback from client radiologists) or internal peer review process, this is the true pulse check of quality and defines the organization's performance improvement, or lack thereof. The core philosophy behind such a process involves objectivising error evaluation (the American College of Radiology's Radpeer scoring process is the current benchmark) and ensuring that the peer review process is consistently followed. It is all too easy in the midst of busy day to day work to let what may be perceived as "non-essential" processes slip or slide, and ensuring continuous focused attention on them is key to optimising teleradiology performance.

Rigorous data tracking mechanism: Coupled with peer review is the need for effective data collection from this process, which captures the information that is needed to provide the quality insights. The best way to ensure that steps 1 and 2 are followed in sequence to have a technology based solution for the same. In the case of our organisation, our teleradiology workflow platform Radspa also contains a robust quality assurance portal which allows for peer review to be assigned, performed and objectively scored. This data is continuously captured and subsequently extracted and sorted based on all the relevant parameters, namely based on error grade, referring client, radiologist etc.

Analytical approach: It is important to analyse the data effectively by asking the right questions that allow trends to be captured/identified. For an individual case, how could the error have been avoided? Is a particular member demonstrating a pattern of error on say, CT pulmonary embolism studies? Or is there a particular modality, such as CT angiography where the group as a whole has a higher error rate? Is the error pattern indicative of an individual performance issue or is there a systemic issue involved? Such trendspotting of error patterns can help to identify and address training or operational needs for the group, or to provide specific feedback to an individual. Here again, an effective online QA management and analytics portal such as Radspa can greatly help a teleradiology provider to detect and address such trends.

Couple the learnings from peer review analysis with teaching/training: As suggested by the previous step, the output from the data analysis is only effective if it is used to generate training material to benefit the individual radiologist as well as the entire group. It is necessary to capture the relevant images to illustrate the teaching point as well as to identify the specific learning insight that is gained from the retrospective analysis of the error. This process is key to transforming learning to teaching, which is at the heart of all quality improvement. The fundamental philosophy is (or should be) that the error of one should translate into a learning for all.

Submerge the ego: This last point is part of EQ or Emotional Quotient development. When a radiologist joins our group, in my initial interaction/orientation with them, my key message/request to them is to sublimate their individual ego in the larger purpose of learning and growth. For quality improvement to occur, it is important for the individual radiologist, however senior or experienced, to be receptive to feedback and accept that everyone is capable of error and should be open to learning from it as well. I personally believe that my greatest learnings have arisen out of my errors, and am candid in sharing my own errors/misses with the rest of my colleagues, as I feel that quality assurance, to be effective, must be seniority-agnostic!

Teleradiology, given its outsourced nature, has traditionally been held to a higher quality standard than in-hospital radiology. And in a competitive industry such as teleradiology represents, the differentiator must be quality and not cost. The hallmark of true quality is introspection and insight, and any teleradiology provider of substance must be willing to go the extra mile and spend the extra hours needed to gain the meaningful insights that can genuinely facilitate improved quality of performance. Hence the critical importance of a structured QA program/process for a teleradiology service provider. The ultimate goal is to learn from one's errors in order to prevent further such incidents. In teleradiology no less than anywhere else, as the aphorism goes, an ounce of prevention is far better than a ton of cure.

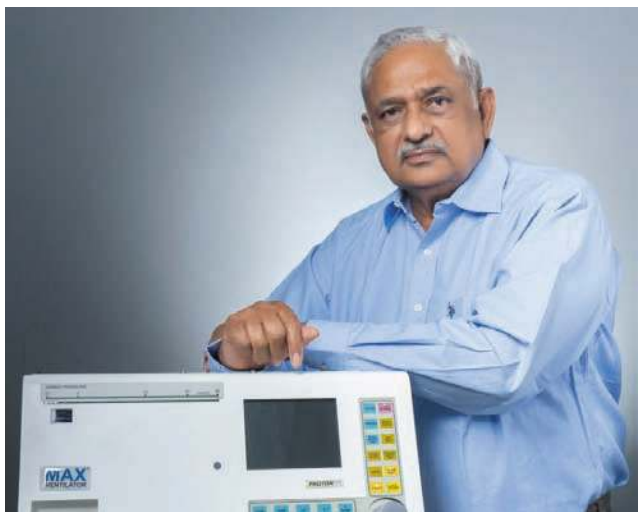
***Express Healthcare's* 21st anniversary edition presents predictions of trends to watch out for in the year ahead**

Medical devices and equipment required for COVID care will continue to see more improvements in underlying technologies

Ashok Patel, CEO and Founder, Max Ventilator highlights that COVID-care related devices and technologies will remain relevant

While the advent of Omicron has spooked Indians as also the world in a reminder that we have still not seen the last of COVID-19 as yet, it goes without saying that the last two years have indeed been turbulent for patients, the healthcare sector and the authorities. However, the upside has been that the sheer disruptionist nature of this pandemic has also catalysed the rise and emergence of an array of technology innovations and discoveries. Whether it is in healthcare devices and equipment, or modes of delivery including remote care and monitoring of patients, or even remote clinical research, or applications supporting evidence-based clinical decision-making or technological advances in epidemiology, there is a lot that has happened in the healthcare space and especially the med-tech sector in the recent past.

Now that we approach the end of 2021 and 2022-beginning is just around the corner, it is an opportune time to envisage and foresee what the New Year could hold for the med-tech sector. Among several possible developments, here are five trends that will likely rule the med-etch sector in 2022.



Telehealth and telemedicine technologies will continue its march ahead

First, telehealth and telemedicine with all their associated segments will witness unprecedented traction in terms of technology innovations and development. Since it is in nascent stage especially in India, there is a massive need for improvement as well as scaling up of delivery of healthcare services via electronic information and telecommunication technologies. As a result, medical technologies related to remote and contactless patient diagnosis and monitoring will become sharper and more sophisticated this year not only allowing more user/caregiver-friendly diagnosis but also continuous and more precise monitoring of a patient's vitals and clinical parameters such as heart rate, respiratory rate, sleep apnea, myocardial performance etc. At the same time, there will be increased standardisation of technologies and platforms related to Electronic Health Records (EMRs) and Electronic Medical Records (EMRs) much relevant to patient diagnosis and management.

COVID-care related devices and technologies will remain relevant

Second, in light of omicron reviving the fear factor on account of COVID-19, medical devices and equipment required for COVID care will continue to see more improvements in underlying technologies as well as more output and production. Lifesaving devices such as ventilators will become more complex and intricate in design and manufacturing underpinned by innovation and creativity. Additionally, they would increasingly adhere to international standards while becoming more effective from patient care and clinical outcome point of view. Diagnostic devices such as fingertip oxymeters and thermometers will continue to remain relevant in the medical device manufacturing scheme of things. At the same time, due to the increased need for separate COVID wards and general patient isolation in hospitals, modular isolation wards and rooms will see better design along with better hospital furniture for ICU and COVID wards. Further, given the importance of lifesaving oxygen, not only oxygen concentrators will upgrade in terms of technology, technologies supporting onsite generation of oxygen will also gain momentum and focus.

Device parts and components to get a big push

Third, even as the med-tech supply chain has been disrupted globally, the need to become self-reliant will drive innovation and enterprise in medical device parts and components segment of the industry in the country. Cables, probes, battery parks, circuit boards, metal parts/castings, harness, tubings, machine parts, metal fabricated components, medical-grade rubber and injection moulded components will get more attention from both private players and the government helped on by the latter's policy incentives.

Surgical device technologies will cross new frontiers

Fourth, with elective surgeries making a comeback due to relative weakening of the COVID scare notwithstanding omicron, technologies related to surgeries will see more investment and become more advanced employing robotics, AI and machine learning one example of which is the robotics assisted surgical devices (RAS). Already, an array of precision surgical tools for different spheres of care such as neurosurgery, cancer surgery, cardiovascular surgery, musculoskeletal or orthopedic surgery, plastic and reconstructive surgery, among others, has found some action and visibility in the country. One after another, new-age medtech startups have increasingly driven innovation and upgrading of technologies in this segment. This will gain even more momentum in the coming year.

Disease prediction technologies to see much traction

And fifth, in light of the widespread havoc that COVID has caused, the medtech industry including engineers, innovators and scientists will continue to give utmost attention to disease prediction technologies. Employing on-the-ground data from an assortment of sources such as health apps, EHRs, EMRs, wearables, biometric devices and even genomic data from large chunk of populations, disease prediction technologies will make huge strides this year. Leveraging big data, AI and machine learning, the new-age disease prediction technologies besides aiding in more efficient and accurate disease forecasting, diagnosis and treatment of individuals, can also prevent outbreaks of infectious diseases, epidemics and even pandemics of the kind that we are experiencing currently, among larger population segments.

In sum, the year ahead looks to be full of promise and potential for the medtech industry in the country. With its impressive technological and engineering manpower strength, forte in software and embedded software development, along with a supportive and easy clinical trial landscape, India has one of the best environments in the world for prototyping as well as product development. And there is no reason why medtech sector will not leverage these strengths backed by favourable government policies in the coming year.

Growth challenges & policy roadmap for Indian medical device industry

Dr Ravikumar Rathod, Joint Secretary,Healthcare Sector,PHDCCI highlights the policy roadmap for medtech sector

India is witnessing the growth of medical device industry with growing population, increasing life expectancy, enhancing of household purchase capacity along with rising of health insurance coverage, rising burden of Non-Communicable Disease (NCDs), medical device infrastructure development and various government policy support.

Over 6000 type of medical devices and over 800 domestic medical device manufacturers, which are majorly MSMEs with an average of $450-500 million turnover, are there in India however 86 per cent of medical devices are presently imported in India. Technologically less advanced medical devices are primarily manufactured by domestic Indian players while advance technology products like cancer diagnostics, medical imaging devices and ultrasonic scanners are majorly import dependent.

Under the 'Vocal for Local' clarion by Prime Minister Narendra Modi; sunrise sector medical devices has been considered as the 'Make in India for the world' to make India self-reliant and reduce the import dependency. Various government initiatives and schemes like 1. National Biopharma Mission, entitled "Innovate in India (i3) – Empowering biotech entrepreneurs & accelerating inclusive innovation" was approved by the Cabinet Committee on Economic Affairs in May 2017 with a total project cost of Rs 1500 Crores for five years on a 50 per cent cost sharing basis 2. Production Linked Incentives Scheme (PLI) Scheme for Medical Devices introduced in 2020 with financial incentives to attract the sectorial investment & boost domestic manufacturing. INR 3,420 Crore of incentives will be awarded during the scheme tenure from FY 2020-21 to FY 2027-28. 3. Development of Medical Devices Parks-Common infrastructure plays a vital role in the medical device industry development and under this scheme the common infrastructure facility will be developed with a total scheme outlay of INR 400 Cr to reduce the production cost. 4 medical devices park will be created with financial assistance of INR 100cr each.

Though the government is supporting with various schemes and initiatives to make India self-reliant in medical devices, there is a need to set out an action plan by policy makers

Though the government is supporting with various schemes and initiatives to make India self-reliant in medical devices, there is a need to set out an action plan by policy makers. For 'Make in India' to realise its vision and objective in the healthcare sector, there is an immediate need for the government, industry (medical devices players, healthcare providers & health insurers) and other stakeholders (academia, research institutes and funding agencies) to step up and, make coordinated and concerted efforts to promote indigenous manufacturing. As a key contributor, government is responsible for conducive policy, single window regulatory environment and implementation framework while industry on the other hand needs to encourage innovation and indigenisation for improving accessibility, affordability and quality healthcare. Investment, innovation, skill and infrastructure are the four pillars to make the dream come true for India to become self-reliant in medical devices.

Short term objectives:

◆ Need to rationalise the

■ Import and export Harmonized System Codes (HS codes)- the 8 digit format should be change to 10 digit, reducing the items covered under "Others" category giving the correct picture.

■ PLI Scheme for next 3 years;

■ Consolidation of R&D funding on medical technologies-the scattered R&D funding and incentives for innovative technologies should be consolidated to make the maximum use of it

■ Free fall of prices for social maximisation and set minimum prices of products for leveraging the business- For ensuring that ethical marketing is not being disadvantageous, trade margin rationalisation is needed and will also protect consumers from exorbitant pricing.

◆ Categorisation of research by nature of institutions as government or private should not be encouraged and we must have national R & D fund which does not discriminate between government and private institutions.

◆ Scientific regulatory pathway to be introduced for common regulatory filling platform where traceability can be done clearly and duplicity can be avoided without disturbing the current performance.

◆ Capitalisation of our strengths by channelising the rising FDI towards existing & dependable budding manufacturers and component manufacturers to form joint ventures and collaborations.

◆ More focus to be given to Indian standards by public procurement agencies.

Long term objectives:

◆ In line with SDG-3 of WHO i.e., quality healthcare a wellbeing for all government can introduce universal healthcare insurance policy for every strata of the society.

◆ Technology in terms of device and AI/ML should be a part of medical curriculum.

◆ Uniform interpretation of regulations across the country.

◆ Up gradation of Indian quality & regulatory standards to cope up with the global standardisation.

Conclusion:

COVID-19 proved Indian manufacturer's resilience towards any kind of challenges to cater and medical device sector played a formative role in ensuring significant progress for achieving affordable, accessible healthcare for all. Active promotion of indigenous manufacturing of medical devices through various progressive programs introduced by Government of India like PLI scheme & development of medical devices park that can support and promote domestic manufacturing will increase India's contribution in the global arena. Central-State policy coordination along with the monitoring and control mechanism for the industry paves a way in true spirit the call for self-sufficiency in medical devices.

Software as a device-Challenges in healthcare

Dr Chinmaya Chigateri, Founder & Principal Consultant, Healthminds Consulting shares his views on crucial policy changes in medtech sector in 2022

The import, manufacture and distribution of medicines in India continue to be regulated by the Drugs and Cosmetics Act 1940 and the associated Drugs and Cosmetics Rules, 1945 which provides for the categorisation of drugs into schedules and the guidelines for storage, sale, display, and prescription of each category. Changes, as required from time to time, are made to this act to accommodate the advancements in medical technology. Medical devices used in healthcare are also regulated by the same act. The Indian Government introduced the Medical Device Rules, 2017 to distinguish medical devices from pharmaceuticals for the purpose of regulation.

The Medical Device Rules classifies medical devices into four classes based on risk.

- Low Risk - Class A
- Low-Moderate Risk - Class B
- Moderate-High Risk - Class C
- High Risk - Class D

This classification is needed to determine the level of stringency with which these devices would be regulated. The draft classification also clarified that standalone software would be regulated as a medical device.

Artificial intelligence has found multiple use cases in the healthcare sector and has displayed tremendous promise for enhancing health outcomes in a resource-strapped country like India

Artificial intelligence has found multiple use cases in the healthcare sector and has displayed tremendous promise for enhancing health outcomes in a resource-strapped country like India. It is forecast that the application of AI in healthcare in India will be an INR 432 billion industry by the end of 2021 while the regulators have recently acknowledged software as a medical device. This shows the startling disparity between business reality and the speed of setting up a robust regulatory system. AI carries huge challenges for India's traditional regulators who have to do some serious tightrope walking to balance an AI innovation system with strict patient safety and affordability. The regulators and stakeholders will need to take a holistic view of the industry and understand the impact of regulations on the medical ecosystem as a whole.

A set of robust regulations for the pharma sector helped India to become one of the world's leaders in generic drugs via a regime of price controls, process patents and industrial promotion policies. The need of the hour is to create a similar, independent framework for medical devices and software to reduce the dependence on imported medical technology and create an opportunity for Indian companies to thrive.

The government is currently working to bring a new law to regulate drugs, cosmetics and medical devices that will replace the 81-year-old Drugs & Cosmetics Act, 1940 and include areas like medical devices, online pharmacies, emergency use authorisation and compensation rules in case of EUA and clinical trials.

It will be interesting to see how medical software and algorithms are being dealt with. We will need regulations around quality checking of the facilities where these devices are produced as well as the law framework around patient safety and the deterrents for malfunctioning of devices or incorrect diagnosis and treatment due to faulty data.

An earlier committee in 2019, under NITI Aayog had suggested a separate act for medical devices and software instead of placing it within the Drugs and Cosmetics Act. Since medical devices are essentially different from drugs, a separate regulatory framework would address the needs better. A separate act for medical devices would provide the much-needed clarity and encourage potential investors. We would also need a body similar to the Bureau of Indian Standards to monitor the quality and provide certification.

Medtech which comes under the wider umbrella of healthcare systems focuses on designing a wide range of smart medical devices for diagnosis, prevention, monitoring, treatment and patient care. It includes smart inhalers, robotic surgery, wireless brain sensors, 3D printing, artificial organs and wearable devices.

The Indian medtech segment was valued at $10.36 billion in 2020 and is expected to grow 5x by 2025. The government is offering support by way of favourable regulations and schemes including 100 per cent FDI and 15-year tax holiday for locally created medical technology products. The demand for inexpensive high-quality, widely accessible medical devices is rising prompting global players to set up production facilities in India. The key enabler for the medtech sector is secured data that can be conveniently stored and analysed. The government is planning to introduce a digital health card for each citizen under its ambitious National Digital Health Mission which will have an individual's complete medical record. Medtech solutions will play a big role in the success of this initiative.

Whether the combination of medical devices in the original Drugs and Cosmetics Act 1940 will be able to take care of the concerns of all stakeholders remains to be seen. A quick resolution in the right direction would help the Indian healthcare industry move ahead in the field of medical technology, craft a new growth path and gain global acceptability.

Medtech sector is working towards creating a better healthcare infrastructure

Dr Sudhir P. Srivastava, MD & Founder, SS Innovations highlights the topmost trends in the medtech sector which will be major growth drivers to face new challenges and bring in positive changes in the healthcare sector

Medtech industry went through a complete change during the COVID-19 pandemic, but the changes have arisen for the betterment of the existing structure. We will see research, innovations, and development at a much faster rate as the global community has realised the importance of medtech to keep the community safe and healthy.

We are very hopeful about the year 2022 and looking forward to it with aspirations for many more improvements. For the last two years, the world has been continuously fighting to survive the devastation of COVID-19, but what started with the disruptions of the healthcare services, took a positive turn and brought out major developments in the medtech sector.

As the world is getting back to normalcy, we see that the medtech sector is working towards creating a better healthcare infrastructure.

The topmost trends in the medtech sector which will be major growth drivers to face new challenges and bring in positive changes in the healthcare sector are going to be as follows.

Supply chain management: Due to the breakdown in the supply chain during the pandemic globally, the medical device industry also faced challenges of shortages of critical components. It was not a small issue, because of this, many device manufacturers experienced the disruption of their business. So medtech industry experts are recognising this as a threat and understanding the need to place a proactive plan to keep the supply chain running without interruption.

The COVID-19 pandemic made the healthcare industry realise the importance of point-of-care testing devices. The need for point-of-care testing devices was so massive, that not only production but the complete research and development process was revamped

Medtech industry is now proactively keeping a check on extended delivery time, signing on local delivery partners, redesigning or redeveloping to match supply availability.

It's important to create a safety net so that critical care medical devices are available without delay because the unavailability of any specific part can be life-threatening due to delays in delivery.

Point of care diagnostic devices: The COVID-19 pandemic made the healthcare industry realise the importance of point-of-care testing devices. The need for point-of-care testing devices was so massive, that not only production but the complete research and development process was revamped. Medtech industry always works with great speed in order to meet the demands of the most critical services zone.

Innovations have made it possible to quickly respond to the global health crisis, however, it took us some time to control the situation accordingly. Manufacturers of diagnostics equipment will have to be more proactive not just about R&D but also about finding the right OEM partners, correct marketing channels, and also most importantly, keeping the rapid response technology in place, available to end users. This will help the healthcare sector to be more prepared to handle any healthcare crisis that may arise in the future.

Utilisation of robotics: As the healthcare system went through disruption due to the global health crisis, the foremost challenge was keeping frontline workers safe. Robots became the savior as they transformed the medical field, not just for surgeries, but robots were engaged in streamlining supply delivery, simple patient care, and hospital sanitization. We also see robotics surgeries as a game-changer in 2022, as it is less invasive and results in fewer complications. Hospitals will be able to manage more surgeries and patients will return to normal life post-operatively much faster. Robots will be able to assist and help healthcare professionals to work more efficiently and precisely. Though currently, the usage of robots is not cost-effective, with the launch of more cost-effective variants, robotic surgery will catch up, and more and more patients will be able to receive its benefits.

Integration of artificial intelligence in healthcare: AI is going to be the most important in the coming year as we have seen that during the COVID-19 pandemic, it helped in better test analysis, teleconsultations and treatment. AI speeds up the process and erases the constraints of distance. COVID-19 was a testing field for AI as social distancing was needed and so it paved a path for the high demand for telehealth consultations.

Innovations in the field of AI will make sure that more services are incorporated through it in the healthcare infrastructure. AI is a boon for India since it will connect the remote villages to better healthcare services and help more doctors help more patients to recover from critical illnesses.

Medtech is not just about designing a device but developing an ecosystem of connected devices

Rajneesh Bhandari, Founder, NeuroEquilibrium highlights the role of technology in medtech sector and future ahead

According to Yuval Noah Harari, "Pandemics press the fast forward button." COVID-19 has significantly impacted the medtech industry and boosted consumer adoption of many innovative technologies. Here are key trends and technologies that will shape the future of healthcare.

Telemedicine and remote diagnosis

COVID-19 caused massive changes in consumer behaviour with an exponential adoption of telemedicine. Though telemedicine has been around for many years, it did not gain much traction because of regulatory issues, insurance reimbursement restrictions, and lack of acceptance by consumers and doctors. The last two years have witnessed a dramatic change in regulations to enable telehealth worldwide. In 2020, NITI Aayog implemented one of the most futuristic telehealth guidelines. Teleconsults are the new global normal. A recent McKinsey report has said that telemedicine will replace at least 30 per cent of hospital OPD, and in the next five years, five crore households will be doing virtual consults, mainly under a subscription model. Riding these trends, telehealth companies, like Teledoc (USA), have become unicorns.

The top 10 causes of death in India require treatment by a super-specialist doctor. However, the number of super-specialists like endocrinologists, neurologists, or nephrologists in India is less than a tenth of global standards. Technology can be a force multiplier to solve both problems of accessibility and affordability. Remote diagnosis, enabled by artificial intelligence and algorithms, can dramatically decrease the cost of providing super-specialty services and increase accessibility exponentially.

> This new era of digital and AI-enabled care will be revolutionary as we move from sick-care to healthcare, from episodic to predictive and preventive, and from standardised to personalised

Wearables and digital therapeutics-Internet of Medical Things (IoMT)

The adoption of wearables is at the tipping point. Wearables offer connected data and continuous monitoring to measure various health parameters like ECG, oxygen saturation, sleep, gait, heart rate, blood sugar, etc. We now have patients' parameters monitored in their real world, on the go, at work, while asleep. The objective data and real-time feedback increase patients' adherence, motivation, and accountability for their own progress.

Digital therapeutics provides scientifically proven software-driven therapeutic interventions to prevent or manage a medical disorder and improve patient outcomes using behavioural science, and its adoption will increase exponentially in the near future.

Virtual Reality (VR) and Augmented reality (AR)

VR is now increasingly used to treat neurological conditions and mental disorders. Gamification and immersive exposure therapy can be powerful tools to improve motivation, engagement, and outcomes in pain management, post-traumatic stress, diabetes, obesity, phobias, etc. VR and AR are also being used to train surgeons and improve surgical techniques.

3D printing

3D technology came into prominence during the COVID pandemic, with critical parts of ventilators being 3D printed. 3D printing will transform medical technology radically, including dental implants, prostheses, hearing aid moulds, etc.

Artificial Intelligence (AI)

AI is getting increasingly good at doing what humans do, but more efficiently, almost instantaneously, and at a lower cost and has enormous implications for the future of healthcare. As per a recent study by Deloitte, AI applications in European healthcare can provide annual savings of Euro 200 billion. AI is being increasingly used in healthcare for diagnosis, image analysis, clinical trials, drug discovery, etc. There are more than 70 AI devices that USFDA has already approved.

The most significant disruption is because the convergence of these multiple technologies' feeds into one another. Today medtech is not just about designing a device but developing an ecosystem of connected devices and generating actionable data in real-time for the patient, doctor, or caregivers to improve care. This new era of digital and AI-enabled care will be revolutionary as we move from sick-care to healthcare, from episodic to predictive and preventive, and from standardised to personalised.

Investments in medtech sector

Sushil Mehta, Angel Investor & Chairman, NextGen Invitro Diagnostic talks about the trends which are making medtech sector a lucrative investment

As global health ecosystems struggle to contain the epidemic and satisfy the mounting needs of an ageing population, medical technology will be critical for years to come. By developing novel technologies that enhance health data, enable remote treatment, and streamline processes, the medtech industry represents a massive potential for private and venture investors.

India has done an amazing job of rising to the occasion and controlling the pandemic throughout this time period. The ICMR and its many institutions, as well as the Ministry of Health and the Government of India, should be commended for their tremendous efforts. India developed its own vaccine and proceeded to distribute one billion doses. With more investment in the healthcare sector and a continued commitment towards better healthcare as a nation, we will be better equipped to handle such pandemics in the future. Along with the government, business sector entities must also participate. As shown in the creation of the indigenous vaccine by the Indian Council of Medical Research and Bharat Biotech, public-private partnerships (PPPs) might be the solution.

The global market for medical technology is around USD 450 billion and expanding at a rate of 5 per cent, while nations such as India, which account for a relatively tiny percentage of the population, are growing at a rate of 15 per cent but have the potential to develop at a rate of 20 per cent over the next decade. By FY 22, India's healthcare infrastructure would be worth USD 349.1 billion, expanding at a rate of 17 per cent annually, according to data by "theIndiawatch.com,"

India aspires to achieve self-sufficiency in the manufacture of medical equipment. Incentives for home manufacturing are urgently needed. To encourage investment, India has streamlined its foreign direct investment (FDI) laws in healthcare. Apart from simplifying FDI laws, the Government of India (GOI) has implemented further structural changes to encourage investment in healthcare facilities. tax exemptions, exemptions from income taxes.

Trends making medtech sector a lucrative investment

Putting the focus back on the consumer: Medical technology and digital health advancements have given people more control over their healthcare experience than ever before. Patients can get medical care from the comfort of their own homes thanks to virtual platforms. Previously available solely to doctors and healthcare practitioners, these products can now be sold directly to patients. There is also a growing demand for personalisation in the healthcare journey and medtech can play an essential role through technology and more efficient devices.

Growing use of biopharma: Diagnosis is possibly one of the most important areas where technology can have a transformational effect. Some prominent examples include imaging based diagnostics technology for blood and cancer (oral and cervical etc) analysis etc, Nanotechnology/ microfluidics-based instruments for use in remote locations for diagnostics, genomics (instrument and reagents) for infectious disease, cancer, and genetic abnormality diagnosis, and home testing/ POCT – BP, sugar, haemoglobin, clinical chemistry, and infectious disease parameters etc supported with data management.

Focus on accessibility and equality: The pandemic exposed the disparities in access to healthcare among diverse groups, particularly among lower-income and minority populations. Technological innovations, such as those deployed in response to COVID-19, will very certainly be integrated into future healthcare planning in order to reach these people for testing, treatment, and vaccination. Additionally, experts believe that all levels of government will devote additional money to digital health services, owing to the direct influence of these people' health on the general economy. This emphasis on diversity and inclusion generates a large and rich environment supporting the development of medtech.

A fragmented market: At the moment, the medical technology sector is very fragmented. With the potential to acquire and integrate several businesses and enhance revenue via cost synergies, fragmentation presents an appealing opportunity for private equity investors.

The medtech sector is booming and there hasn't been a better time to invest in its growth!

Emerging trends in the medtech industry: Movers & shakers

Tanaz Buhariwalla, India Director, IDA Ireland highlights the key trends in the medical technology industry that shaped 2021 and will continue to evolve in 2022

As everyone knows, 2020 was a challenging year, and this year is no different. This year has also been different for the medtech industry, as it has grown at an unprecedented rate, with demand for medtech products increasing.

The global medtech market is expected to reach US$600 billion by 2024, with a growth rate of around 6 per cent. Indian medtech market which is over US$12 billion, is highly dependent on imports, with about 85 per cent of products being imported. This is rapidly changing with indigenous medical device makers attracting significant investment interests from private equity, venture capitalists and a few of them preparing to go public.

Five trends in the medical technology industry that shaped 2021 and will continue to evolve in 2022 include:

Diagnostics and evolving new business models: Diagnostics remain the leading segment with over 14 per cent market share in the global medtech industry. The pandemic has further accelerated its growth. Many Indian IVD companies have done incredibly well in getting products in the market when they were most needed. A trend to call out is that medical device companies have integrated and have become cross intersectional health infrastructure providers. This model will undoubtedly continue to evolve.

Diagnostics remain the leading segment with over 14 per cent market share in the global medtech industry. The pandemic has further accelerated its growth

Wearables: As most people had to stay indoors, maintaining and monitoring one's health became a priority, giving consumer tech devices a thrust, particularly wearable fitness bands and smartwatches. With healthcare vital tracking features being loaded, this market is here to grow exponentially.

Telehealth: The focus of IT in healthcare and digital health innovations has grown rapidly in the last 5 years. As a result of the pandemic, the adoption of telemedicine has grown exponentially creating new prospects for healthcare companies, IT SAAS platform firms and the healthcare analytics market.

Personalised preventive healthcare space: Startups are offering a virtually integrated approach to customising fitness regimes by tracking biomarkers, body vital stats and combining it with consultation on food and preventive healthcare. There are over 900 wellness startups in India, more than 10 per cent of which are backed by marquee investors.

While all of the trends are driving the sector forward, we cannot ignore the challenges. Due to soaring demand for electronics during the pandemic, a supply crunch for semiconductors chips affecting every industry from automotive to consumer electronics to medical devices was seen. Though only a tiny fraction of the world's chips are consumed by the medical devices industry, OEMs still felt the impact. So far, most chipmakers have taken a pragmatic approach to back medical device makers before other industries as they deal with the human element and their products save lives.

Indian healthcare: Trends & growth drivers

Jatin Mahajan, Managing Director, J Mitra & Co shares his views, trends & growth drivers for the healthcare industry in 2022

The booming Indian healthcare industry is growing at a CAGR of ~23 per cent. Healthcare is India's largest service sector, providing quality healthcare for the 1.3 billion-plus population. Indian Healthcare Industry will touch USD 372 bn (roughly INR 27,90,000 crore) by 2022.

We have witnessed numerous pathbreaking trends in the last decade. The merger of engineering and medicine is the most significant trend driving disruption and growth of the healthcare industry. Other key trends have been.

◆ **Consumer devices, wearables, and apps:** Wearable devices continuously monitor patients' critical parameters. Wearables include embedded medical devices (into patients' bodies) and other devices worn on a person's body. These devices provide healthcare workers real-time information on patient data while they remain at home.

◆ **Robotic surgery** is a relatively new procedure for minimally invasive surgery. However, robotic-assisted surgery has become the standard treatment for prostate and is fast pervading other organs and diseases.

◆ **3D printing technology** reduces the cost of manufacturing prototypes, prosthetics, tissue & skin, and even pharmaceuticals.

◆ **LASIK:** Laser technology advancements have made eye surgeries easy for physicians and affordable for patients, eliminating reliance on eyeglasses. This elective procedure is efficient and safe and allows surgeons to cater to a larger audience.

◆ **AI (Artificial Intelligence) & ML (Machine Learning):** AI can manage patient admissions, scheduling, and billing. AI can analyse and decode complex data, provide exceptionally potent data for efficient & precise diagnostics. As a result, AI will probably broaden and bring down healthcare costs and let doctors and staff focus on patient care.

We have witnessed numerous pathbreaking trends in the last decade. The merger of engineering and medicine is the most significant trend driving disruption and growth of the healthcare industry

◆ **IoT (Internet of Things):** IoT has transformed the healthcare industry by connecting devices, systems, and objects the global population uses. These are utilised to leverage data and enable more timely, specific, and contextualised decisions.

◆ **Blockchain:** As a database technology, Blockchain uses encryption and various other security procedures to store data, linking it to augmented security and usability. This innovation facilitates many facets of healthcare, including patient records, supply & distribution, and research.

◆ **Voice-controlled assistants:** Speech recognition systems include components designed to optimise patient care or reduce clinician workloads in healthcare settings. Voice recognition is used for data management, clinical documentation, and streamlining daily workflows.

◆ **Remote care:** Relying on the IoT's convenience in transferring data between devices, remote care offers comfort with quality. Remote patient monitoring and telehealth are possible through video conferencing, big data, and wearable technology. As a result, physicians can monitor and diagnose patients miles away.

◆ **Telemedicine:** COVID-19 has undoubtedly accelerated the delivery of telemedicine, and experts affirm that telemedicine is here to stay. Many patients prefer it.

Many technologies are in their early stages. However, the healthcare industry recognises these benefits and will capitalise on the technologies above.

Various reports by NITI Aayog, Invest India, and IBEF point towards a robust growth for the industry, especially in the post-pandemic scenario. So, what are the key growth drivers?

The key driver catalysing the growth and development of the healthcare industry is technological innovations. Technology is the most significant catalyst of many disruptive innovations in healthcare and supports every facet of healthcare.

◆ **Policy:** The Indian Government has increased its healthcare allocation from 1.2 per cent to 1.8 per cent of the GDP. There is a growing implementation of public-private partnership models in India's healthcare sector. NITI Aayog and Invest India are aggressively driving investment for the Indian healthcare industry.

◆ **Diagnostics:** India is among the leading exporters of IVD solutions worldwide. The Indian in-vitro diagnostics market is likely to reach USD 2 billion in 2026, from USD 1.3 billion currently.

◆ **MedTech:** India is the international center for frugal medical devices engineering. The Indian medical devices market stood at INR 77,539 crore in 2020 and is likely to grow at 35 per cent CAGR from 2020 to 2025 (IBEF report), fuelled by the "Make in India" campaign.

◆ **Health insurance:** Health insurance accounts for 20 per cent of the non-life insurance business. It is the 2nd most extensive portfolio, with premium income growing over 16 per cent.

◆ **Hospital infrastructure:** The hospital industry accounts for 80 per cent of the Indian healthcare market. It will reach USD 132 bn by 2023 from USD 61.8 bn in 2017, growing at 16-17 per cent CAGR. Numerous hospital projects by renowned organisations like Apollo Hospitals, Columbia Asia, Manipal Hospitals, Max Healthcare, Medanta, Cloud Nine Hospitals, Park Group, and Narayana Health are coming up in tier-2 and tier-3 cities.

Internationally, China has lost much trust as a global supplier of reliable healthcare products. There is a resultant shift towards India as the most viable alternative. As the producer of two global Covid vaccines, India has gained much trust, which is a critical influencing factor.

The coming years will herald a boom for the Indian healthcare industry. This will catalyse a win-win situation, including healthcare providers and healthcare-seekers.

The role of digital technology and artificial intelligence in medical imaging

Satyaki Banerjee, CEO-Medical Imaging, Trivitron Healthcare highlights the role of technology in medical imaging

The new millennium brought in a transition from conventional Screen-film Radiography to Computed Radiography (CR) and gradually over the last two decades to Direct Digital Radiography (DR). The future however lies in Artificial Intelligence (AI) enabled Radiography systems.

Computed Radiography cassettes use photo-stimulated luminescence plates to capture the X-ray image, instead of traditional X-ray film. The exposed CR cassette goes into a digitiser that converts the latent image stored on the plate into a digital image that can be further processed, edited and viewed on a computer/screen. CR is a two-step process, the first being Image Acquisition and the second step being the image readout by the digitiser.

Digital Radiography systems use Active-matrix Flat Panel Detectors consisting of a scintillator detection layer deposited over an active matrix array of thin-film transistors and photodiodes. With DR, the image is converted into digital data in real-time and is available for review within seconds. Flat Panel Detectors using a scintillator like GOS (Gadolinium Oxysulfide) or CsI (Cesium Iodide) are called Indirect Conversion Systems. When the scintillator is exposed to X-ray, the beam is absorbed and converted to fluorescent light. A photodiode array further converts the fluorescent light to an electric charge and the corresponding TFT switch completes the readout process in real-time.

DR systems have significantly higher dose efficiency than CR systems. They are two to three times more efficient at converting dose to signal than CR. This increased dose utilisation means that a DR can produce the same image quality as CR at a lower dose or that DR can produce higher contrast resolution images than CR using the same dose.

AI algorithms involving deep learning are increasingly being deployed for image-recognition tasks. Deep learning is based on a neural network structure that emulates to a great extent the working of the human brain

In clinical practice, a DR system generally requires a 40 per cent lower radiation dose than CR or Screen-Film systems. The latest generation of wireless DR detectors with automatic beam detection offers the flexibility of retrofit in a traditional system designed for use with CR or screen film, but with the benefits of much higher throughput, portability and flexibility. In addition, panels are now equipped with a data processing engine and carry their own calibration files, which allow the images to be corrected on the panel. On-panel image corrections increase the image transmission speed and reliability.

The digital image whether it has been acquired by a CR or a DR system is generally transferred to a PACS system in the form of a DICOM file. During the process of report writing, a radiologist would generally rely on powerful image processing software that provides an array of tools to critically review the high-resolution image leading to diagnosis. The current trend is to further enhance these software tools by incorporating Artificial Intelligence algorithms that can predict diagnostic scores/probabilities and can assist the radiologist to arrive at highly accurate and conclusive diagnoses within a shorter time period.

AI algorithms involving deep learning are increasingly being deployed for image-recognition tasks. Deep learning is based on a neural network structure that emulates to a great extent the working of the human brain. Neural network structures are designed to learn differential and delineating features from clinical data automatically, enabling them to approximate very complex nonlinear relationships. Once these neural network structures are trained with statistically significant samples of clinical images with expert radiologists specifying a structured approach towards identifying image patterns for a conclusive diagnosis, the software is able to emulate the human thinking process and predict diagnostic scores leaving the task of the confirmatory diagnosis to the expert eyes of the radiologist.

The advancement in computing hardware, availability of a large repository of expertly tagged clinical imaging data in digital form to train the neural network structures and continuous refinement of AI algorithms have led to the development of applications that can perform extremely precise differential diagnoses. Many modern Digital Radiography Systems come equipped with software tools that has anatomy specific AI tools that can assist radiologists to deal with much higher caseloads and quickly perform very precise diagnosis.

AI has the potential to augment the capabilities of doctors

Dr Sina Bari, Director-Medical AI, iMerit highlights that the Radiologists and clinical centres are rapidly adopting AI to detect numerous potent diseases

The evolution of technology, access to huge datasets and the need for smarter, quicker solutions are constant contributory factors in the rise of artificial intelligence (AI), even in healthcare and medicine. While the application of AI and machine learning is finding its purpose in several clinical services, radiology is leading the way.

AI has been demonstrated to be especially successful in processing and analysing large volumes of radiologic data to improve the quality and accuracy of diagnosis from medical imaging. It has empowered radiologists to gather insights that enhance their efficiency and capabilities. Industry leaders also feel digital radiology is one of the most mature AI use cases in healthcare, having the potential to revolutionise diagnosis and patient care.

Radiologists and clinical centres are rapidly adopting AI to detect numerous potent diseases such as cancers, neurological abnormalities, hidden bone and muscle damage, and screening patients promptly to prioritise treatments.

According to a report by Signify Research, the world market for medical imaging AI applications is projected to reach almost $1.2 billion by 2025, with a compounded annual growth rate of 26 per cent.

In 2020, radiologists and clinical staff heavily relied on technology to support an overwhelming number of patients needing care and prompt diagnosis due to the COVID-19 pandemic. In such scenarios, technological advances such as AI and machine learning (ML) could speed up processes, strengthening the healthcare system.

Here are the top six AI trends in radiology for 2022:

Integration of AI into smartphones

Clinical experts predict that AI has the potential to augment the capabilities of doctors, especially in developing countries. For instance, researchers at Stanford University are building a tool to enable physicians to take images of an X-ray film using smartphones. The algorithm at the core of this tool will scan the film for problems such as tuberculosis and others. Such apps work with X-rays and do not require advanced digital scans, which are scarce and costly. Smartphones might be augmented with ultrasound probes read by AI algorithms, empowering clinical staff worldwide.

Integrating AI software into imaging equipment

At present, AI software for radiology is commonly deployed through cloud-based platforms

or installed directly into the internal servers of hospitals. This reduces productivity as radiology practices adapt to a new workflow and has been noted to discourage hospitals from adopting image-recognition AI.

AI companies are thus increasingly exploring the integration of software directly into scanners as edge-computing to facilitate automation of medical image analysis. Such enhanced analytical capabilities can enable hospitals to maximise the number of patients diagnosed daily and improve treatments.

'Homegrown' algorithms over commercially available tools

The American College of Radiology recently reported that radiologists utilising AI in clinical practice favour algorithms they've created specific to their local population compared to commercially available tools.

These custom tools are built to support the understanding of the community, identify threats and improve diagnosis, leading to efficient patient care.

Improving image resolution to maximise algorithm performance

Poor-quality data negatively impacts the development process and performance levels of deep-learning algorithms. Imprecise images decrease the accuracy of insights generated by AI, spoiling its chances for extensive implementation.

AI companies are developing techniques to boost the output of image recognition by capturing better images. For example, US-based Subtle Medical Inc uses image-recognition AI to transform blurry images unsuitable for analysis into high-resolution scans.

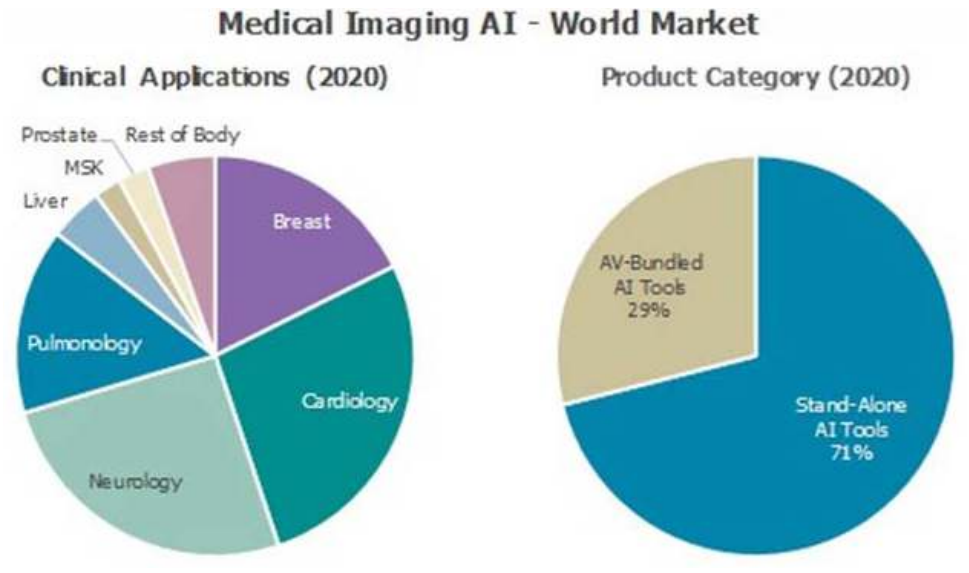
Detecting multiple diseases from a single image

Doctors are seeking flexible support tools to improve diagnosis and to determine right treatment. Catering to this requirement, AI companies are investing in more resources to identify multiple conditions from a single image. For example, solutions from DeepMind Technologies and Pr3vent Inc are designed to detect over 50 ocular diseases from a single retinal image, while VUNO Inc's algorithms can detect a total of 12.

Enterprise AI in radiology

Enterprising AI into radiology can offer significant longitudinal information to clinicians over time with respect to a patient's disease progression. An AI tool, able to record every aspect of an image, could impact a patient's health outcomes in the future, significantly influencing treatments in children affected by diseases. Multiple imaging data from one patient combined with that of others suffering from the same diseases can yield newer and deeper insights on the disease and its progression.

AI is poised to significantly increase the value of radiology. It has the potential to provide an edge over traditional diagnosis, enabling healthcare professionals to improve patient care. And early adopters of AI in healthcare practices will be future-ready.



Source: Signify Research

July-21

A robust screening modality is need of the hour

Dr Rahul Vakharia, Consultant Radiologist, Wockhardt Hospital highlights the key trends in radiology sector in 2022

Fetal USG: With the advent of high quality probes and high quality machine and a collective experience in fetal USG, it has become a sub specialty practice in present day radiology. Only an experience radiologist should perform a fetal ultrasound who has a sound knowledge. Present day fetal USG can pick up varied congenital abnormalities in a relatively early pregnancy in particular neural and cardiac pathologies.

Stroke Imaging: The treatment of ischemic stoke has undergone a sea change with the recent guideline from DAWN trials in treatment of stroke. The time frame of the ischemic stroke was extended for 6 hours to 24 hours in selected cases. The mechanical clot retrieval plays an important role in line of treatment after administrating IV thrombolysis.

CT coronary angiography: Coronary artery disease is a leading cause of mortality and morbidity in India, hence a robust screening modality in asymptomatic individuals with co morbidities is need of the hour. CT coronary angiography can fill the void as a screening procedure. Advances in machine technology in the field of CT, a good coronary angiography can be performed under <1mSv. An interesting article authorised by J. Graby et all in clinical radiology has applied AI to understand the perivascular tissue inflammation which can predict the future plaques.

Lung cancer screening by CT: Lung cancer is a leading cause of death in adult made due to smoking or consumption of tobacco based product. A screening chest x ray would not pick up an early cancerous lesion. A screening chest CT with low radiation done technique can significantly lower the mortality related to lung cancer. Nelson study conducted in Netherlands showed lowering of lung cancer related mortality and early detection of lesion with long term survival.

Lung nodule screening by MRI: Imaging of the lung with MRI had always been a challenge. The ultra short echo time MRI for evaluation of lung nodule was comparable to the chest CT. This advancement in the near future will help to screen a large number of populations without the harmful effect of radiation.

The promise and potential of digital technologies in radiology

Dr Nikhil Cunha, HOD–Radiology, SLRaheja Hospital predicts that technology will continue to revolutionise the radiology sector

Radiology by its nature is intricately connected to the internet and is at the forefront of technological advancements. But the past the few years have seen an immense transformation in imaging applications backed by digital technologies. These technologies have enhanced diagnosis and prognosis accuracy as well as given better & sharper images for accurate diagnosis of patients. With the help of digital technologies Radiologists, today are being motivated to look beyond their own corner of the medical world and think more about the larger healthcare enterprise & the entire care continuum.

Today, all modalities are growing exponentially and growing faster. These technologies have mainly facilitated radiologist in three main areas:

Application of Artificial Intelligence (AI) especially, AI has made a lot of progress within this field. To make AI algorithms work, thousands of data sets are annotated by medical professionals daily. Today, identifying smaller nodules, which at one-point of time was impossible to detect, is absolutely possible and this is because of technologies backed by AI. The momentum of AI and the eventual implementation of deep learning models seem assured. AI algorithms, especially deep learning, have shown incredible progress in image-recognition tasks like lesion detection or segmentation. It has made great advancements in the field such as mammography, colonoscopy, vascular measurements of the heart and lung examination for COVID-19 diagnosis.

With the growing body of evidence that shows the extraordinary potential of AI in healthcare, radiologists visually evaluate medical images for the detection, characterisation and monitoring of diseases. AI methods can help recognise complex patterns in imaging data but it will be a quantitative characterisation of medical imaging. Secondly, with 5G coming into play, images can be sent faster and in part of the country, in turn making medical diagnosis more accessible. For instance, during the pandemic PACS helped in faster reporting of COVID-19 cases in the past two years. However, the benefits of radiology AI software continue to grow, and radiologists, practice administrators & IT staff must continue to educate themselves on the potential

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Advances and trends in radiation therapy in 2022

Sushil Beriwal, VP-Medical Affairs, Varian talks about the advances in radiation therapy in 2022

Radiation therapy is an integral part of cancer treatment. It is used in the management of the majority of solid tumors to either cure or palliate symptoms. The delivery of radiation therapy including external beam and brachytherapy has become more conformal and precise with integration of 3D image guidance including CT scan and/or MRI. This has led to better local control and reduced side effects, which has a positive impact on patents' life. Advancement of technique has also opened up other options for cancer patients including shorter course of radiation (hypofractionation) and stereotactic body radiation therapy (SBRT). Some of the advancements and trends are as follows:

Shorter course

The COVID-19 pandemic brought unprecedented changes to the world as we know it. In an attempt to balance the risks of exposure, evidence-based guidelines were published in 2020-21 encouraging the use of 5-fraction regimens of radiation therapy for the most common disease sites, including breast, prostate, and rectal cancer. As we work to return to a new normalcy, we expect radiation oncologists will continue the evidence-based adoption of shorter courses of radiation therapy. These shorter courses are patient-friendly and equally efficacious. Older concerns regarding hypofractionation were driven by 2D planning limitations, which are now mitigated by advanced conformal planning, heart-sparing techniques such as deep inspiration breath-hold, and daily image guidance.

Stereotactic Body Radiation Therapy (SBRT)

This technique, initially used for treatment of early-stage inoperable lung cancer, is emerging as a potential option for even operable lung cancer. It is non-invasive and is well tolerated and some comparative data suggesting a similar outcome as surgery in appropriately selected patients. This pin-point technique of radiation therapy is delivered in 1 to 5 outpatient treatments. Another expanding indication for SBRT is treatment for metastatic disease especially in patients with limited metastases (1 to 5 in number). The goal of this treatment is to eradicate this limited site of metastatic cancer commonly involving lungs, bones, or lymph node, which, in conjunction with systemic treatment (chemotherapy, targeted therapy or immunotherapy), may help patients live longer. Early data are promising, showing excellent local control and low morbidities. Ongoing larger studies will help us better define the role of this modality in management of oligometastases or oligoprogression disease. The ongoing studies are also exploring the combination of SBRT and immunotherapy to see if SBRT can enhance the effect of immunotherapy through both direct and indirect effects.

The technique of Stereotactic Ablative Radiotherapy (SABR) also offers potential for treatment of refractory ventricular tachycardia. Small published series and reports have shown promising early results. There will be a prospective multi-institutions phase 3 study starting in 2022 sponsored by Varian to see the true impact of this technique in treating certain refractory tachycardias.

Artificial intelligence (AI)

Artificial intelligence is one of most talked about subject in every sphere of life including medicine. Radiation therapy is no exception and various aspects of AI are being explored in radiation oncology. The past few years has seen increasing adoption of AI in radiation therapy, including AI-driven auto segmentation for contouring organs at risk and target for radiation planning, use in adaptive therapy as seen in Varian's Ethos™ system, and planning tools such as RapidPlan®. AI will continue to help save time and improve quality of care with consistency of target delineation among physicians. The other potential uses of AI are: a. Decision support tool to optimise plan of care. b. Radiation therapy planning to improve quality and efficiency. c. Radiomics to predict cancer outcome d. Modeling based on patient and disease characteristic to predict risk of complications. These advancements can help decrease healthcare inequities by empowering physicians with better tools to make cancer care uniform across the globe.

Biomarkers

With the advancement of science, we are able to individualise care using biomarkers. These biomarkers are both predictive and prognostic and help us guide cancer care. These genomic markers are already used in breast, head & neck, and prostate cancer. Ongoing studies will further expand indications and also better define the role of existing biomarkers in radiation therapy.

In summary, the advances in radiation therapy are aimed at making cancer care easier and accessible. The expanding indication in treating metastatic cancer will possibly help patients live longer with better quality of life. Technology including AI and genomics will help us individualise care and also help decrease inequities in cancer care.

The promise...

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benefits, drawbacks, and costs of implementation.

Storage of data: Digital technologies such as cloud computing has provided an edge for raw data management in radiology. Based on the type of medical imaging solutions, cloud computing can be used in different scenarios given below:

- ◆ Archiving, storage of massive image data as well as medical image disaster-recovery can be done remotely
- ◆ Cloud image-based software applications, like 3D healthcare image applications, imaging centers, and mobile image reading
- ◆ Remote health monitoring and image-based online consultation

Enabling communication and exchange of data: In the past few years, the limits of imaging informatics have been pushed beyond traditional borders due to transformations in communication technology. The evolution of telemedicine has been advantageous for both healthcare providers and patients alike. The same concept has been applied in radiology too. The exponentially growing availability of mobile applications has a significant impact on the fast development of new e-Health services. This increasing availability of mobile computing hardware and software is particularly relevant to radiology, where the day-to-day workflow is intimately intertwined with digital tools. These are increasing enabling radiological communications and is ensuring access to such services even in rural areas. For instance, Radiologists have been able to help in plastic and orthopedic surgeries by sharing CT scans and dicom to special centres where very accurate 3D printing for bones, ear lobe prostheses, and plenty of other applications are done.

In the coming year, technology will continue to revolutionise the radiology sector. Radiologists will need to upgrade themselves to continuous education on digital technologies and its application in the future.

Need of the hour is to create affordable, more accessible testing for SARS-CoV-2 as well as all other infective diseases on faster and confirmatory platforms

Dr (Prof) D M Vasudevan, Technical Director, Agappe Diagnostics Former Dean-College of Medicine, Amrita Vishwa Vidyapeetham and Principal, Amrita Institute of Medical Sciences and Research, Kochi highlights the post-pandemic scenario of diagnostic sector

Post-pandemic and pandemic lessons have taught the whole world the preponderance of diagnostic tools, where the molecular diagnostic (MDx) solutions as well as point of care solutions and these two sectors have emerged as the most prospective branch of diagnosis.

In comparison with pre & post-pandemic era, the MDx sector has shown phenomenal growth from 2 per cent to 27 per cent and it's growing continuously.

The need of the hour is to create affordable, more accessible testing for SARS-CoV-2 as well as all other infective diseases on faster and confirmatory platforms, which can be performed with ease and without the service of untrained technicians. Faster & newer ways have to be developed to identify antibodies that neutralise the virus. More than 100 vaccines for the SARS-CoV-2 are at various stages of development and newer mutants are emerging frequently with more infectivity and varying virulence. In a world of closely 9 billion people, countries must be in a state of emergency preparedness to tackle emerging infectious diseases, with rapid diagnostic solutions and effective isolation.

Neutralising antibody testing tools may evolve to be next priority for advocating new doses of vaccines depending on your immunity levels. There are unpublished reports that the efficacy of double vaccination may not be enough for the proper threshold of immunity, especially in a world of numerous mutants emerging, within a short time.

Neutralising antibody testing tools may evolve to be next priority for advocating new doses of vaccines depending on your immunity levels

For emergency preparedness, point of care or mobile or diagnosis at the doorsteps of the patient will be the essential alternatives of the days to come. The POC segment of diagnostics with handy, handheld, one step, cartridge-based multiple solutions will be the next-generation tools in various platforms like Immunofluorescence, Chemiluminescence, dry chemistry, hematology will pick up. Agappe is also trailing the trends with utmost care, quality & affordability in minds.

With respect to COVID-19, the mass screening & speed of testing process have undermined the pristine approach of our public & Govt to switch over to newer platforms with confirmatory rapid COVID-19 test results in the shortest time.

Large-scale testing, isolation & contact tracing are central points to control the pandemic effectively, especially in the light of new Omicron virus scare. Since December 2019, COVID-19 has resulted in over one million deaths & put extreme pressure on health systems & economies.

Clinical diagnostic laboratories currently rely on molecular tests based on the polymerase chain reaction (PCR) or Reverse-transcription Loop-mediated isothermal amplification (RT LAMP) for detecting SARS-CoV-2 infection in samples such as throat/nose swabs. PCR-based tests are probably the most widely used & are considered the gold standard in terms of sensitivity & specificity. But, of-late, we have other equally good or more specific testing methods developed to have better specificity & sensitivity.

RT-LAMP technology is a strong platform for diagnosing COVID-19 virus, with much shorter time as compared to RT PCR method. This test facilitates quicker analysis of genetic material than traditional PCR & has been successfully used in the detection of the COVID-19 virus. RT-LAMP achieves high specificity due to the target sequences.

Its isothermal reaction allows higher amplification efficiency, as there is no need to wait for thermal changes, thus no time is lost. Whereas, a traditional PCR can take around 3 to 4 hours, RT-LAMP takes less than 40 minutes for sample collection.

Agappe had already developed LAMP-based technology named Mispa Lume with reagent LumeScreen n-Cov during 2020 for confirmatory COVID-19 testing in less than one hour.

Thereafter, new reagent without RNA extraction step, AG InstaLume (98.7% sensitivity & 100% specificity) has been launched by Agappe which can perform the confirmatory test in just 40 minutes from collection of swabs, which can detect Omicron variant also. This has been approved by all regulatory bodies. This can be highly useful for airport screening, social functions, hospitals etc, where the authorities get confirmatory results in less than 40 minutes. Many airports in India are presently using this technology for screening their international passengers.

Post-pandemic situation changes the structure of the society. New geopolitical, socioeconomic dynamics will surface, values will change, and our lives and habits will also be subjected to modifications. Countries have to prioritise their expenditure. Weaker sections of society require all the possible assistance. Regardless of the devastation caused by the crisis, human population will prevail, and humanity will still find the strength to recover. Investing in public health, preparedness, and relying on science will bring a better future. Agappe, your best partner in diagnostics, will be with the masses, providing quality, innovative & affordable rapid solutions for the society at large.

From AI to haptics, big shifts in growing diagnostic market

Dr Manjiri Bakre, CEO and Founder, OncoStem Diagnostics highlights the trends in diagnostics that will capture the market in 2022

In 2020, India's in-vitro diagnostics market was estimated at $1255.18 million. In light of the pandemic, the staggering demand for clinical diagnosis and a high incidence of infectious disease (read COVID-19), this market is poised to reach $1,990 million in 2026, registering a CAGR of nearly 7.10 per cent during the forecast period. Then, there are the other factors influencing the market including an ageing Indian population, increasing disposable income, access to insurance, lifestyle diseases, awareness of preventive healthcare, POC (point of care) testing, etc.

This potential growth has fuelled an incredible amount of investment into the industry with advances abounding. We're witnessing a revolution in Indian healthcare that's largely propelled by a stretched-thin medical infrastructure system. The pandemic taught the medical fraternity the importance of digitisation, robotisation and automation, essentially, faster and efficient diagnosis with reduced input. Even the government of India has acknowledged this and has introduced schemes like the Production Linked Incentive (PLI) which emphasises investment in manufacturing of medical devices and pharma drugs, among other things.

As innovation burgeons in Indian healthcare, here are some trends in diagnosis that will capture the market in the next year.

We will witness strides towards full automation, reduced costs and time for sequencing and analysis essentially relying on equipment that will both label and analyse genomes according to requirements

Genome sequencing automation

After the Delta strain, the world is now gripped with another mutation of the Coronavirus, Omicron. As a priority right now, to combat these variants, automation in genome sequencing is needed more than ever. Automated genome sequencing incorporates a fluorescent dye to identify nucleotides instead of a radioactive isotope. We will witness strides towards full automation, reduced costs and time for sequencing and analysis essentially relying on equipment that will both label and analyse genomes according to requirements.

Minimally invasive technologies and molecular diagnostics

Minimally invasive accurate methods to monitor health are really the game changer. While today we use an invasive biopsy to confirm cancer's status and progression; future lies in liquid biopsies – tumour analysis via biomarkers, circulating tumor cells (CTCs) and circulating cell-free tumour DNA (ctDNA) in blood. Non-Invasive Prenatal Testing (NIPT) screens for any chromosomal disorders caused by chromosome anomalies by drawing blood from pregnant mothers. Advances will be made towards the development of robust and replicable liquid biopsy/blood - based assays for widespread use in many aspects of healthcare.

Artificial intelligence (AI) in oncology and imaging

AI with healthcare can transform India's medical infrastructure. In spite of the progress so far, oncology challenges extend to detection, characterisation and monitoring. AI has the capacity to most importantly, monitor thoroughly and collate data, and then analyse that information for specific treatment needs through machine learning algorithms, neural networks. For instance, the integration of multiple-omics data from pathology, genomic, proteomics, demographics, etc can arrive at multidimensional disease analysis. Similarly, AI in healthcare can effectively improve workflows, processes, reduce human error and improve quality of patient care. Increasing the efficacy of a companion diagnostic (CDx) device or test – which provides essential information for effective use of a particular drug – is one such outcome to tailor individual treatment.

Wearables and virtual healthcare anywhere

Finally, a biggest trend I would like to see in healthcare in future is in wearables leading to continuous monitoring of patients, telemedicine, telepathology, teleradiology and in haptics. Haptic technology aims to simulate the sensation of touch as a feedback system to communicate information to and from the user. As visually-oriented species, we usually don't realise how incredibly useful our sense of touch really is. In future, we should use haptic technology to recreate the interactions between a clinician and the human body during medical examinations and surgical procedures, in a variety of ways like wearable backpacks and vests that vibrate, gloves, sleeves through direct palpation of the anatomy, or indirectly through the manipulation of instruments such as endoscopes, catheters and guidewires, etc.

One of the key learnings of the pandemic is that people are now aware of the importance of precise diagnosis. COVID-19 has already accelerated the implementation of technology-based solutions in healthcare. Since the release of the government's telemedicine guidelines, virtual and phone consultations have grown exponentially allowing for extended access to healthcare. It's imperative we expand this approach to other diseases and ailments as well.

In an age of digital information overload, building trust is essential

Dinesh Chauhan, CEO, CORE Diagnostics highlights the key trends in diagnostic sector which will be crucial in the future

The diagnostic industry has emerged as an indispensable sector in India's burgeoning healthcare sector, and it is one of the country's fastest-growing services. The domestic diagnostic sector is predicted to be around USD9 billion (about Rs 675 billion) and is expected to develop at a CAGR of 10 per cent over the next five years. Changes in the demography, an increase in changing lifestyles, and higher income levels across all socio-economic groups are responsible for fuelling growth in this sector, as well as increase in preventative testing, deeper penetration and extension of healthcare services and insurance.

In the global effort to resist and restrict the spread of SARS-CoV-2, the virus that causes COVID-19, the importance has been re-emphasised. Despite accounting for only 2 per cent of overall healthcare spending, IVDs have a 66 percent influence on clinical decision-making. They are critical in detecting disease, evaluating therapy efficacy and patient health status, and/or enabling disease prevention.

IVDs cover a massive spectrum of conditions and are such a fundamental aspect of modern medicine that the World Health Organization has designated about 122 test categories as essential. Despite their tremendous utility, current diagnostic testing still has room for improvement.

Key trends to look forward to

While the coronavirus changed the way healthcare is delivered around the world in 2020-21, the year 2021 specifically has brought its own set of challenges, including differing perspectives on vaccines, powerful COVID-19 variants, and hospitals overflowing as they cater for patients with and without the virus.

> Quality improvement in research activities is critical to improved patient outcomes and success, these are time-intensive programmes, and it can be challenging to efficiently expose and integrate new findings in the context of a constantly shifting clinical practice

◆ Telemedicine has established itself as an important part of the healthcare scene

Many doctors and health systems quickly adopted telehealth and virtual care models as social distancing and stay-at-home orders upended the healthcare delivery model and have witnessed the benefits it can bring to patient care. It will likely prove durable long beyond the epidemic and will establish itself as a permanent and important fixture in the healthcare ecosystem.

◆ Quality enhancement hastens the implementation of evidence

Following the pandemic, which exposed the flaws and limitations of medical research's present delivery system, there is an increased demand for tools and solutions that decrease the time between identifying clinical problems and implementing evidence-based clinical remedies. Quality improvement in research activities is critical to improved patient outcomes and success, these are time-intensive programmes, and it can be challenging to efficiently expose and integrate new findings in the context of a constantly shifting clinical practice.

◆ In an age of digital information overload, building trust is essential

With the COVID-19 pandemic came the information epidemic, as the World Health Organization coined it for the influx of erroneous or misleading information across social, digital, and physical contexts in healthcare.

It is important to only trust in "high-quality, evidence-based health material" not just for patients, but also healthcare professionals. In an information-saturated world, having material that reflects patients' lived experiences and assists physicians in providing clear, accurate, and accessible health information will be critical to create trust amongst patients. Effective, engaging digital health necessitates not only the proper technology, but a full-fledged experience that informs and motivates consumers.

◆ Demand for monitoring diagnostic tools

Patients require more frequent monitoring and often for longer periods of time as the population ages and the prevalence of chronic disease rises. This has fuelled the demand for monitoring diagnostics tools. Biomarkers like Troponin T and NT-pro BNP can help clinicians diagnose, monitor, and effectively manage cardiovascular disorders.

Another area of expansion is the use of predictive biomarkers, as healthcare organisations realise the significance of being able to identify at-risk individuals. If we can predict cancer before it develops, we will be able to act early with the appropriate treatment and save lives. This is a substantial departure from the existing practice, which is to wait until symptoms appear before diagnosing the problem.

◆ AI helps to minimise hospital-acquired infections (HAIs)

In the coming years, the healthcare industry will be examining the usefulness of artificial intelligence (AI)-powered infection prevention and control (IP&C) technologies to better monitor patients in real-time with swift infection risk diagnosis and early clinical intervention. While healthcare sector has been allocated more & more resources for infection prevention and control efforts to contain COVID-19, it has also caused an increase in healthcare-associated infections (HAIs).

Conclusion

Diagnostics is no longer limited to illness detection. From screening, diagnosis, and prognosis to patient classification and treatment monitoring, it plays a critical role across the healthcare system. It aids in the improvement of clinical practice and treatment quality, as well as patient outcomes.

So, while diagnostics has always been a basis of healthcare, it is now poised to play a crucial role in revolutionising healthcare. Diagnostic solutions enable clinicians to make better decisions, give patients more control over their health and well-being, and provide payers and policymakers with the assurance that they are investing in the correct solutions. We now have access to a more proven and effective approach to healthcare, one in which diagnostics plays an even larger role.

Technology will write the next chapter of diagnostic care

Pallavi Jain, Managing Director, Krsnaa Diagnostics highlights the role of technology in revolutionising the diagnostic sector

Two years into the pandemic, and the world is now used to unprecedented waves of transformation, in order to keep up with the dynamically changing environment. While we are in a constant phase of learning, this pandemic has already shaped the healthcare & pharma industry to become more agile, collaborative and truly innovative, which has further increased the scope to push the boundaries. As part of this ecosystem, the diagnostics industry has also gone through a phase of evolution to recalibrate itself to the post-pandemic world. Landmark mergers & acquisitions, launch of major IPOs, geography expansion in deeper markets, rollout of supportive government initiatives & policies and innovative approaches to better the last mile connectivity, the list can go on. And this is just the beginning of the potential and opportunities that lie ahead of the industry. As envisioned by the experts, the growth projected for the Indian healthcare industry will be largely driven by the increase in healthcare spending by the aging population, rise in income levels, increased awareness for preventive testing along with high-end diagnostic offerings and prompt health-related measures taken by the government.

Given that diagnostics is the natural extension and a key stakeholder for the pharma industry to strategise their future approach, it is important to understand some of the trends and growth drivers that will continue to boost innovation in the sector.

Scaling up and targeting remote locations is the key

Investing in tier II and tier III cities of India is a strategic success driver for expanding the diagnostic network. Collaboration with more health institutes and increase of collection centres in India will help the diagnostic sector increase its reach and provide better access to the masses.

> Healthcare would remain a key focus area in the post- pandemic world, and is likely to drive specialised, preventive and wellness testing

Public private partnership will ensure seamless collaboration for effective delivery

Going forward, the government's share within the diagnostic industry is projected to grow at a CAGR of 14 per cent to 17 per cent in fiscal 2023, driven by government-led programmes such as the Ayushman Bharat Health Infrastructure Mission healthcare project. Effective partnership between the public and private players will help make quality diagnostic services accessible at attractive and affordable prices to the last mile patient even in the remotest of locations.

COVID has influenced the trend of preventive healthcare

Healthcare would remain a key focus area in the post-pandemic world, and is likely to drive specialised, preventive and wellness testing.

Adoption of agile patient-care practices will boost the trend of decentralised testing

Innovative new technology will allow for wide-scale acceptance of rapid testing near the patient, including their homes, which will help in better disease diagnosis, monitoring and management. Another advantage of digitalisation around point of care and at-home diagnostics includes the simplification of testing procedure and analysis, along with ensuring storage of results in a secure digital environment, which is accessible to various healthcare providers.

Technology will write the next chapter of diagnostic care

Another area which has picked up momentum, especially in the post-pandemic times, is medical consultation via telehealth and telemedicine services. These technological innovations have helped the diagnostic players bring quality diagnostic services to the doorstep of the patients.

Real-time diagnostics is a reality

Wearable devices, biosensors, lab-on-a-chip and other emerging technological innovations – ranging from watches, clothing and glasses to specifically-built implantable and ingestible devices– will be able to simplify collection of physical health information such as heart rate, blood pressure, respiratory rate and body motion. As an improvement over some of the challenges posed by traditional diagnostic testing, real-time diagnostics will enable continuous monitoring and provide instant feedback in case of any irregularities. The scale of real-time diagnostics is expected to eventually grow, while traditional testing continues to support patients in the remotest of locations at present.

Artificial intelligence will guide the growth of deep learning models. Artificial Intelligence (AI) in medical imaging will help HCPs diagnose diseases based on medical images. There is a need to adopt a more analytical approach towards gathering health data to monitor public health and establish trends. And this is possible only through advanced technologies such as AI, IoT, etc.

It is an exciting time for the healthcare & diagnostic industry, and it will be interesting to witness how the industry further evolves, on the sidelines of the technological advancements, dynamically competitive environment and changing patient requirements.

Personalised point-of-care testing and self-testing kits are one of the top current trends

Dr Angeli Misra, Director, Lifeline laboratory highlights the key trends in diagnostic sector in 2022

Diagnostics are the mainstay of the detection, diagnosis and assessment of any disease. Over 70 per cent of the medical decisions regarding disease treatment, management and prevention are based on diagnostics. They are a crucial tool in preventive healthcare as well.

Currently, the diagnostics industry is being primarily driven by the COVID-19 pandemic, and has been trying to keep rapid pace with the Sars-Cov-2 virus and its emerging new mutants in a veritable combat mode, to meet the huge challenge in catering to the deluge of urgent doorstep sample collection, quick turnaround time and speedy delivery of reports.

Personalised point-of-care testing and self-testing kits are one of the top current trends for continuous monitoring of chronic care patients, besides being the key to preventive healthcare solutions. Virtual healthcare solutions for primary care of chronic medical conditions with tele-medicine and teleconsultation, personalised service, doorstep testing, focus on accessible and affordable quality preventive healthcare and well being, and pharmacy services at a click, have come to the fore in a big way.

Technological innovations and newer tests are constantly being devised and upgraded, to deal with the pandemic as well as the implementation of the latest and highly sophisticated software applications to scale-up to the demand of the burgeoning volume of tests required to be conducted, while keeping a sharp eye on quality control and accuracy and affordability. Genome testing and the implementation of artificial intelligence (AI)-based analytic solutions are the way forward to cater to the anticipated increase in the total volume of tests in the near future in the wake of a possible third wave and its aftermath. Digital and technological innovations in the manufacture of diagnostic equipment are now integral to the healthcare industry. Robotic process automation has emerged as a logical solution at high-end diagnostic centres, along with digitisation to cover the lacunae in the area of skilled lab technicians and personnel, as well as improved precision and quicker results.

Preventive healthcare solutions and health insurance needs are showing the way forward with improved marketing communication techniques and employment of social media to spread the message.

Re-invention of national health policies, bearing in mind the urgent need for meeting the challenges of improving emotional and mental well-being of people, which has suffered in the wake of social isolation and economic crisis in the lockdown scenario, are pressing and immediate concerns which are shaping the future trends of the diagnostics sector. All the while, it is to be borne in mind that it had to cope with tremendous pressures of limitations like social distancing in the lockdown scenario, and yet spruce up its act in bridging the gap in the demand-supply chain, despite a lack of skilled technicians, and managing and collating a humungous volume of data, and keep up with the extensively hectic research and development in the field. National health programmes and policies are working to make healthcare accessible for all sections of society, including the rural population. This has resulted in a proper assessment of the country's disease burden, disease trends and effective collation of data, and extensive emphasis on research, to a great extent.

Cooperative competition, or coopetition, with key power players of the healthcare industry, is a key trend in health care. The government has spruced up its efforts to encourage coopetition and provide incentives for growth in the domestic medical devices industry and also encouraging FDI (Foreign Direct Investment), in order to achieve a leading rank in the medical devices manufacturing industry.

Currently, the diagnostics industry is being primarily driven by the COVID-19 pandemic, and has been trying to keep rapid pace with the Sars-Cov-2 virus and its emerging new mutants in a veritable combat mode

There is a dire need for converging advanced technologies and techniques to address the underserved diagnostic market

Puneet Sharma, COO & Co-Founder, DiagRight & **Asitranjan Biswabhusan**, Co-Founder & CEO, DiagRight indicates a dire need for converging advanced technologies and techniques to address the underserved diagnostic market

Puneet Sharma, COO & Co-Founder, DiagRight

Asitranjan Biswabhusan, Co-Founder & CEO, DiagRight

There is no denying that the COVID-19 pandemic has changed our world forever, most notably the medical industry and its diagnostic market. In the past two years, the medical industry had to make multiple changes to their process and space to adjust the COVID-19 positive cases and customers' behavioural changes. A bulk of these changes have evolved towards adopting automation and welcoming new models wherever possible.

It was a bold yet necessary move, as the medical industry lacked lustre for some decades now. It certainly provided the tailwind to grow and explore further. Between the initial uncertainty revolving around the COVID-19 transmission followed by multiple stages and phases of lockdowns, optional telehealth services became mandatory. Of course, a shift in consumer psyche and preference, who are now extra cautious about their health and well-being accelerated this transition. The change in scenario and consumer behaviour also led to a sharp rise of multiple at-home services like blood sample collection or diagnostic tests from home.

According to a report published by Edelweiss-the domestic diagnostic industry is estimated at around $9 billion and is expected to grow at a compounded annual growth of around 10 per cent by 2025. The report further said that the "Indian diagnostic industry is highly fragmented and underpenetrated despite the presence of over 1 lakh labs."

This clearly indicates a dire need for converging advanced technologies and techniques to address the underserved diagnostic market. This much needed collaboration will lead to trends that permanently change the diagnostic market for good.

> Between the initial uncertainty revolving around the COVID-19 transmission followed by multiple stages and phases of lockdowns, optional telehealth services became mandatory

Home blood sample collection: With the COVID-19 and its multiple variants sending shock waves across the globe, people have shifted preferences on the process of sample collection. Rather than going to a hospital or diagnostic centre for sample collection, which holds higher probability of infection spread, people are looking for at-home available options for all possible kinds of diagnostic tests. The trend has already picked up momentum in tier-I cities which supports a relatively stronger supply chain in comparison to tier II and III, as people avoid physical visitation to medical or healthcare facilities.

Accurate reports: Accuracy is of paramount importance in the diagnostic industry. Any medical professional must have an accurate diagnosis report to suggest the most suitable line of treatment to the patient. Hence, diagnostic carries a huge responsibility to deliver accurate reports on time. The current healthcare infrastructure and last-mile delivery, in particular, are the two enablers that would push this consumer preference.

TAT of reports: While the diagnostic market in tier-I cities is well-permeated, it is still stressed in the tier-II and III markets because of operational constraints. A cancer patient, for example, still has to wait for upto 72 hours to get access to their vital test reports. An increasing trend, is the customer expectation to have early access to digital reports within 12-24 hours, as is the usual standard for tier I healthcare.

Preventive healthcare: COVID has brought nations and citizens into deeper realisations. One, for example, is the significance of life and keeping a tab on health aspects of near and dear ones. This has led to the biggest trend of preference shift from curative healthcare to preventive care. People are adopting a healthy lifestyle regime, where they opt for nutritious food, exercise daily and keep a constant check on health reports.

Healthcare startups – a solution or bubble: India is witnessing a rise in startups, across sectors. These are ideas which are enabling a solution-based approach with the means to experiment and innovate, and bringing some unique technologies, that deliver on providing flexibility, scalability, and affordability to the mass at large. For instance, multiple startups in the logistics field are committed to automating and orchestrating last-mile operations. These are not mere profit or valuation- oriented ideas, but solutions that is solving concerns and requirements of many across the nation.

Dawn of the new era: Top trends emerging in diagnostics sector

Subhamoy Dastidar, Co-Founder & Director, Lilac Insights explains various key trends in diagnostics sector

The diagnostics industry has boomed over the past few years. The COVID-19 pandemic has further accelerated the growth of the sector. With investors putting more capital in this space, diagnostics will continue to grow, and CAGR will increase by 10 per cent in the coming years.

Due to urbanisation and globalisation, the diagnostics sector has recently witnessed a change in demography. The sedentary lifestyle in cities has led to the rise of lifestyle diseases such as heart illnesses and diabetes. To help tackle them effectively, people demand better quality healthcare and focused diagnostic services. New healthcare models are replacing the older ones to adapt to current needs. These new models help harness the power of advanced genomics to understand the personal risk of a lifestyle disease through specialised diagnostics.

The new tests aid individuals in accessing their current condition and taking steps to get customised treatments. Having such access to personal genomics data can help patients take control of their health and lead better lives. A paradigm shift from general healthcare to specialised and customised diagnostics is evident globally.

There is a major trend in the diagnostics industry – consolidation. There are over 8,000 big and small labs in the country. These big labs aim to buy the smaller labs, leading to a more consolidated and organised sector

Top trends in the diagnostics sector

There is a major trend in the diagnostics industry – consolidation. There are over 8,000 big and small labs in the country. These big labs aim to buy the smaller labs, leading to a more consolidated and organised sector. Besides existing labs, we also see larger pharmaceutical companies entering the diagnostics sector and contributing to its growth. Since the onset of COVID-19, many small and medium labs have started offering RT-PCR tests. Due to this, people have begun to access diagnostics services for their use directly. With diagnostics becoming accessible and essential, more and more people are interested in these services. So, there is an increase in knowledge and interest in molecular tests giving rise to genome sequencing and other genetic tests.

Another trend noticed is the rise of genome sequencing and personalised genomics. With growing applications of knowledge on genomics and continuous evolution of our understanding, the overall focus is also evolving towards better interpretation and relations of different human traits and disease propensity of an individual.

The clinical importance of genome sequencing is increasing for precise diagnosis, understanding drug resistance, disease management, customisation of treatment. This can aid in creating new therapies and vaccines for various illnesses. Genome sequencing can also help us identify an individual's vulnerability to diseases and disorders, including neural and cardiac conditions. These conditions increase the scope of genome sequencing incredibly. Besides these, easy access, low costs, and practical application of the tests also contribute to the growing scope.

The last trend to look ahead is the use of artificial intelligence (AI). While AI is increasingly gaining attention, we have little knowledge of how healthcare and diagnostics can benefit from AI. Not just big hospitals, but all clinics and labs can boost their efficiency and revenue by leveraging AI. Deep learning, a subset of AI designed to identify patterns, uses algorithms and data to give automated insights to healthcare providers. An in-depth study of AI will help healthcare mediums identify loopholes, gather data, and use algorithms. This will automatically provide beneficial insights to the healthcare providers. It will also help automate daily tasks such as authorising, following up, maintaining records and sharing test results to ease the work process, ultimately saving time and money.

Finally, big hospitals, clinics, and labs have to implement success-driving methods to understand the ever-evolving expectations of new trends and adapt to them. Doing so will help them tap into the growing potential of advancements in the diagnostics sector. This way, the players can keep up with the market wherever it leads.

Home diagnostics is the way forward

Dr Kanav Kahol, Founder and CEO, DIVOC Health highlights that home diagnostics is the way forward

Rapid innovation and technical infestation have dictated the landscape of healthcare for the most part of the last decade. Recent times have witnessed several upgradation and modifications in the way different sectors functioned in the industry. Especially with the advent of the COVID pandemic, innovation and enhancement in the healthcare sector have become more of a need than a necessity. Thus, the healthcare industry has undergone significant changes and growth in recent times.

One of the sectors that are spearheading this growth is the diagnostic sector. A report by IBEF and the Ministry of External Affairs highlighted the same by stating that the Indian healthcare industry is expected to value $372 billion by 2022, in which the diagnostic market alone is projected to reach the value of $32 billion by the end of the same year. The report also stated that the growth is not restricted to just metros, but is also evident in tier-II and tier-III cities.

A firm operating in a fast-growing and dynamic environment needs to be aware and at top of all industry trends to capitalise on them before the competitors and gain an edge. Some trends that are expected to be prominent in the year 2022 in the diagnostic sector are discussed below.

Technology has played a critical part in transforming not only diagnostics and treatments, but also clinical data management and research

Home diagnostics is the way forward

The recent pandemic has taken a toll on all industries, and the diagnostic industry is no different. Ever since COVID struck, people have become wary of hospitals and diagnostic labs. Questions regarding the safety of the premises and the reliability of the tests conducted by the overworked personnel were the primary reasons for the wariness. Even in the post-COVID era, the cautious approach of people has not faded much. In this scenario, the idea of at-home diagnostics has emerged as a solution.

While it is true that people developed a guarded approach to diagnostics amidst the viral outbreak, on the flip side, people also grew increasingly concerned about their health and upkeep. Thus, home diagnostics facilities, by allowing people to get regular insights into their health status from the comfort and safety of their home, have surfaced as the go-to option in these times. This trend has escalated tremendously in the COVID era and is expected to dictate the approaching year as well.

Technical infestation and upgradation will be a prime presence.

Technology has been making its way steadily into all of the global processes for the good part of the last decade. The advent of the pandemic has only worked to accelerate the technical surge. Technology has now become an integral part of most of our routine and non-routine activities, including healthcare and diagnostics.

Since India, and the world at large, was not expecting to confront a catastrophe of the size of COVID, we were naturally far from prepared when it came around unexpectedly. In that scenario, to provide healthcare and diagnostic services to larger segments of people, technology was heavily relied upon. Even the government depended on the use of technology to raise awareness amongst the masses and worked to ensure their safety through mobile applications and online campaigns.

Further, technology has played a critical part in transforming not only diagnostics and treatments, but also clinical data management and research. All data related to the patients, medical inventory, and related research has to be collected and stored in an utmost efficient and precise manner as even the smallest of mistakes in these data collections in the healthcare field can spell large troubles down the lane. These processes, too, have been moved to digital means and are now being conducted with the help of machine learning, AI, IoT, etc.

Overall, the technological shift that surfaced as a necessity in the COVID times has grown to become a preference now as more and more people and professionals are attracted to the accuracy and feasibility that comes with it. Thus, the use of technology in medical testing and treatments has become the norm of the present day and is expected to only grow in the future.

Importance of achieving self-sufficiency

The deadly pandemic has served as a reminder of the evident lack of healthcare facilities in the country. Several people had to suffer because of delayed or wrong diagnoses owing to this lack. Further, we had to heavily rely on imports for several essential types of equipment and diagnostic kits and supplies. There was also a stark lack of streamlining in terms of logistics.

Now with the vaccines rolling out and the world looking at an expected closure of the pandemic, one can expect that measures will be taken to strengthen the healthcare position of the country. Significant investment in installing and upgrading all medical equipment and diagnostic supplies is anticipated in the year 2022.

Summing up

The COVID pandemic and its consequent restrictions have been largely dictating the way things work around the globe for the last two years. Now as the vaccines are being administered to the public and the pandemic is meeting a possible end, one has to speculate how things will take a turn in different segments.

The use of digital technology enables the diagnostic trends that are helping to shape the future of healthcare

Dr Kush Singh, DGM Lab Operations, Redcliffe Labs highlights the crucial role of technology in diagnostic sector

In today's healthcare system, in vitro diagnostics (IVDs) play a critical role. Their significance has been emphasised in the worldwide effort to combat and control the spread of SARS-CoV-2, the virus that causes COVID-19. Despite accounting for only 2 per cent of total healthcare spending, IVDs influence over 66 per cent of clinical decision-making. They are critical in diagnosing disease, assessing treatment efficacy and patient health status, and/or enabling disease prevention.

IVDs cover a wide range of conditions and have become such an important part of modern medicine that the World Health Organization has designated 122 test categories as essential. Despite their enormous utility, current diagnostic testing could be improved.

The use of digital technology enables the diagnostic trends that are helping to shape the future of healthcare.

Diagnostics in real time

Wearable biosensors, which include watches, clothing, bandages, glasses, contact lenses, and rings, as well as specially designed implantable and ingestible devices, can collect a wide range of physical health data, including heart rate, blood pressure, skin temperature, respiratory rate, and body motion. Real-time diagnostics provide a much larger and more robust dataset for clinical decision-making than more traditional diagnostic tests, which only capture a "snapshot" view of a patient for a specific parameter. They allow for continuous monitoring, instant feedback on any irregularities that are detected, and can be used to track a person's overall health and well-being.

> One major benefit of digitalisation in point of care and at-home diagnostics is the simplification of the testing procedure as well as the analysis and storage of results in a secure digital environment that healthcare providers can access

Medical imaging with artificial intelligence

Based on medical images, artificial intelligence systems can assist HCPs in diagnosing disease. A recent meta-analysis found that deep learning models' diagnostic performance was comparable to that of healthcare professionals. Despite the concerns raised about the research methodologies of the individual studies included in the meta- analysis, this AI application has enormous potential. Furthermore, the discovery that study quality improved over time is encouraging.

Solutions for data-driven lab optimisation

Diagnostic labs are always looking for ways to reduce the number of unnecessary tests while increasing the value of their services. The question is how they can best capture and extract information from the tests they run to help improve their operations. One solution is to implement robust business intelligence and analytics IT systems that can analyse massive amounts of test result data and assist lab managers in improving lab utilisation by quickly identifying sources of unnecessary testing. Using this technology, labs will be able to better manage their testing loads by eliminating unnecessary tests and providing better value with those that are run.

Emerging at-home diagnostic solutions and point-of-care testing

Rapid testing near the patient including their homes is now possible, thanks to innovative new technology, which can aid in disease diagnosis, monitoring, and management. It can also shorten the time by reducing or eliminating travel time for samples and results. One major benefit of digitalisation in point of care and at-home diagnostics is the simplification of the testing procedure as well as the analysis and storage of results in a secure digital environment that healthcare providers can access.

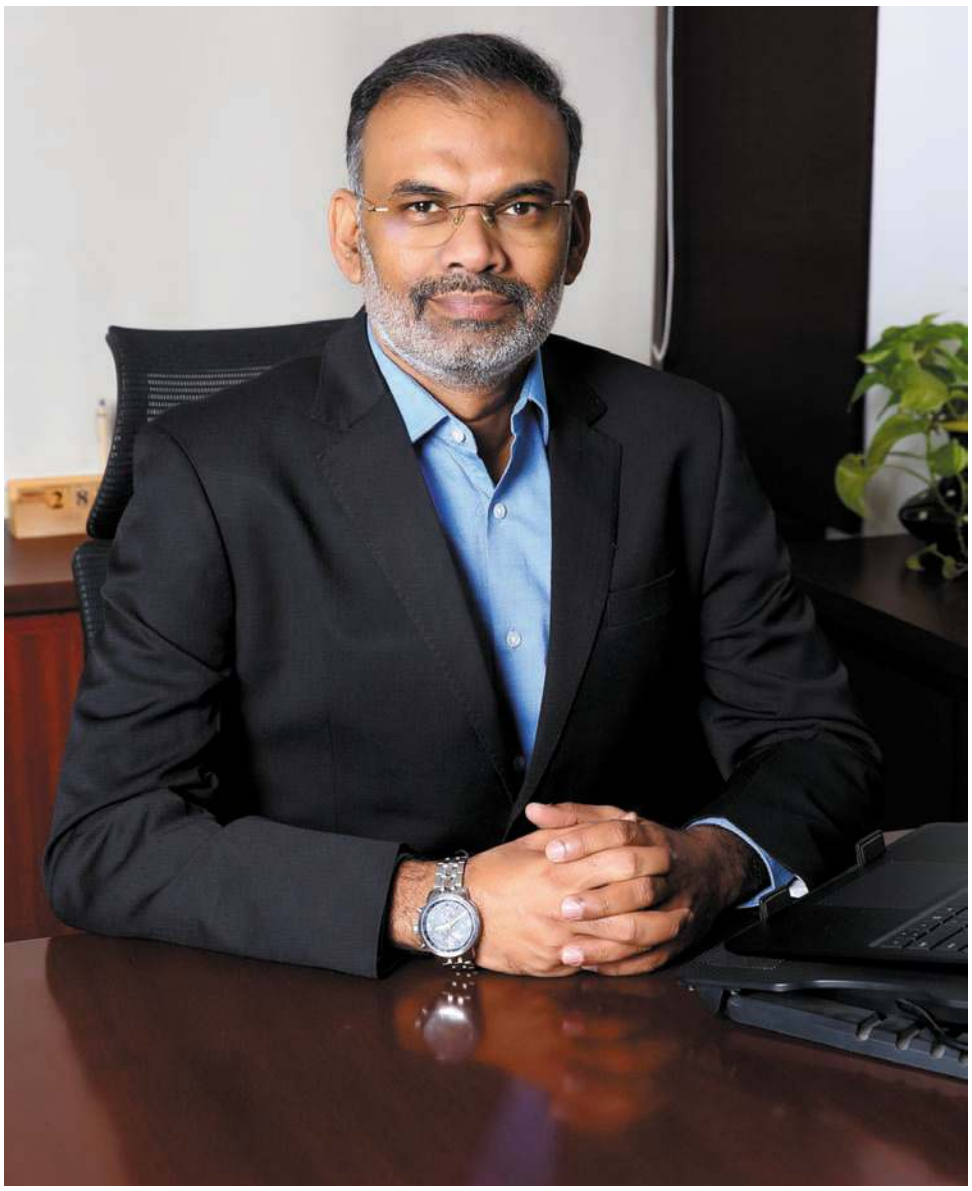
Personal genetics and predictive genetics

By using a person's blood, hair, skin, or other tissue samples to help predict future risk of disease, predictive genetic tests could have a significant impact on health outcomes. These tests can prove highly beneficial because they can detect mutations that raise a person's risk of developing genetic disorders before symptoms appear. If a medical intervention or preventive measures are available for a disease that has been predicted, the power of such digital tools becomes extremely useful.

The pandemic has brought in a huge awareness of quality and accuracy of reports

Anand K, Chief Executive Officer, SRL Diagnostics stresses preventive healthcare, wellness and fitness is set to grow

Diagnostics comprise less than 5 per cent of healthcare costs while diagnostic insights influence 60–70 per cent of healthcare decision-making. In the developing world, diagnostics is often a negligible proportion of healthcare spending. India has one of the lowest spend on diagnostics in the world. The pandemic has changed the dynamics of diagnostics to some extent and there is a new perception of the role of diagnostics in the post-pandemic world. We are moving from diagnostics being a transactional relationship to one where diagnostic becomes the mainstay of patient management.



Customers are prudently opting for quality and accredited labs

Some of the immediate changes that we are witnessing specifically in the diagnostic sector pertain to the experience that we provide to a customer/patient. The pandemic has brought in a huge awareness of quality and accuracy of reports. There is a heightened sense of awareness and patients now consciously choose a trusted and an accredited lab for their diagnostic needs.

Home services will significantly grow in the coming year

We are living in a time where customers are promised that groceries and essentials will be delivered in under ten minutes. Quicker turnaround times for reports and availing diagnostic needs from the comfort of homes has now become a norm for customers. Newer and rapidly advancing diagnostic technologies help us deliver test reports in record times. For example, at the onset of the pandemic, a COVID-19 RTPCR test took anywhere between 24-36 hours but now a rapid RTPCR test can be delivered within four hours.

More and more patients are now choosing to avail diagnostic tests from the comfort of their homes and home services is expected to grow significantly in the coming year

Seamless customer experience and topmost convenience will be key differentiators

More and more patients are also booking tests from their phones and devices and receiving test reports through email and whatsapp. Therefore, it is imperative to provide a seamless and hassle-free experience.

Preventive healthcare, wellness and fitness is set to grow

The young population today not just wants to be healthy, but are focused on nutrition and fitness. Customers are opting for routine wellness and investigate tests to ascertain if they are in good health. This trend is set to grow and will aid the preventive and wellness market. Not just routine wellness tests, but there is also an onset of customers willing to undergo genetic tests to understand their risk of inheriting genetic disorders.

We are entering an era of personalised medicine brought upon by molecular diagnostics and high-end genetic testing.

We are entering an era of personalised medicine brought upon by molecular diagnostics and high-end genetic testing. Let's look at cancer as an example. Today, we diagnose cancer using anatomic pathology techniques from extracted tissue obtained through biopsies. But cancer is fundamentally a genetic disease. Solely relying on a stained slide to determine cell morphology of a tumour may suffice at the moment. But in the near future, genetics can inform a pathologist of the inner workings of a tumour by providing its unique genetic signature.

As we enter the era of mainstream application of precision medicine, tailored therapeutics, wearable, and artificial intelligence, the importance of diagnostics' role in medicine will continue to grow and the definition of what constitutes a diagnostic test will continue to evolve.

The synergy between the healthcare and IT industry is going to stay here, may be permanently

Arun Mallavarapu, CTO and Co-Founder, Fedo talks about the long term and important role of IT in healthcare sector

The dynamics between the healthcare providers and patients have entered a new ecosystem during COVID19 pandemic. Social distancing has made the traditional healthcare services including the physician's consultation quite impossible to execute. The entire healthcare industry relied on IT industry to create an atmosphere for virtual care services. It also included efficient network for remote working, coordinated communication & channels for data management. With the prevailing market conditions, the healthcare IT industry grew, and the growth was exponential with availability of newer technologies like AI/ML, BIG DATA, computer vision etc. Where some organisations focused on providing IT solutions to cater the rising healthcare demands, some worked on innovative ideas to curtail the rising healthcare costs. Telehealth, remote patient monitoring, etc. have gained momentum like never before. Recently, the healthcare industry has dived into predictive and preventive care in addition of disease management and sick care services.

Today, the IT industry is trying to cater to the 3 pillars of healthcare service – Availability, Accessibility & Affordability. The changing times has added another name to it – Acceptability

The sweeping of technology in financial services has added more value to the healthcare industry. While the current healthcare cost is rising with innovative products & services, it has also become unaffordable, especially by the developing countries like India. Even though right to health is the basic human right but affordability is the matter of concern for every household due to which the right is not being executed at its full strength. It has been estimated that the total out of pocket medical expenses in India is around 62.6 per cent of the total health expenditure which is the highest in the world. The dire necessity to seek the best of healthcare is forcing the individuals to go for multiple loans from the unorganised sector and eventually becoming bankrupt. The union of healthcare & fintech industries is a perfect marriage that can bring about transformational change in making the services affordable to all. Banks and other financial institutions are coming forward to adopt new IT systems to reduce the out-of-pocket v expenses, cost of care, easy payment options, providing healthcare packages and to avail the best of healthcare services affordable to all.

A person's healthcare journey, right from birth to prevention care, surgery & post-surgical care, is accompanied by a financial journey. The acute diseases including pandemics like COVID-19 demand immediate health and finance needs whereas non-communicable diseases like Diabetes seek long term consistent finance needs for efficient disease management. Hence, there is a dire necessity for a trusted and transparent healthcare financial service that is designed specifically to meet these challenges. Recently, Fedo has launched India's 1st Health Savings Account (HSA) in collaboration with Open Neo Bank. It is a financial platform that will recommend a right combination of tools / assets that can be used for qualified medical expenses. Powered by robust AI algorithms along with FEDO Score – a unique health score resembling credit score, it can predict an individual's health risks and the possible medical expenses. It can be used for providing better interest rates than regular savings accounts thereby providing an incentive for customers to save for healthcare purposes. It also offers smart investing options for better returns and preapproval credit lines for any medical emergencies. HSA in combination with FEDO Score and deep tech analytics platform will lay the foundation for a holistic healthcare ecosystem.

Today, the IT industry is trying to cater to the 3 pillars of healthcare service – Availability, Accessibility & Affordability. The changing times has added another name to it – Acceptability. It has been very much evident that how fintech industry has supported the entire healthcare industry by integrating digital payment platforms for health services. The synergy between the healthcare and IT industry is going to stay here, may be permanently. More value generations will be seen in the fields of diagnostics, genetic tracing, disease management services, healthcare financing in the coming years. What needed is a better adoption rate of technologies in the healthcare industry, especially by the providers as well as the patients.

The potential of technological intervention through IT solutions and other innovations is almost limitless

Vivek Sharma, Managing Director-India,Lenovo Infrastructure Solutions Group highlights the role of IT in healthcare sector in the future

Although the healthcare industry has been transforming with technology for decades, realistically, digital transformation was moving at a snail's pace. The pandemic brought forth the industry's challenges in the last 12-18 months, and since then the sector's digital transformation has seen an irreversible acceleration, enabling, and forcing healthcare organisations to deliver their services remotely, adopt an increasingly patient-centric approach based on data insights, and accelerate medical research.

With the help of IT solutions such as hybrid cloud, high-performance computing, analytics & AI, etc., technology can pave the way for the healthcare industry in achieving groundbreaking progress in people care by identifying patterns in treating issues before they deteriorate, improving drugs, predicting, and tailoring healthcare based upon individual needs. Here are a few technological interventions that will shape up the healthcare industry in 2022 and beyond.

IoT is opening doors to advanced patient care technology

The sudden influx of patients in the last 12 to 18 months has encouraged the healthcare industry to rely on modern medical devices to provide excellent patient care. Owing to such developments the global IoT market for healthcare is predicted to reach $446.52 billion by 20281. India not being far behind, is expected to cover almost 11 per cent of that market, as IBEF estimates indicate that the medical devices industry in India is expected to reach $50 billion by 20252. Internet of Medical Things (IoMT) solutions for healthcare will open avenues for efficient telehealth delivery with patient care technologies such as remote patient monitoring, emergency response systems, and more. IoT can also assist the healthcare industry to improve medical and patient care services across the country through an interconnected infrastructure that connects medical devices, hardware infrastructure & software applications over the internet. This will further create bigger market opportunities and have a significant impact on healthcare device manufacturers - for them to support advanced patient care technologies with devices enabling doctors to provide predictive and personalised care to patients remotely.

AI and big data & analytics can work together to efficiently deliver insights

The applications of AI in healthcare are limitless. Valued at $5.7 billion in 20213, AI is already being used in many areas of healthcare, including improving patient treatment outcomes and providing personalised care. The industry has always been flooded with a deluge of information that is complex and generated across different segments. With IoMT enabling advanced patient care technology, medical practitioners and hospitals need useful insights to improve patient care delivery. The use of analytics & AI over big data will help segregate the required type of data, find a possible connection between different data points, identify patterns and correlations between them to create recognisable knowledge, and quickly deliver them in the form of insights. Doctors will find these insights useful to administer effective and personalised patient care in time.

Computing at the edge is increasing the speed of data processing

Gartner estimates that 75 per cent of enterprise-generated data will be processed at the edge by 20254. The success of such advanced patient care technologies depends upon effective data processing capabilities directly at the edge sites (closer to consumer), making computing an integral step of an intelligent transformation process. To scale these digital health initiatives, healthcare systems must be able to manage vast data sets and process almost real-time to improve time to market given the sensitive nature of this sector. Computing at the edge of the network enhances speed and performance – healthcare organisations can effectively handle data processing closer to the client/patient devices, reduce latency, and support the capability of real-time decision-making.

The sudden influx of patients in the last 12 to 18 months has encouraged the healthcare industry to rely on modern medical devices to provide excellent patient care

Hybrid cloud is making healthcare industry workflows faster, scalable, and productive

Nutanix's Enterprise Cloud report indicates that 95 per cent of healthcare companies in India are prioritising the adoption of hybrid cloud. Several critical aspects of patient care highly depend upon the smooth operations of IT infrastructure. Hospitals produce vast amounts of data such as admission records, diagnoses results, historical data, treatment plans, optimisations, etc. that flow in from different workflows within the hospital network. All this data tied in a complex system, are likely to lead to issues related to budgeting and data management. Not only can hybrid cloud resolve such issues with cost-effectiveness and seamless processes for better management, but also enhance overall business agility, innovation, data security, data back-up, and recovery, supporting the application of advanced tech solutions, and enhancing overall patient care.

Consumption-based IT infrastructure models are helping businesses save money

While healthcare organisations experienced unimaginable care requirements, the industry was not immune to business continuity challenges. These businesses had to work the most to cut costs and deliver the same level of patient care in the middle of dwindling revenues. Unlike physical infrastructure drawing large investments and managed IT services following fixed payments, consumption-based IT infrastructure models are billed upon actual usage, allowing healthcare businesses to better manage their CAPEX and OPEX concerns, scale up/down as per business requirements. These pay-as-you-go solutions come with additional infrastructure management services to help businesses manage their IT infrastructure.

The potential of technological intervention through IT solutions and other innovations is almost limitless. Smooth outcomes from a lot of these solutions also largely depend upon a strong network. Given that a lot of data exchange has to occur during the implementation of these solutions. 5G will offer substantial connection power and speeds that will support all the solutions to help transform the health care industry. Healthcare organisations must smartly adopt IT solutions that help them scale their operations and maintain business continuity ensuring almost zero disruption in providing the best patient care. Looking forward to 2022, technology will only continue to revolutionise healthcare.

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Data-driven healthcare: Paradigms and beyond

Dr Sharada Rao, Vertical Head-Delivery Life Sciences, Birlasoft talks about data driven healthcare delivery and highlights the top trends in healthcare sector in 2022

The healthcare industry and data are inextricably linked since a decade now. Electronic Health Records (EHR) data, hospital MIS, patient information, pharma discovery, and all other inter-related systems formulate an everlasting and ubiquitous ecosystem that sustains the progress and development of medicine.

Over the past decade, organisations have acquired the latest technologies to support their patients virtually and provide real-life expertise. Remote sensors, diagnostic machines with connected devices, patient-physician portals, healthcare applications and health cloud platforms gather volumes of healthcare data that organisations can use for various purposes. Thus, big data analytics in healthcare is essential for the industry.

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A prescription for care delivery players

In the post-2020 world, rapid digitisation, and an explosion of digital transformation within the healthcare ecosystem have left care delivery players with a rich field of data that lies mostly untapped. This includes data that is locked away within ecosystems or patient data like Electronic Health Records (EHR) that cannot be freely shared due to data privacy regulations which bring costly implications on instances of slippage.

Added to these factors is a rising enthusiasm for wearables and the willingness to share health data with trusted players in exchange for sophisticated emergency care services. In the above-mentioned world, the healthcare ecosystem is set to win as care providers, wearable manufacturers, drug manufacturers, and distribution and logistics providers partner together to unleash the value of data-driven insights.

Here are three trends that are shaping up new paradigms of care delivery powered by data-driven insights.

Decoding the facets of data-driven healthcare

Trend 1: Patient data maturity brings business benefits

Currently, the patient data landscape stands largely fragmented. EHRs contain multiple fields of mostly unstructured data, and the industry is only beginning to move towards standardisation. However, as patient data matures, many players are experimenting with a complete digitisation of patient records and synchronising diagnostics functions with doctor-patient interfaces and other administrative tasks within user-oriented platforms.

While such transformations bring big business benefits to care providers, the complete extent of patient data will be realised as standardisation and data quality improvements empower an era of the fully paperless patient experience. Moreover, because the pandemic has helped patients and doctors find comfort in video consultations, the healthcare infrastructure will shape up for specialised procedures and diagnoses, while routine visits and preliminary consultations will go remote and contactless.

Trend 2: Data-driven healthcare empowers care of the patient

Data is a key catalyst in powering the personalisation of the patient experience - that personalisation is also the key to navigating pricing pressures profitably and improving the quality of care for the patient. For instance, patient data replete with medical histories, and genetic and demographic data is already being leveraged to create custom drugs that bring higher effectiveness while dodging unique conditions that afflict patients with complicated conditions.

As regulations enforce value-based care delivery paradigms, such data is vital to sharing risks and finding shareable profits with other players in the value chain - such as pharmaceutical companies and health insurers.

Finally, unification of patient data within big data platforms is also enabling care providers to bring a complete and exhaustive picture of their patients to the doctors, and AI-powered prescription rule checkers that scan for interactions, efficacy, and effectiveness of treatment plans for each patient.

Trend 3: Care provision orchestration goes nimble

Currently, the healthcare ecosystem employs a massive workforce to orchestrate care delivery. While this is a positive factor for economic growth, the limits, and drawbacks of strong reliance on healthcare workers were realised for the better during the pandemic. With data-driven care provision, the healthcare machinery can be made nimbler, relying on fewer links in between. For instance, hospital administration, assignment of specialty practitioners to cases, patient registration, creation of diagnostic results, and treatment quality and success rate measurement can be abstracted within platforms powered by data.

IoT-originated data has shown promise in healthcare administration functions like scheduling patient visits, maintaining sanitisation standards, equipment utility tracking, and predictive maintenance of expensive equipment. However, front-facing functions remain largely human-driven. Application interfaces powered by AI algorithms and pluggable data sources will be instrumental in the digitisation of front-facing functions, thereby making healthcare provision nimbler, and consequently, cost-effective, and profitable.

What next?

One thing to note here is that data-driven healthcare is yet to permeate today's rapidly digitising world. Data privacy considerations and underlying regulations are critical determinants of how rapidly the trends will unfold. Collaborations with ecosystem partners and the use of privacy-preserving mechanisms like trusted intermediary establishments, redaction techniques, edge processing, and PII masking are already opening new possibilities.

The healthcare ecosystem has much to look forward to - in a data-driven world, new benchmarks of profitability and patient experience will be set, and cost centers such as compliance and administration will emerge as sources of competitive advantage. New paradigms will rewrite age-old ones, and a paperless, AI-powered, healthcare will yet again, reinstate the industry to its glory, will yet again, reinstate the industry to its glory.

Healthcare 4.0 and the big five tech that will run it

Dr Vikram Venkateswaran, Member, Healthcare Working Group, IET Future Tech Panel explains about major technologies that will drive the growth of healthcare industry in the future

Adarsh (name changed) was a young executive working in a multinational corporation. He had been recently promoted to support his company's aggressive growth plans. He was conscious of the stress that would accompany such a responsibility and had invested in his health. He was regular with his workout and sported a fitness watch that tracked his vital parameters. One morning while on the treadmill, his smart watch indicated an extremely high heart rate. Concerned about this, he immediately consulted a physician over his phone on a teleconsultation platform. He was rushed to the hospital where they discovered high blood pressure that could have led to stroke. Adarsh had been lucky but he was also smart, having proactively invested in preventive care that could detect issues and lead to timely interventions.

Adarsh is not alone. With many people investing in proactive interventions, the healthcare system of the future will be driven by the consumer and will revolve around better patient experience, better clinical outcomes and operational efficiency all of which will need to be delivered through innovative care models.

Healthcare protocols have traditionally been built to support doctors and are based on their experience in dealing with ailments (evidence-based medicine) where patients are treated in the hospital or clinic after reporting symptoms. The new healthcare system (Healthcare 4.0) will be driven by consumers and patients seeking better access, experience, and preference for preventive care. It may or may not involve traditional hospital settings, thereby ensuring that hospital bed utilisation is optimised and used for critical cases.

The new healthcare system (Healthcare 4.0) will be driven by consumers and patients seeking better access, experience, and preference for preventive care

A major hospital in Bangalore is working with a network of old age homes to monitor patients at the home, without requiring them to visit the hospital for regular checkups. There are tie ups with a local physician (for in-person interventions required) and a local ambulance service in case of any emergency. The doctors from the hospital monitor the vitals through an IOT device and schedule video checkups twice a week. Going forward such models are likely to become common.

This transformation in healthcare is a result of rapid technology adoption and progressive regulations that encourage more access to care and emphasise on outcomes. For the healthcare system to reach its full potential, it will need to embrace the following big five technologies.

Cloud computing: Cloud forms the cornerstone for transformation in healthcare, starting from storage of patient data, harnessing real time computing to make decisions, and providing anytime, anywhere services to patients. Cloud is also an enabler for technologies that comprise healthcare 4.0. In the coming years we will see more cloud investments and usage by almost all players in healthcare.

Artificial Intelligence (AI): Healthcare has seen the usage of AI in critical decision making, with demand for AI pegged at USD 10.4 billion globally. Manipal Hospital was one of the first healthcare systems in India to implement the Watson Artificial Intelligence System in oncology. Many pharmaceutical companies have started using artificial intelligence to look at potential candidates for drug discovery and accelerate the process beyond ligand identification, opening possibilities of customised medicine. Medical devices similarly have started leveraging AI to reduce exposure time to radiation from equipment.

Automation and machine learning: Automation along with machine Learning is creating a paradigm where binary decision making in therapeutic areas like tuberculosis management are possible with machines leveraging automation and supervised/unsupervised learning. Similarly, diagnosis in areas like oncology has been accelerated with vital inputs coming through machine learning which recommend the next best action to physicians and surgeons to help them with the diagnosis. Similar implications are seen in pharmaceuticals and medical devices.

Cyber security: Healthcare organisations were earlier perceived as noble institutions and not specifically targeted by threat actors, but this has changed significantly in the last 2 years. Many hospitals have experienced data breaches leading to compromise of patient data and significant reputational backlash. Consequently, healthcare organisations are investing heavily in areas like security monitoring, cyber defence, and preventive cyber controls.

Blockchain: Unlike the other areas mentioned above, blockchain is a foundational technology. With features like immutability, encryption and distributed ledger, Blockchain in many ways was built for the healthcare industry. Several modules can be built on blockchain to add value to the healthcare ecosystem, such as Smart Contracts in health insurance and Electronic Medical Records (EMR).

The pandemic has pushed the healthcare industry to re-evaluate its operating model. Most organisations have moved ahead with their transformation agenda. However, not adopting any of the big five technologies can hamper success.

Key trends in the preventive healthcare sector in the upcoming year and major drivers

Vishal Gondal, Founder & CEO, GOQii talks about technology-driven approach and preventive healthcare in 2022

The current pandemic has changed the course of healthcare to a more technology-driven approach. It has taught us the importance of telemedicine, taught us that health is equally important with wealth. Along with this, wearable smart devices have changed the dynamics of how we view health and fitness. Preventive healthcare has become of paramount importance in current times.

For instance, in the fight against COVID-19 wearables have been able to detect an individual's body temperature, SpO2, BP, HR and the likes on a continuous basis. One of the most significant advantages of telehealth is that it reduces contact between patients, healthcare workers, and other patients yet providing a valuable patient-care experience. Wearable devices give healthcare workers access to real-time patient data while they're still at home.,

With greater emphasis on preventive healthcare, GOQii strongly believes that preventive healthcare is the only viable, long-term, mass-market solution.

Here are some key trends in the preventive healthcare sector that are likely to shape the future of Healthcare in India in the coming years.

◆ **Remote Healthcare Monitoring (RPM):** With the ongoing pandemic, remote patient monitoring has gained ground. RPM tools and programs have the potential to coordinate outside the doctor's office in the patient room. RPM also permits and delegates the patients to take a more dedicated approach to their health. RPM helps in earlier diagnosis and is a more convenient way of treatment. It improves and upgrades health without sacrificing the cost and time or convenience.

> Digital therapeutics will be the way forward where companies that operate in the preventive space will partner with various pharmaceutical companies and healthcare organisations to provide digital therapeutics solutions across therapy areas like GERD, diabetes, obesity, gastrointestinal disorders, mental health, stroke management and cancer therapy

◆ **Digital therapeutics:** Chronic diseases have increased the burden on healthcare systems across the globe. Cardiovascular disease (CVD) is the leading cause of death globally. The high prevalence and incidence rate of chronic diseases is a major concern for healthcare systems across the globe. The treatment of patients with chronic diseases is a significant challenge, as psychosomatic or biopsychic factors very often influence these patients. Since chronic diseases are often associated with high levels of uncertainty, patients need to change their behavior as part of a new self-care lifestyle. Furthermore, many chronic disorders and conditions are progressive, and their incidence increases with age. As a result, with significant growth in the global geriatric population, chronic disorders are expected to rise further in the coming years. Digital Therapeutics will be the way forward where companies that operate in the preventive space will partner with various pharmaceutical companies, hospitals, medical device providers (Healthcare Organisations) to provide digital therapeutics solutions across therapy areas like NAFLD, GERD, diabetes, obesity, gastrointestinal disorders, mental health, stroke management, cardiac care, DVT, long COVID care, cancer therapy. All these programs are delivered in partnership with the healthcare providers via doctors and are monitored closely for patient engagement and clinical outcomes.

◆ **Outcome based insurance:** Health insurance has become more vital today than before. Health Insurers are starting to put the customer at the heart of everything they do. By activating and collecting the right data from IoTs such as activity trackers (wearable) – they're able to better understand consumer needs and offer customised advice, coverage, and tailored pricing. This shift indicates insurers are now viewing consumers as individuals, rather than customer segments. Usage-based insurance policies, for instance, tap into customer data in order to charge users according to their specific needs and behaviors, putting the consumer in charge of their own fees. Based on how healthy a person is, insurance companies can offer differential pricing and a plan to every user which can further be customised based on improvement in health. IRDA, the regulatory body of the Insurance industry is also now aligned with this aspect. Companies such as GOQii are already working with insurers like Max Bupa and Bajaj Allianz.

◆ **Integration of health & wealth:** What if you can keep a track of your health, make cashless payments and also earn rewards in returns. Contactless payments are gaining prominence in India. A smart wearable device on a wrist can track one's steps and heart rate and also be used as a payment device. Payments up to Rs 5000 can now be made without a pin by just flashing your smart wearable on contactless payment POS Communication (NFC) chip embedded in the smart wearable strap enables all the functionalities of a standard contactless bank card. GOQii is already offering this service with Axis Bank.

◆ **Longevity:** Plenty of medical research is ongoing about the "right" amount and type of exercise to get the best diet to eat to maximise longevity. India's oldest -Ninety Nine year olds and centenarians attribute their longevity to sound sleep, eating nutritious food and staying active, as per the GOQii India Fit Report 2020. Research indicates that people who report being happy and satisfied with their lives are more likely to enjoy longer life spans with good health and fewer long-term limiting health concerns. Bonding with family and friends appears to enhance health, and even increase longevity. Endeavour should be to create awareness about preventive health while providing people a platform to improve their health and fitness and move a step ahead to increase India's average lifespan to 80 years and above.

How should healthcare organisations succeed in digital transformation in 2022

Sachin Saxena, founding team member & Senior Director-Marketing, Innovaccer shares his views on digital transformation of healthcare organisations in 2022

The last few years have brought us drastic changes in the digital transformation landscape of the healthcare industry. This period has been marked with significant challenges and the laying of basic foundations for the digital disruption of the care sector. A rather new-age term, "TechQuillibrium," best describes our present-day scenario-a balance between traditional healthcare and the one with technology.

While the healthcare industry was slow to incorporate digital solutions, the pandemic expedited digitisation, taking on the enormous challenges of saving lives. Providers had to adopt technology from telehealth to remote patient monitoring (RMP) and artificial intelligence to treat patients effectively, which otherwise would have taken years if not decades.

In a report published in 2018, Gartner suggested that about 52 per cent of healthcare organisations have a digital dexterity program as part of their digital business strategy. The article further added that the healthcare industry had taken the lead in transforming the data interactions, business processes, and data management strategies to an enhanced level.

Almost a century ago, breathing with the help of a machine (the Iron Lung) was supposed to be the biggest breakthrough in the history of medicine. Fifty years later, it was suddenly possible to see a fetus in the womb of its mother. Less than 25 years later, an artificial heart of successfully implanted for the first time. And then, five years after that, robots and lasers could conduct surgeries. The pace of transformation in healthcare has been steadily accelerating, and in the last two years, it has made leaps that should have taken decades. Following the same trends, I believe that there are a few facets that healthcare organisations need to pay attention to in order to succeed in digital transformation in 2022.

Health cloud is the next step

Healthcare systems around the globe are looking at accelerating their journey of digitisation, and Health Cloud can be the flag bearer of these trends. As we make further progress towards digital health, it is critical to make sense out of the never-ending data points in a real-time, interoperable, and secure manner. Healthcare clouds can be the game-changers here. These health clouds can work with any data set, regardless of the source, and build unique patient records for patient populations. As healthcare data grows, we need to have the capabilities to be flexible and scalable enough to grow, and health clouds will make it all the more worthwhile.

Prioritising patient care

Patient-centricity is that one word that all organisations are already swearing by. Today, patients have become more engaged and involved in enhancing care. They are more aware of the technology, the treatments, and the care models, aiming to leverage the same to make their experiences more accessible.

Patients rapidly understand the criticality of better participation from their end, which is why more than 75 per cent of patients want to know more about their health programs. The PRM (Patient Relationship Management), an application to prioritise patient care, could be a widely accepted solution in 2022, transforming patient participation with integrated clinical engagement and financial data to deliver patient-centric care.

By 2022, patients will prefer providers that offer them control over their own healthcare experiences. Organisations would have to make their actions louder than their words, with extensive resources dispensed to review the patient experience.

Value-based care and population health management

The value-based care model has been trending ever since the Affordable Care Act of 2010. Things have progressed on that front, especially in the last few years. Now, organisations are focusing on not just the various payment models it brings but also the nuances it talks about, like population health and its social and political determinants.

Organisations will be focused more on population health management strategies as well as health equity to make a deep-rooted impact in improving the population's health and outcomes while also reducing costs. These varying needs will need to be addressed individually and with utmost precision. Stakeholders are already driving the shift to value-based care (VBC), persuading providers to focus on positive patient outcomes rather than the number of services given. And with digital tools, like AI-enabled and smart analytics, we can expect optimised care without compromising costs.

Telemedicine might become a permanent fixture

The pandemic's effect on the healthcare sectors worldwide was so severe that they were nearing their expiration. Healthcare delivery quickly turned to remote and virtual alternatives as means to provide care to the rest. Telehealth was one such adoption. The usage of telemedicine jumped to 36 per cent by mid of 2020 in the US, according to CivicScience.

The trends so far suggest that telehealth has a high possibility of becoming a permanent and prominent fixture in the healthcare ecosystems today and tomorrow. These would ultimately drive more dialogue around garnering access to the remotest of corners and make a shift to virtual models.

Healthcare systems are likely to open up to such innovations adding the benefit of achieving a positive ROI through digital solutions and as patients become more accustomed to telemedicine. While most of these predictions are not set in stone, telehealth is what is here to stay, and as the millennials say, "slay."

Collaborative approach

We have troves of information on our health locked in electronic silos, and we need to adopt the approach of caring as one. Partnerships are prime to achieving the digitised ecosystem the close collaborations of payers, providers, consumers, and those connected through platforms delivering patient care. Through this collaborative approach, organisations would be able to take on the challenges as one, making it more reachable and enhanced for those in need.

Conclusion

The digital transformation of healthcare is much more comprehensive than carried out in other industries. Regardless of lagging when it comes to the adoption of technology, the digitisation process has ensured minimised costs and better care for patients. Healthcare organisations must pay close attention to these trends and plan accordingly to succeed in digital transformation in 2022. New models and trends may require novel solutions that address aspects of health that go beyond traditional services. For success in the digital health landscape, enterprises need to move forward with an open mind and an eye on the trends and think about making healthcare accessible for all, a healthier future and learning to care as one.

Telemedicine now needs to be integrated seamlessly with hospital management operations with its allied privacy and regulatory compliance

Arun Meena, Founder & CEO, RHA Technologies highlights that the healthcare sector will be looking at leveraging technology as a focussed initiative to create a more seamless experience for all the stakeholders

Year 2022 will most probably be the year when the healthcare sector will have relegated the pandemic from emergency status to critical ailments category, and perhaps even seasonal flu status by December, if the world is lucky.

The near impossible patient load and allied protocols while seizing the operational, management, and strategic bandwidth of the sector had also created a situation of reduced profitability due to curtailment of lucrative elective procedures. This had the impact of putting on hold most technology update plans too. The situation also made the sector realise the new healthcare realities and gave many of them the very first experience of global pandemic situation for which they need to be better prepared in future.

Year 2022 will thus be the year when these learnings and delayed plans move towards fructification. The defining theme will be

a) operational capability to manage beyond peak demand spurt

b) technological advancements that enhance remote treatment for routine procedures and ailments, and

c) productivity enhancement for specialised doctors, hospital allied staff and healthcare professionals.

Large and smaller healthcare institutions will need to select the most appropriate IT roadmap given their specific context of size, patient profile, and speciality given that India has a vast spread of situations. The key IT trends that are thus expected in the year 2022 are:

Telemedicine

This has been talked about for long and nearly every hospital implemented a version of telemedicine during the pandemic. Healthcare providers who were not able to implement or were burdened with poorly implemented technology solutions quickly adopted to apps like whatsapp to provide basic form of teleconsultation. The business model, payment logistics, and patient and doctor protocols and comfort have thus been acceptably tested. In many cases, doctors were able to manage a higher patient load with lesser work stress while patients were freed from long waiting time for their turn.

Telemedicine now needs to be integrated seamlessly with hospital management operations with its allied privacy, confidentiality, taxation and regulatory compliance. It is time that the practice is institutionalised and standardised across the sector and hopefully 2022 will be the year that critical mass is achieved.

Patient health data

Big data and analytics will also allow organisations for the first time implement patient CRM. This will help hospitals create life-long value for patients and enhance the patient's ability to prevent critical issues. While this may seem counterproductive to business goals, it will be more than compensated with higher patient confidence for elective and preventive procedures thus creating a solution where everyone benefits.

Smart document transformation with e-signatures

This will be a key area of attention given the social distancing lessons and the huge productivity enhancement of support staff along with reduction in treatment errors. The complete patient record from diagnosis to admission to treatment to discharge can thus be a digitally automated workflow enabling complete index and audit trail. The biggest point in favour being the easier implementation across organisation sizes.

Big Data and Analytics

With the foundation of connected IT layered with years of available data-big data and analytics will be a force multiplier for the sector. Most medium to large organisations and especially multiple property organisations will gain huge advantage in their operations and demand spurt management. The integration of smart document transformation will give added leverage to the power of Big Data and Analytics.

Diagnosis powered by AI

Artificial Intelligence/ Machine Learning (AI/ML) has been making waves in multiple industries and healthcare is long overdue for its integration. The beneficial impact on diagnosis, research, monitoring, and proactive criticality indication will help organisations raise the bar in patient success and productivity boost. AI/ML will also help the hospitals allocate expensive healthcare staffs in the most efficient manner to boost support and reduce costs.

Augmented/virtual reality

AR/VR will go a long way in boosting imagery on one hand and operations planning on the other. OTT serial have been showing the benefit of AR/VR being used and to a considerable extent a lot can be replicated in the real-world. Thus, helping surgeons conduct hitherto near impossible procedures in a less risky manner and shortened time frame.

Private/hybrid cloud

The pandemic and its allied requirement for remote access has brought upfront the need for healthcare organisations to adopt cloud whole heartedly. Patient information privacy is extremely important and cloud technologies have long proven their capability in ensuring the same.

Blockchain adoption

Doctor patient privileges can be further ensured by robust implementation of blockchain technology. Blockchain will create a tamper-proof and auditable system to ensure the patient privacy is not violated.

AI-robotics

Robotics combined with AI will be the new update to hospitals this year. Their assistance in surgical procedures, radiology, and difficult procedures requiring critically high precision will create a service differentiator. This will also help the organisation attract premium patients and medical tourism.

Patients across the board can thus hope to see a major leap in healthcare systems with these IT upgrade in 2022. The Healthcare sector will be looking leveraging technology as a focussed initiative to create a more seamless experience for all the stakeholders with improved outcomes all around.

Pandemic mobilised a major shift toward the adoption of digital healthcare technologies

Pradeep Goel, Founder & CEO, Solve.Care highlights the technologies that will play an important role in the upcoming year

As we stand on the threshold of a new year, it is an apt time to look back at how we faced and managed the challenges that arose with the global pandemic. From accelerated drug development to using new mRNA technologies to develop COVID vaccines, it was clear that the pandemic mobilised a major shift toward the adoption of digital healthcare technologies.

As the lockdown and fear of COVID infections prevented patients from visiting hospitals, it was the adoption of telemedicine that kept doctors in touch with the patients for ensuring continuity of care. The year ahead will see the healthcare community continuing to use telemedicine as an integral part of patient management. Telemedicine will increasingly be used to address many lower risk illnesses and diseases for patients, while also ensuring that the health and wellbeing of physicians are placed at a high priority.

Telemedicine will see more usage in the number of specialties in healthcare. One such example is the use of telemedicine in pre-operative and post-operative care. It will help to reduce the in-hospital pre-operative visits to the minimum while allowing the surgeon to safely assess the pre-operative patients' fitness for surgery. It will similarly reduce the need for multiple post-operative visits to the hospital. Studies have shown that telemedicine is a safe and effective means of communication and care of surgical patients. It also helps to save travel time and cost savings without compromising clinical outcomes.

The year ahead will see the healthcare community continuing to use telemedicine as an integral part of patient management

Telemedicine services built on blockchain technology will bring together patients and doctors in a secure manner. It will simplify access to care, as well as how payment and healthcare benefits administration are managed. Telemedicine will help in the democratisation of healthcare across borders, and we should see the further development of open cross-border global telemedicine networks that help to meet the demands today as well as the expected huge growth for telehealth services in the future.

Going forward in the New Year, I see blockchain technology gaining greater innovation and adoption in the healthcare sector. It will play a crucial role in the decentralisation of patient data management. Blockchain technology use in supply chain management will enable innovative solution frameworks that address the problem of counterfeit drugs through secure and immutable supply chain traceability.

Blockchain will also ensure that patients are made sovereign with complete control over their data, with the ability to provide consent to share the medical data with healthcare providers for whatever healthcare services they need. For this, healthcare institutions will have to move from being custodians of patient data to embracing secure innovation using blockchain technology that allows data to be kept on a decentralised and immutable ledger.

With prevention, a key theme both in relation to infections as well as non-communicable diseases such as obesity, stroke, heart disease and cancer, the role of remote patient monitoring devices and 'smart wearables' are set to increase and expand. Self-care will be enhanced by advances in the Internet of Things (IoT) technology. Doctors will be able to monitor the patient and diagnose ailments using the data collected remotely.

Quality of care will also improve with greater applications of Artificial Intelligence (AI), which can result in increased productivity and efficient delivery of care by healthcare systems to help in the provision of better care to more people. AI can also help healthcare practitioners to spend more time in direct patient care and reduce burnout by eliminating repetitive work. AI is already being used to improve the speed and accuracy of diagnosis and screening for diseases and this will continue to rise. AI-powered technology will play a critical role in clinical care; research and drug development, population health management, and other public health interventions such as disease surveillance and outbreak response.

At the same time, the emerging technology of the metaverse is all set to transform the very concept of healthcare and the interaction between the doctor and patient. The metaverse can combine artificial intelligence, augmented and virtual reality, IoT, Web 3.0, quantum cloud computing, and robotics for multiple uses in the real world. This includes AR/VR being integrated into medical training and supporting doctors in rural areas using telemedicine.

2022 will see the rise of digital healthcare technologies as we strive to make healthcare equitable for all.

The future of healthcare is smart and connected

Runam Mehta, CEO, HealthCube highlights the major shifts in the healthcare sector in the future

The pandemic has forced us to re-evaluate our focus on healthcare, both, at an individual and at a national level. This improved focus and increased investments have accelerated innovation and completely shifted consumer trends - causing a boom in the industry.

The healthcare sector is transforming at a rate like never before. It is very important to be cognizant of the key trends that majorly drive the industry.

A seismic shift in healthcare delivery focused on care closer to home

Since the onset of such a deadly virus, people's outlook towards managing their health has changed completely. People have developed a sense of awareness and caution that has impacted the visits to hospitals/ clinics or labs. We are seeing a major shift of patients from hospitals to at-home care. Ease of availability, convenience, acceptance within the medical community and avoidance of hospital-acquired infection are some obvious benefits.

With digitalisation at its peak, the pandemic acted as a catalyst for telemedicine and remote care adoption.

Patient consumerisation and personalised care at the heart of care

Digital health is not just a disruptive innovation but a cultural transformation of a traditional consumer! The Internet has empowered patients; they are better informed about their health, associated costs and have the ability to track our health parameters. Equipped with all this data, patients are now partners in decision making where earlier they were passive recipients of advice. For better or worse, recent trends show an increased comfort with sharing data post-COVID. The new era consumer is in charge of her own health and the onus is on the medical ecosystem to provide personalised care and ensure that the consumer is at the center, always.

Point-of-care tests to become increasingly sophisticated, with the potential to adopt lab-on-a-chip technology able deliver accurate results within minutes. 3D bioprinting is used to create living human cells or tissue for use in regenerative medicine and tissue engineering

Artificial intelligence, predictive analysis and automation will play pivotal roles

With the help of big data & artificial intelligence, health tech can analyse, compare and predict the occurrence of an epidemic early enough to pre-empt its spread. Predictive analytics can help identify future trends in patient care both at an individual level and at a large scale; hopefully preventing the next pandemic. The healthcare artificial intelligence market is expected to grow at a CAGR of over 46.21 per cent during the period 2020-2026. The future of healthcare will heavily rely on digital tools, data will be more widely shared, collected, and analysed to improve clinical outcomes globally. As this transformation advances, cybersecurity has to be a crucial part of such algorithms to ensure patient safety & privacy while ensuring effective delivery of high-quality care.

Disruptive technologies will focus on reliability and affordability

With improved technologies, health tech entrepreneurs must aim to make healthcare affordable, accessible, and reliable. Point-of-care tests to become increasingly sophisticated, with the potential to adopt lab-on-a-chip technology able deliver accurate results within minutes. 3D bioprinting is used to create living human cells or tissue for use in regenerative medicine and tissue engineering. In the near future, the 3D-printed materials will benefit the patients in providing cost-effective organs, implants, and devices, while simultaneously providing innovative testing/training methods to medical students for research purposes.

Healthcare IPO and investment activities to remain strong

In 2020-21, the healthcare sector witnessed a surge in venture fundraising, an acceleration in private investments in biopharma & health tech. There has been a strong uptick in funds raised by IPOs and SPACs. As per India Brand Equity Foundation, healthcare market in India is expected to reach $372 billion by 2022, driven by rising income, better health awareness, lifestyle diseases and increasing access to insurance.

Central and State Governments are expected to increase per-capita public expenditure on health and to invest in sub-sectors of the healthcare industry. Investments are, but the first step. Thoughtful execution and sustained effort can save lives but create jobs, boost the economy and create a positive loop of innovation.

In nutshell, the future of healthcare is smart and connected

With a greater focus on collecting and analysing data, there will be the growth of wearable technology, remote patient monitoring, integrated electronic health records, and genomics. A new generation of technology will disrupt the healthcare industry. Be ready to witness anything from the deployment of robots to support people in rehabilitation to Virtual Reality simulations as a tool for doctors to empathise with their patients.

The role of technology augments access, delivery and outreach of services crucial to human existence

Shyatto Raha, Founder and CEO, MyHealthcare elaborates on the role of technology in helping caregivers and medical professionals formulate more targeted patient care plans

The past couple of years have witnessed massive digital transformation, especially in the health-tech space. Technology, data and digital health solutions are now addressing all aspects of healthcare – be it doctor consultation, pharmacy delivery, diagnostics, home healthcare or remote patient monitoring. The COVID-19 induced pandemic has only made this move swifter, giving an impetus to the adoption of technologies that are strengthening the healthcare delivery channels. Today, technology is helping caregivers and medical professionals formulate more targeted patient care plans thereby improving the overall health and wellness ecosystem. The role of technology augments access, delivery and outreach of services crucial to human existence. The future is expected to revolutionise patient-care delivery using technology, data and digital health solutions that will address all their healthcare needs. Some of the key trends that we will witness across healthcare in 2022 are:

The increased need to digitise healthcare has further prompted many healthcare providers to lean on technology that provides digitised delivery of healthcare services by 2024

Diagnostics

Diagnostics has always been at the centrestage of detection, diagnosis and assessment of any disease. Over 70 per cent of the medical decisions regarding disease treatment, management and prevention are based on diagnostics, thus making it critical for the line of treatment as well as preventive healthcare. India's e-diagnostics market stood at $0.07 billion in 2020 and is growing at a CAGR of 66 per cent. Though the medical diagnostics industry accounts for only five per cent of the total health system cost, it influences 95 per cent of the remaining costs. With the diagnostics space lending itself to be viewed as a natural extension for the pharma industry, laboratory tests have contributed to 80 per cent of the objective data in clinical records. The Indian diagnostics industry is highly fragmented and under penetrated despite the presence of over one lakh labs. With around 41 per cent of the spend in primary healthcare being on diagnostics, the Indian medical diagnostics industry will play a vital role in the prevention and wellness space, which is the foundation of *Ayushman Bharat*. The use of AI in smart reports in the future will bridge the gap for customer clinical understanding, as these explain and interpret diagnostic lab test reports and translate health-relevant patient inputs into easily understood biomarker readings, health tips and other insights based on a medical reasoning engine.

Medtech and health-tech industry

The digital healthcare market is segmented into tele-health, mHealth, electronic health records/electronic medical records (EHR/EMR), and others (remote diagnostics and healthcare analytics). The increased need to digitise healthcare has further prompted many healthcare providers to lean on technology that provides digitised delivery of healthcare services by 2024. Patients want their telehealth experience to be seamless and integrated, without juggling between multiple apps and websites. On-demand healthcare was the most funded "value proposition" in 2020. Patient monitoring remains a promising arena for growth; enhanced accessibility and convenience will encourage patients to embrace mHealth services and solutions including healthcare apps and wearable devices. With telemedicine coming to the forefront, there has been a giant leap in how healthcare is provided and is expected to be popularised in the coming years.

Understanding this need for IoT devices and their impact, tech giants such as Google, Apple, Samsung and others are also pushing a whole new gamut of digital health applications for monitoring heart rates, ECG, blood oxygenation, blood pressure, pulse rate, blood sugar levels and more. Several healthcare organisations and doctors are also embracing the use of artificial intelligence (AI) in adding value to the quality of care delivered to their patients. The tools integrated with AI help transform the healthcare delivery model by automating the everyday processes in the sector and providing improved patient outcomes.

Healthcare IT and hospital infrastructure

Deploying new digital tools and services has the potential to increase consumer satisfaction, improve medication adherence, and help consumers track and monitor their health. There's almost an 80 per cent rise in consumption of digital healthcare services after COVID-19. As virtual care and hybrid care have become mainstream during the pandemic, we expect more companies in the health-tech subsector to expand into the alternative care space. With telehealth, hospitals are now also concerned about reaching patients online, how to deliver care while protecting patient information. Government initiatives such as the announcement of Telemedicine Practice Guidelines, National Digital Health Mission (NDHM), and eAccess to healthcare will be crucial for the sector.

Digital health ecosystems are sure to come to the forefront and become successful if they identify gaps in the delivery of healthcare and create relevant solutions. As we move towards the future of digital healthcare and patient centric experiences, the industry is working to adapt to the needs and demands of a new era of health seekers.

We will witness a larger focus on integrated health system via patient-centric approach

Saurabh Gupta, Head- Strategy, Mylab Discovery Solutions opines that healthcare sector is likely to witness closer collaboration across value chains for facilitating innovation

The pandemic has presented us with many areas of innovation and a renewed focus to create accessibility and affordability of quality healthcare. It is precipitating change across the healthcare ecosystem and has propelled continuous, real-time innovation that affects the way care gets delivered across the care gamut. According to the Indian Economic Survey 2021, the Indian pharma market is estimated at $42 billion in 2021 and is likely to reach $65 billion by 2024. The key drivers of growth include increasing lifestyle diseases, changing attitudes towards preventive healthcare, adoption of technology, rising demand for affordable healthcare delivery systems, etc. One of the fundamental shifts we will witness is a larger focus on integrated health system via patient-centric approach.

Diagnostics

◆ **POC Diagnostics:** Point-of-care (POC) diagnostics is expected to be one of the fastest-growing market segments owing to the decentralisation trend in testing. POCT will take center stage in the coming years and with AI-driven interpretation, it will break barriers that had been existing for quite a time. Point-of-care testing stands to revolutionise many aspects of medicine, and the range of tests being imagined is growing along with a consumer base. Research work is being undertaken on advancements in biosensors, microfluidics, bioanalytical platform, assay formats, lab-on-a-chip technologies, and a huge potential is observed in the smartphone-based biosensors that can be used in POC diagnostic devices.

◆ **Molecular diagnostics:** Molecular diagnostics will witness a major shift from centralised laboratories to decentralised POC testing. Most notable progress will be observed in the areas of infectious diseases and oncology molecular tests. Also, the bacteria-derived technology will drive the next generation of accurate and inexpensive molecular diagnostic technologies that can detect from antibacterial resistance to viral outbreaks to cancer-causing mutations in circulating tumour cells.

We expect molecular diagnostics to get a front seat when it comes to the distribution of healthcare budgets, which will help us introducing new technologies and make healthcare more accessible, effective and affordable for all.

Medtech

Healthcare is at the cusp of digital innovation and is expected to grow exponentially in the next five years. The rapidly evolving technology landscape and government initiatives such as production linked incentive scheme (PLI) are expected to accelerate the growth of the medtech industry. Artificial Intelligence, robotics, blockchain, cloud-computing and IoT and other new-age technologies are set to further push the boundaries of how healthcare is delivered.

We also expect closer collaboration across value chains for facilitating innovation, which will in turn expand the sector. We will see further growth of point-of-care diagnostics, molecular diagnostics, telemedicine, and the home healthcare market.

Startups

The pandemic has created a huge opportunity for innovators, especially for biotech, medtech and healthcare start-ups. They helped reduce the impact of the COVID-19 second wave with innovative solutions for diagnostics, patient care and vaccination drives.

In the coming year, we will see many healthcare start-ups build patient-focused innovations and develop impactful products using new technologies. We expect several diagnostic players to develop various diagnostic related solutions indigenously, thereby reducing our dependence on imports.

Health insurance

We expect to see a rise in demand for health insurance in 2022 in the wake of the COVID-19 pandemic and economic recovery. Health insurance would play a critical role in strengthening the healthcare ecosystem and improving the efficiency and quality of healthcare delivered. We are hoping that newer models of pricing will emerge which will significantly reward the customers who are careful about their health. Also, we believe healthcare insurance companies will start penetrating the smaller towns and help people them protect their savings from a medical adversity.

Healthcare IT

There is a significant need for technology to offer affordable solutions at scale. Innovative, sustainable and scalable technologies have the potential to improve lives in India. We expect rapid adoption of advanced technology towards an outcome-based, patient-centric care model. The use of AI/ML in healthcare will be more diverse and deeper, from identifying new molecules to predicting adverse events to suggesting best treatment pathways. Genetic, deep learning techniques, robotics are going to further open new doors.

Hospital infrastructure

The second surge of pandemic in recent months overburdened the nation's health care infrastructure, leading to a shortage of hospital beds and medical supplies. In addition, India's hospital bed density is less than half the global average of three hospital beds per 1,000 people. There is a greater need for building high-quality health centers and hospitals in the country especially in rural areas. Driven by demand for quality public healthcare infrastructure and attractive government schemes, we will witness an expansion of hospitals, diagnostics and pathology centers in tier I and II cities. We expect the hospital industry to grow due to progression in technology and rise in various diseases.

Radiology and imaging

Owing to heightened awareness of early-stage diagnosis, diagnostic imaging will grow higher in volume across X-Ray, CT, and MR modalities. Further, we are witnessing innovations and technological advancements in the imaging segment resulting in helping clinicians to solve complex diagnosis challenges. 3D printing, AI will continue to be among the next generation of technologies for radiology.

With the increase in the power and complexity of technology, patients have the scope to gain more insights on their data or metrics

Nimith Agrawal, Founder, DoctCo explains how different aspects in healthcare like mode of patient consultation, treatment, diagnosis and payments have changed drastically, leading to an improved experience for patients

The field of healthcare has been evolving over the last few years. Several different aspects in the healthcare sector including the mode of patient consultation, treatment, diagnosis, and payments have changed drastically. All of these aspects have led to an improved experience for the patients and have resulted in an ultimate positive impact. There are several different subgroups in the entire field of healthcare. All of these subgroups have experienced a certain degree of change in their functioning and deliverables. In this article, we will have a look at the six most major sectors and the key trends and drivers in these sectors.

Diagnostics

The space of diagnostics has been fairly large with the boom in the number of diagnostic devices currency available in the market for different conditions. With the expansion in this area, there are several key trends that have been observed. Moving from large diagnostic equipment that required the presence of a patient at a hospital, clinic, or lab, the process of diagnosing a patient has become more convenient. There are several handheld diagnostic devices that are now available for over-the-counter use. These devices help patients test at their own convenience as per need. Moreover, the option for take-home tests have also been brought into the space of diagnostics that has drastically improved the experience of the patient.

Medtech

When it comes to the field of medtech, there have been many changes that have been observed of late. One of the main changes has been the transformation of the mode of delivery of care. The traditional method of visiting hospitals is no longer a constraint. Moreover, with the increase in the power and complexity of technology, patients have the scope to gain more insights on their data or metrics. This transition and adoption of recent changes have been supported by several key drivers. Several patients have been more comfortable and interested in using telehealth services compared to traditional doctor visits.

> The healthcare IT sector has also substantially contributed to empowering patients and users to make informed decisions regarding their healthcare by the means of offering them more information based on their personalised data

One of the main factors that have led to this trend is the increased convenience that telehealth provides. With improved security and privacy measures adopted by medtech companies, patients and users are more comfortable allowing access to their medical data in exchange to receive more insightful and actionable information.

Health insurance

A decade ago, health insurance was not as widespread as it is today. Most individuals in the current time have an active health insurance plan not only for themselves but for their families as well. The need for health insurance grew with the increase in inflation rates that thereby made healthcare expensive. Moreover, apart from this factor, several insurance companies have stepped into the healthcare space offering different types of attractive plans. These plans help users stay financially secure with respect to healthcare while also helping them avail the necessary care that is required.

Healthcare IT

Especially in the field of healthcare, patient privacy and security of medical records and data are extremely crucial. There have been several instances wherein healthcare institutions and hospitals tend to fall behind improving their privacy networks and security systems thereby facing a security breach. This had called in for a more nuanced system to improve security. Healthcare IT firms have been developing new softwares and firewalls to avoid such security breaches thereby helping protect the integrity of the patient's privacy and confidentiality.

Moreover, the healthcare IT sector has also substantially contributed to empowering patients and users to make informed decisions regarding their healthcare by the means of offering them more information based on their personalised data.

Healthcare infrastructure

With respect to healthcare infrastructure, there have been more strategic and agile supply chains. In addition, personalisation of healthcare has also been brought into the infrastructure across several departments. There has also been a higher penetration of insurance and reimbursement in the entirety of the healthcare infrastructure thereby increasing the flexibility of payment for patients. This has also been a key driver towards an improved healthcare system.

Radiology and Imaging

Some of the key trends that have been shaping the future of radiology and imaging include the changing demographics, urbanisation and the rise of the middle class. The acceleration in urbanisation has led to more people seeking radiology and imaging services, thereby creating a need for improved systems, lesser wait times, faster processes, and others. This has also brought in the need for better adaptability and extreme flexibility.

In a nutshell

The field of healthcare has gone through a plethora of changes and has observed a series of key trends over the past few years. These changes have been influenced by the urbanisation of the country, increased need for healthcare, improved requirements for convenience, and several other factors. Ultimately, these changes in the healthcare system have improved the experience and convenience of patients.

From biotech and smart medicine to VR, AR, smart cities, digital twins and robotics, everything has contributed to the rise in digital health

Amjad Jabbar, Vice President-Digital Health, QuEST Global details how the pandemic has turned out to be the biggest catalyst required to bring about a huge change in digital health

The rise of digital health

The process of technology-driven change has been rerouted this year, due to the ongoing pandemic. While the biggest drivers of change are Artificial Intelligence (AI) and the internet of things (IoT), their effects were felt on various additional industries than what one may have anticipated. One such area is healthcare. The focus of advanced research in medicine, vaccines, social welfare, and environmental health has shifted to addressing the ongoing crisis and all the emerging technologies have played a major role. From biotechnology and smart medicine to virtual reality, augmented reality, smart cities, digital twins, and robotics, everything has contributed to the rise in digital health.

A new period post pandemic

In India, the healthcare sector has grown tremendously in the last 10 years and has become one of the largest sectors in the country, both in terms of revenue and employment. Post the pandemic, the biggest positive outcome out of this has been the rapid evolution of digital health. Earlier, data in cloud was taboo, AI's proof was questioned, and technology acceleration was considered unsafe. However, since the onset of the pandemic, this has changed considerably, and the first impact was seen through the overnight shift of point of primary care delivery from hospitals and clinics to home. Even virtual consultations and home-based monitoring were enabled rapidly with wearable devices being considered as miniaturised monitors.

With all the positive developments in place, there also exist security challenges in this new era of cybersecurity. The healthcare system is a major target for national threats

COVID-19 alone has urged governments around the world to fund disease research, rapid diagnostic methods, understanding transmission and contact tracing, and the development of genomics-based vaccines. The learnings over the last 18 months have accelerated the drug development process by decades.

Accelerating the industry change

Today, the medical industry is entering an era of accelerating digital innovation as patients seek on-demand medical care because of their busy schedules. Not to mention, people have become much more mobile over the last decade, driving the growth of on-demand healthcare services in tier 1 and tier 2 cities. The pandemic also showed that people are willing to share their personal data when their health benefits are clearly communicated. This has led to an increased reliance on AI-driven prediction tools to forecast where resources can be used most efficiently and make data licensing contractual. One of the greatest benefits of AI is its capability to transform medical devices by improving their performance. This trend will continue.

The sudden alignment of stars in the world of digital health has also revolutionised the investment in health technology. With the $1 trillion invested in COVID-19's research, investment in digital health in the first half of 2021 ended with $14.7 billion in several digital health transactions in the United States *(Ref: Rock Health Report)*.

The age of cyber crime

With all the positive developments in place, there also exist security challenges in this new era of cybersecurity. The healthcare system is a major target for national threats. The medical industry spent $18 billion on cybersecurity, up 15 per cent year-over-year, according to a Rock Health report. More than the billions of dollars spent on cybersecurity, healthcare systems have faced threats by ransomware hackers exposing patient data and legal disruptions caused by data breaches. The money earned by ransomware companies is reinvested in sophisticated platforms that cause worse attacks. Health systems also need to fund research carried out for protective measures taken for cybersecurity. This creates a grave situation in which the medical, as well as patients and the general public, pay both hackers and protectors.

Push by the Indian government

The Indian healthcare system is highly diversified, offering many opportunities in all segments, including providers, payers, and healthcare technology companies. The country has also become one of the major destinations for high-quality diagnostic services, with huge investments in advanced diagnostic facilities reaching more segments of the population. From a biopharma perspective, India is a world leader in vaccine manufacturing and pharmaceutical companies here have supplied more than 50 per cent of the global demand for different vaccine needs to achieve global immunisation.

Digital health is the future

The pandemic has turned out to be the biggest catalyst required to bring about a huge change in digital health. This change is progressive and is here to stay. One keyword is "resilience," as more and more resources are being spent developing technologies to avoid the devastating effects of pandemics and epidemics on lives and the economy. With the help of digital health, providing an affordable, accessible, and accountable health system for a healthier population around the world has become a possibility.

IT health trends-The way forward

Dr Gunjan Bharadwaj, Founder & CEO, Innoplexus highlights the IT health trends which have emerged as focus areas for caregivers, pharma companies and patients alike

In the recent years, we have seen a paradigm shift in healthcare operations globally. Alongside the curative approach, there is a greater emphasis on building a preventive and digitally-driven healthcare landscape. In the wake of the COVID-19 pandemic that has been around for almost two years now, there is an even greater push on technology-driven healthcare. In this era of virtual care and remote diagnostics, there are some key IT health trends which have emerged as focus areas for caregivers, pharma companies and patients alike.

With refinement of tech and greater acceptance by the masses, a larger switch to machine-oriented healthcare delivery ecosystem is coming into picture

Data-driven healthcare and data security

In the digital healthcare ecosystem, there is a huge surge in the volume of health data being collected. Ranging from a patient's doctor consultations and diagnostic processes to continuous data collection by wearable and digital diagnostic devices at home, there are various new and expanding touch points that are offering healthcare providers a greater visibility. There are various positives to it as there is a greater opportunity for the clinicians to make well-informed decisions on the type and timing of the intervention required. For researchers, pharma companies, and health-tech firms, it provides an opportunity to better understand the real-time impact of a new drug or procedure's impact on the patients. This is of utmost importance in finding new drugs and treatment procedures for diseases such as cancer. As one of the most life-threatening diseases with less-than-ideal rate of recovery, and a lack of definitive curative measures, cancer treatment is being transformed by digital interventions.

At the same time, as we go along in finding novel IT-driven ways of combating challenges like cancer, there is a trend of data security in healthcare that is also growing. As is well-known, medical data of patients is sensitive private information that requires regulation of usage rights and adherence to protocols wherein the data of only those patients is shared with caregivers and pharma companies who give consent for it. With a constant surge in cyber crimes and hacking incidents, the pharma companies, research and consultation platforms including smartphone-based healthcare apps are paying greater attention to data security and encryption etc.

The role of AI and ML

There are not many areas of our lives that now remain untouched by AI and ML tools. These technologies are set to play a critical role in healthcare innovation and discovery of drugs. AI solutions are able to better monitor, analyse and predict the effectiveness of drugs and procedures. AI significantly boosts the quality of target identification of a drug. When paired with data provided by patients undergoing a clinical trial, AI-driven research can lead to 10x superior findings compared to the conventional R&D efforts.

We are witnessing AI integration in various healthcare screening, counselling and service delivery arenas. There is a great potential in this trend of using most advanced AI and ML tools to bring about transformation in treatment of diseases like cancer. There are some health tech companies developing path-breaking apps that integrate things like counselling, patient data evaluation, provide access to clinical research and drug trials as well as offer monetisation of patient data under a regulated and consent-based framework. Not only that, AI driven therapies in small biomarker-defined patient subsets can also lead to faster and accurate drug discovery for ailments like cancer.

Development of more effective and custom medication

Genes and cell structures are at the core of all major ailments including cancer, and contagions like COVID-19. Technology driven genomics and gene-editing based processes enable creation of new proteins. By using genetic profile of individuals, scientists are focusing on creating precision drugs that can deliver better outcome, and reduce likelihood of side-effects. There is a lot of focus on using such genomics and AI tools to develop drugs and treatment procedures for heart diseases, cancers and infections etc.

Transparency and authentic information flow

In the modern times when Google has become a preferred medium for everyone seeking information on health and wellness, we are also witnessing a lot of sources that lack in credibility or research-based information coming into circulation. This is where leading healthcare platforms and apps are democratising the flow of accurate and reliable information to patients suffering from ailments such as cancer, cardiac health problems etc. There is a growing demand for free and equal access to information for patients. Having the right information and access to support systems enables patients in combating diseases more effectively. They are empowered to make well-informed choices after fair and transparent consultations and information sharing which is going to be a game-changing practice in the years to come.

From human to machine healthcare delivery

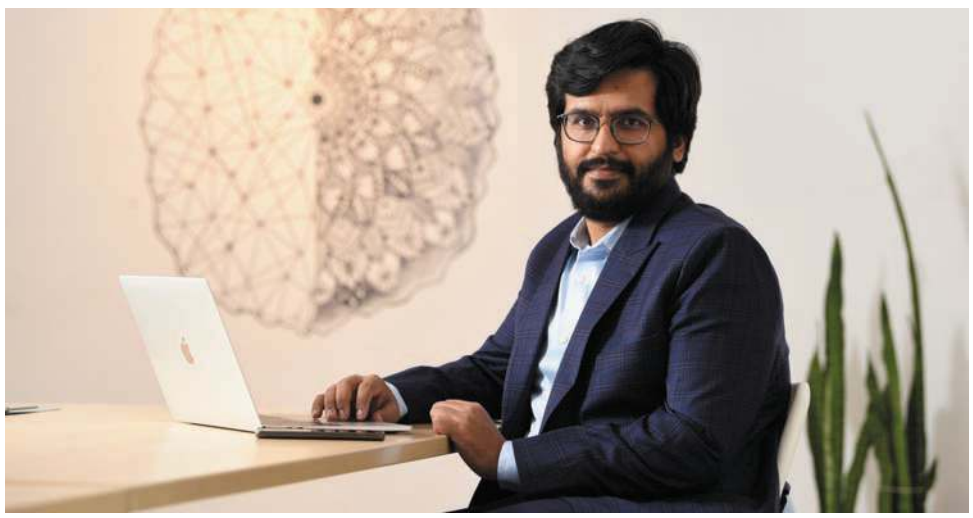
One of the biggest challenges faced by large countries like India is the lack of healthcare resources. The country has a huge gap when it comes to availability of qualified doctors and medical staff to cater to its 1.35 billion plus population. Further, there is also a lack of infrastructure and facilities in the non-metro city areas. As a further challenge, the pandemic has reduced access to in-person healthcare delivery by the medical professionals. However, this shortage doesn't imply that overall healthcare access and information should be denied to the needy.

This is where we are witnessing a rapid rise in adoption of tech-based healthcare delivery wherein telemedicine, smartphone apps, and other digital tools are being used for various aspects of caregiving. For instance, patients can consult doctors online by digitally sharing diagnostic results or symptoms, and seek consultation/second opinions. Digital healthcare apps and platforms offer round-the-clock, anywhere, anytime access to information and support. With refinement of tech and greater acceptance by the masses, a larger switch to machine-oriented healthcare delivery ecosystem is coming into picture. These are the trends of the times, and they will become the benchmarks of medical services in the years to come!

It is time for India to rethink healthcare, not just for itself but for the world

Gaurav Parchani, CTO, Dozee explains how only a tech revolution can bridge the gap between the number of patients and specialised healthcare providers required to deliver quality healthcare for each citizen

Over the course of the last two years the healthcare industry has been a central focus due to the COVID-19 pandemic. The pandemic exposed already existing gaps in the healthcare infrastructure not just in India but also globally. We had a severe shortage of healthcare professionals to cater to the immense patient load. We're at a juncture where the gap between the number of patients and the specialised healthcare providers required is at an all time high and is only going to increase further. Bridging this gap to deliver quality healthcare for each citizen will require no less than a tech revolution in healthcare. We've seen seeding of the same during the covid-19 pandemic but trends like remote patient monitoring, telemedicine, AI enabled management and smart screening techniques, personalised medicine, etc. are only going to amplify. A central piece for most of these trends is availability of data that will be fueled by widespread use of cloud computing and digitalisation in healthcare.



The key trends will be

- Remote Patient Monitoring
- AI disrupting the Healthcare
- Digitisation of health data
- Data driven policy making in healthcare system
- Connected health ecosystem

In both public and private segments there can be seen a huge gap in the healthcare system with increasing patient load. The nurse to patient ratio in India is 1:40 against the global standard of 1:4. Whereas in the chronic care space India lacks a number of specialists for e.g India has around 4500 cardiologists to take care of 50 million+ people with cardiovascular disorders. These technologies will enable healthcare professionals to gain access to critical data on their fingertips 24/7. Continuous remote monitoring, triaging and early warning systems has the potential to save countless lives. After the pandemic, governments and organisations are more focused towards building digital infrastructure targeting preventive and predictive healthcare. The National Digital Health Mission (NDHM) is being hailed as a revolutionary move in the context of healthcare in India. According to a Boston Consulting Group (BCG) report, the digital transformation brought by NDHM can potentially unlock economic value worth $200 billion+ by 2030. The NDHM platform is expected to help in providing comprehensive, interoperable, and accessible data of a patient in a simplified manner. One of the major problems with current systems used across the Indian Healthcare ecosystem is the lack of uniformity of data but with the integration of new technologies we can solve this problem.

24/7 Remote Patient Monitoring will be one of the key fields of growth and will continue to dominate in 2022 as an emerging technology. It is a type of telehealth that involves using technology to track patient data outside traditional healthcare settings.

Digitisation of health data is a platform where all the data of the patients, hospitals can be stored and can be accessed 24/7 with necessary security and compliance. Work on policies and regulation in the healthcare ecosystem regarding the use and storing of data has already begun. Like UPI changed the digital payment system in India and Aadhar creating a unified identity system there is a need for healthtech technology to create a connected health intelligence ecosystem. We've leapfrogged in these areas and we need to do it once more, this time with healthcare. It is time for India to rethink healthcare, not just for itself but for the world.

Marketing trends in healthcare industry

Hareesh Tibrewala, Joint CEO, Mirum India recommends traditional healthcare brands to bring technology to the center of their HCP and customer outreach strategy, and look at how they can leverage this new behaviour, as part of their business model

Healthcare industry is going through some interesting transformation, both in the area of end consumer engagement and in the area of HCP communication. While the direction has been now visible for the past few years, the pandemic has acted as an accelerant and is speeding up the entire transformation. These changes are resulting in newer ways of marketing, leveraging data and technology.

Data driven HCP marketing

As per ZoomRx survey, during the pandemic, physical MR-HCP engagement dropped by about 70 per cent. Hence brands started investing heavily in creating immersive and empathetic digital experiences, so as to attract the attention of the HCP professionals. Even as physical engagement increases post pandemic, technology will play an important part in ensuring that the right communication is reaching the right audience, and there will be extensive use of data analytics to identify what kind of cohorts can be influenced by what kind of messaging, and marketing automation to deliver personalised communication.

Use of chatbots

The healthcare industry is seeing a rise in the use of chatbots. Chatbots are helping patients find solutions to their requirements faster, as well as helping to bridge of the gap between HCP (doctors) and patients. Some interesting uses of chatbots in the healthcare industry are

◆ **Real-time-response:** Doctors, obviously can be reached only during certain times. Hence if someone needs an immediate response, a chatbot could help

◆ **Monitoring:** Can be used to monitor and track patient parameters

◆ **Symptom checker:** By asking some relevant questions, can assist in understanding the condition of the patient

◆ **Provide instant information:** can be used to search databases and provide information in real time in medical emergencies

The healthcare industry is seeing a rise in the use of chatbots. Chatbots are helping patients find solutions to their requirements faster, as well as helping to bridge of the gap between HCP (doctors) and patients

Telehealth

During the pandemic, we all did our medical consultation without stepping into a doctor's clinic. This trend will most certainly stay. Both, doctors and patients, have experienced how tele-health is more productive, cost effective and gives larger distribution reach. We are seeing the emergence of numerous health-tech brands in the form of online pharmacies, appointment booking apps, wearables and patient communities. Traditional healthcare brands need to bring technology to the center of their HCP and customer outreach strategy, and start thinking about how they can leverage this new behavior, as part of their business model. Telehealth thus creates a whole new communication vertical.

From blockbusters to nichebuster

Datamonitor's report suggest that big pharma is moving from mass consumption driven block-buster drugs to niche-drugs, that target niche diseases and fewer people. Thus, digital will start playing an important role in identifying and reaching out to these needle-in-haystack type of customers.

Omnichannel engagement

There is a persistent narrative around pricing pressures on drug companies, resulting in margin erosion. In order to retain margins, pharma companies will need to move from a pure product model to a service-based model. A service-based model will require a far deeper understanding of the customers, and building an omnichannel communication strategy to service the customer across multiple touch points. An omnichannel strategy will also require breaking down of silos between internal teams such sales, marketing and medical teams, and building a single view of the customer.

Shifting from a reactive to a proactive healthcare model

Pradeep Kumar Jain, Associate Principal-Healthcare, Tredence stresses that key healthcare IT enablers, alongwith the will and support of industry's leaders, will be critical to revamp healthcare systems in the post-pandemic era

Post-COVID, healthcare IT will experience a massive transformation. There were many disparities in healthcare in the past, but the pandemic has exposed these shortcomings. Traditional healthcare, for example, used to be reactive. It was either plan- or premium-centric, despite many believing it to be patient-centered. When people in need of immediate medical attention raced to hospitals, the healthcare infrastructure momentarily collapsed. As a result, resources were depleted, and supply chain problems surfaced. Fortunately, there may be better news ahead in 2022.

Cloud computing, platform modernisation, and data disparity resolution are just a few examples of where healthcare IT is headed in 2022. Healthcare providers must begin by finding the right partner, rather than using individual platform vendors to reach their goals

Shifting from a reactive to a proactive healthcare model

Today, healthcare is increasingly transitioning toward a proactive care model. The cloud, analytics platforms, and data management have all become more crucial. The shift powered by these technologies has resulted in the emergence of new industries, such as the $1.5 trillion wellness sector, according to McKinsey. This is only the tip of the iceberg. The importance of innovative technologies, platforms, and solutions for proactive care management is growing. Likewise, physicians have also realised that a reactive strategy no longer works after seeing firsthand how supplies, ventilators, oxygen, and beds ran out during the pandemic. They, too, were victims of a reactive healthcare model.

To accelerate the transition, hospitals and care providers must concentrate on three key healthcare IT enablers to improve the efficiency and cost-effectiveness of medical care delivery.

Healthcare IT trends in 2022 and beyond

◆ **Cloud computing will shape the future of healthcare:** While medical experts and researchers quickly developed effective COVID-19 vaccines, their availability at the right place, at the right time, and for the appropriate number of individuals would not have been conceivable without cloud technology. Organisations across the globe are assisting nations in reaching and vaccinating their citizens more quickly by managing hybrid-cloud ecosystems and multi-cloud deployments.

Despite the sudden spike in the popularity of cloud technologies, many healthcare providers have been sluggish to adopt them because of their closed system. On the contrary, they should accelerate adoption like their counterparts in the retail, manufacturing, and CPG industries have done.

Cloud technology offers collaboration, accessibility, security, and efficiency. In fact, the benefits of cloud computing in healthcare have increased manifold, thanks to the availability of cloud ecosystems that are HIPAA-compliant and have a high level of trust.

◆ **Healthcare platform modernisation solves technology fatigue:** While attempting to meet growing regulatory and compliance demands, the healthcare industry has long relied on various platforms and solutions to carry out its operations. For example, the industry has access to multiple systems from different vendors, such as workflow management systems, risk stratification software, and performance dashboards, among other tools. Unfortunately, such technology systems are not sustainable since platform fatigue often sets in. This also occurs because of poorly integrated monolithic and siloed healthcare systems, traditional communication processes, lack of standardised workflows, and poor compliance levels.

Providers are also beginning to understand and embrace analytics, particularly AI and machine learning, to revamp their platforms. They are using it for several use cases, such as risk-stratification, and identifying members for telehealth services and wellness programs, among other effective practices.

◆ **Health data management will be key for the consumer-driven healthcare revolution:** Hospitals and health systems have mines of data, such as claims, eligibility, finance, and electronic medical records (EMRs). However, they must collect this data and use it to harness new capabilities to enhance patient health outcomes. For example, a patient with a specific chronic illness often approaches the disease's state from a limited perspective. There can be a variety of underlying causes that might exacerbate the condition. Today, there is a need for a system that can help physicians create a continuum of treatment that addresses all conditions at once, rather than one at a time.

Furthermore, healthcare data is retained in strict confidentiality. Facilities don't even allow third-party sites to use their APIs. As a result, getting these platforms to interact with one another can be a nightmare for the CIO or CTO when many platforms are involved. A simplified, streamlined system will lead to a revolution in healthcare.

Looking ahead in 2022

Cloud computing, platform modernisation, and data disparity resolution are just a few examples of where healthcare IT is headed in 2022. Healthcare providers must begin by finding the right partner, rather than using individual platform vendors to reach their goals. In addition, leaders must also reform so that they can fully utilise IT. The will and support of healthcare leaders around the globe will be critical to revamping the healthcare systems in the post-pandemic era.

The primary focus of the market will be on ensuring patient satisfaction and engagement in 2022

Sahil Bansal, Co-Founder and CEO, Fitelo predicts that healthcare segment will witness integration of service providers, payers and pharma companies with the sole aim to ensure better patient healthcare experiences

The Indian healthcare segment has been ever-evolving. While the pandemic disrupted businesses across industries; it emerged as a blessing in disguise for the healthcare sector paving the way for its digital revolution.

The key trends that will dominate the Indian healthcare sector in 2022

With remote healthcare, telehealth and teleconsultations coming to the forefront; the sector sailed all through all the challenges that crossed its path due to COVID-19. As we inch closer to the New Year 2022, the segment is all set to grow and proliferate. According to IBEF, the Indian healthcare segment is expected to be valued at $372 billion by 2022. The factors contributing to the growth will be the rising incomes, growing lifestyle diseases, better health awareness as well as increasing access to insurance. The sector will witness various trends in its growth trajectory.

Patient experiences to be the key

Ensuring patients have good experiences with healthcare services is as important for the healthcare providers as is the customers for businesses. Hence, the primary focus of the market will be on ensuring patient satisfaction and engagement in 2022. The patients have become all the more cautious and conscious about their health and aware of their surroundings. They wish to be an integral part of the healthcare journey. They are also embracing technology to have easy access and to enjoy high-end experiences. Thus, the healthcare segment will witness seamless integration of service providers, payers and pharma companies with the sole aim to ensure better patient healthcare experiences.

Be it optimising patient data, scheduling new appointments, or reducing the errors, Robotic Process Automation will rule the healthcare industry in the times to come!

The emergence of the era of cloud healthcare

Just as cloud kitchens rule our lives and ensure the delivery of hygienic food right at our doorstep, the healthcare segment will accelerate its pace of digitisation especially cloud adoption. 2022 will be a new wave of innovations for the market and one such solution ruling the segment will be health cloud. The collection and storage of patient data as well as quick and instant 'anytime anywhere' access to patient records will be enabled by the cloud. This will improve the operational efficiencies and will further help in offering state-of-the-art healthcare facilities to the patients. As the segment is growing, the industry players should have access to opportunities to become flexible and scale up their businesses. Healthcare cloud will emerge as a game-changer for the same!

Telemedicine to maintain its reign

While the concept of telemedicine existed even in the pre-pandemic times, the coronavirus played a pivotal role in its adoption. The healthcare segment went through various disruptions and healthtech stepped into the picture owing to the wake of digital revolution. As a result, telehealth and virtual care has been the go-to option for better patient care ever since. While it has successfully helped in bridging the doctor-patient gap, it is anticipated that it will not only be a key component of the healthcare sector in the times to come but will rather be its permanent element even in the post-COVID era. Telemedicine will ensure that the healthcare services reach even the remotest of places and patients seamlessly shift to the virtual models of healthcare.

Digitisation at its prime

The healthcare segment will step up to garner Return on Investment (ROI) through digitisation. While it is already at the bottleneck of transformation, new-age tech solutions such as artificial intelligence, machine learning, virtual reality will occupy a prominent position in the market. Specifically, AI and automation will help upscale operational efficiencies and will be one of the significant trends to be witnessed in 2022. As per Invest India, Robotic Process Automation (RPA) will help reduce costs as well as improve the efficiency of the segment's workforce. Leveraging technology will offer the market a plethora of opportunities to make healthcare services advanced and accessible to patients across categories. Be it optimising patient data, scheduling new appointments, or reducing the errors, RPA will rule the healthcare industry in the times to come!

Medical tourism to grow

One of the noteworthy trends to be witnessed is that the Indian medical tourism sector will grow. The market was valued at $2.89 billion in 2020 and is estimated to reach $13.42 billion by 2026. According to Research and Markets, it is projected to more than double by 2022 from its current size in 2016. As per NITI Ayog's recent reports, India's cost-competitive healthcare services and availability of skilled labour are rendering a helping hand in making it a preferred destination for medical travel reasons.

The bottom line

Due to India's robust alternative medicine systems, tech advancements and exponentially growing healthcare sector, the market is increasingly garnering the interest of the investors as well. It continues to offer a myriad of opportunities and the momentum of growth will maintain its pace in 2022 as well. To enjoy a competitive edge, it becomes imperative for industry players to adopt the innovative approach, expand their offerings and address the market trends to leverage them for their benefit!

Healthcare industry providers will need to accelerate adoption and find the right technology partners to bring better future into present

Shivajyoti Bhattacharjee, Vice President-Healthcare & Life Sciences, Cybage talks about the healthcare technology trends anticipated to facilitate enhanced healthcare delivery in 2022

As 2022 approaches, the healthcare industry continues to work toward better meeting the needs of its patients, doctors, and staff. Healthcare providers are now expected to offer improved consumerisation, better automation, and enhanced consolidation. Consumers demand convenience, ease of access, and fast responses not traditionally the features healthcare delivery is known for. As a result, numerous health systems have started to invest heavily in improving their attitudes toward patient experiences.

Here are the healthcare technology trends anticipated to facilitate enhanced healthcare delivery in 2022:

Consumers demand convenience, ease of access, and fast responses, not traditionally the features healthcare delivery is known for. As a result, numerous health systems have started to invest heavily in improving their attitudes toward patient experiences

Virtual Reality, an inevitable future

Virtual reality has recently revolutionised the healthcare industry by improving patient recovery time and hospital management. VR headsets are used in various ways:

◆ **To deliver medical training:** Medical schools no longer need to rely on cadavers to help their pupils understand human anatomy. And can instead use virtual reality to train them in a completely different environment.

◆ **To treat patients:** In case of any neurosurgical or other complex procedures, the teams can practice their intended intervention using VR sets. It can help avoid potential errors during the actual surgery and provide a less high-stakes environment for surgeons to rehearse.

◆ **To simulate surgeries for error reduction:** Robotic surgery is a recent innovation in which surgery is performed using an automated device, e.g., a robotic arm controlled by a human surgeon. The robotic device is precise, meaning better incisions, lower blood loss, and accelerated recovery.

◆ **To modernise physical therapy:** VR has also been shown to speed up recovery time in stroke patients much more effectively than standard therapy. Enabling the patient to practice prescribed daily exercises in a virtual environment keeps them focused and maintains positivity during possible lengthy recovery periods. And it can make the activity more fun!

Digital therapeutics, a patient-centered trend

Digital therapeutics is a patient-centered trend that delivers evidence-based care via software. This healthcare technology was created for clinicians and patients. It incorporates everything from clinical assessment, patient-reported outcomes, and clinician monitoring dashboards.

In response to the pandemic and due to the FDA greenlighting multiple DTx treatments, pharma companies have strategically invested into the growing market. The accelerated investment in and adoption of health-related apps was aimed at expanding access when said access was difficult. The global digital therapeutics market in 2020 was valued at $3,537.29 million. It is predicted to reach $23,569.38 million by 2030, displaying a CAGR of 20.6 per cent from 2021.

Remote Patient Monitoring (RPM), the accessible approach

RPM is a healthcare IT trend that keeps patients and their care providers continuously in touch to coordinate treatment and manage complex illnesses. To ensure non-stop patient monitoring, clinicians provide their patients with several wearable measuring devices.

Such solutions help healthcare institutions cut down on time, costs and deliver high-quality Healthcare even without meeting their patients. Several RPM devices are currently available for tracking symptoms of specific chronic diseases. Blood pressure cuffs help track and report blood pressure and heart rate data of hypertension and heart disease patients. While blood glucose monitors (or glucometers) track and report blood sugar data from people with diabetes.

Predictive analysis, the clever path forward

Predictive analytics aids physicians in the medical decision-making process and helps evaluate big data. It is also advancing the improvement of patient outcomes. Integrating predictive analytics into healthcare can allow providers to switch their course of treatment sooner when the current mode is not working. It saves months of unnecessary, painful treatment, improving the quality of patient care. By looking at past patients' data, machine learning algorithms provide insight into treatments that work best for the current patients. Additionally, it can identify warning signs before conditions become severe.

Artificial Intelligence (AI), an insightful cognition

Global AI in the healthcare market was valued at USD 6.7 billion in 2020. It is anticipated to expand at a CAGR of 41.8 per cent from 2021 to 2028.

◆ **For mental health treatments:** AI can help capture every interaction and generate a baseline for clinical notes. It can provide data-driven insights about the session, patient progress, and guidance for future interactions. It saves time and allows care providers to focus on the patients.

◆ **In radiotherapy treatment planning:** AI can recognise complex patterns within medical data and efficiently offer quantitative assessments of clinical conditions. Deep learning-based tools and other AI-based tools can help refocus tasks performed by the treatment planners.

These emerging technologies are steadily gaining momentum and will soon take over the healthcare industry. Meaning healthcare industry providers will need to accelerate adoption and find the right technology partners to bring this better future into our present.

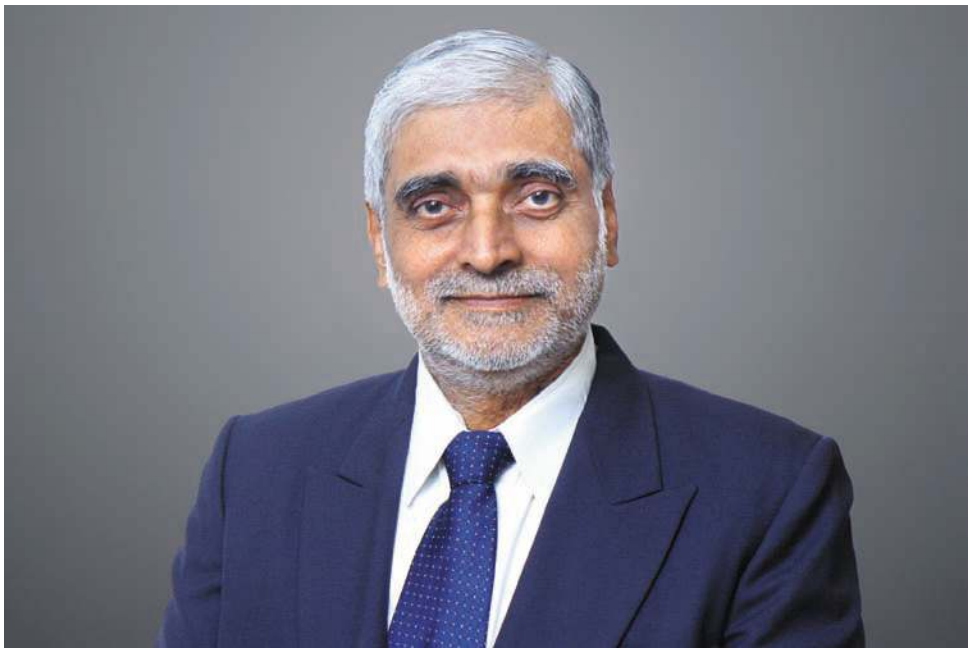
The future of healthcare lies in ability and agility in adopting the technology

Dr Prem Nair, Medical Director,Amrita Hospitals stresses that hospital infrastructure has to be revamped to incorporate recent trends in technology

Over the year we are witness to significant changes in the healthcare infrastructure particularly medical care, medical education and medical research. 23 years back when Amrita Hospital at Cochin was inaugurated, the aesthetics and the technology backed medical care took the industry by storm. Today this has become a standard.

Out mantra at AIMS has been to deliver compassionate, affordable, quality care to our patients. Change is inevitable and so is changes in hospital infrastructure that is evolving day by day for a better future.

Today the future of healthcare lies in ability and agility in adopting the technology and the infrastructure defines the synergies between the different interphases. With efficiency and quality care, patient satisfaction is the core focus and hospitals have to be well-equipped with the latest technology and skill-set. Major changes should be addressed to in hospital infrastructure with the advent of the latest technology.



Hospitals are energy intensive systems with major chunk of requirement for medical grade air conditioning in operations theatres, ICU's, laboratories and also for patient rooms. With increasing energy costs and a green signature being the buzz word, hospital building infrastructure is looking at alternative sources of energy

Hospital building infrastructure

Hospital infrastructure is one of the most complex architectural challenges for any civil infrastructure due to the complexity of the technologies that are integrated, and the expectations of patients and families, which combined with healthcare processes, are required as the input to design a hospital environment.

Hospitals are energy intensive systems with major chunk of requirement for medical grade air conditioning in operations theatres, ICU's, laboratories and also for patient rooms. With increasing energy costs and a green signature being the buzz word, hospital building infrastructure is looking at alternative sources of energy.

Technology enabled connected infrastructure

Patients are favoring the use of various digital health modalities like telemedicine and preferring virtual platforms to avail medical consultations and also for their regular check-ups. Technology has enhanced our hospital infrastructure and enabled it to be more remotely connected with physicians and specialists by the above means.

Decentralised hospital infrastructure

With increasing application of technology, shorter period of hospitalisation and day cases is becoming the norm. Non-invasive treatment procedures are now being done in our outpatient clinics, reducing the inpatient stay. This has spurred the growth of better ambulatory care services, emergency care clinics, rural and urban centres based on a hub and spoke model. All these are leading to a decentralised Hospital infrastructure.

We are also witnessing vertical integration of big hospitals with small healthcare clinics by merger or acquisition that leads not only diversification but also decentralisation. Hospitals are setting up a chain of healthcare units for offering more specialised clinical care.

Hospital cloud infrastructure

With the National Digital Health Mission taking wings under the government initiative, healthcare in India is going to be essentially a data-driven industry. Amrita hospital has a strong Information and Technology resource that allows easy storage and retrieval of patient data though a fully integrated HIS including LIS and RIS. The voluminous patient data is not only difficult and complex to manage but also requires huge hardware and software resources. This makes it out of reach for majority of the hospitals. Therefore, hospitals will tie-up with third-party vendors to store and manage patient or hospital data on the cloud that can meet the security and privacy standards of patients.

Patient-centric hospital infrastructure

In today's competitive world, we are seeing that patient satisfaction has become the mantra for success. Hospitals will focus on offering personalised care for patients while trying to adhere to national and international standards by getting accredited by JCI/NABH/ISO/NABL/NAAC / etc. simplified appointment systems and low waiting time in the OP will redefine hospital operation with mobile apps to facilitate online scheduling and follow-up of appointments. Right from the home delivery of medicines to home doctor visits, the patient will be accorded the maximum personalised care by hospitals.

Hospital infrastructure has to be revamped to incorporate recent trends in technology to ensure the sustenance and profitability of hospitals.

COVID19 inspired hospital infrastructure transformation is here to stay

Nitin Kamaria, Facility Director,Fortis Hiranandani Hospital talks about advances in hospital infrastructure

The COVID19 pandemic placed unparalleled demands on global healthcare systems. In response to that, the industry widely demonstrated its resilience, ability to innovate, and think out-of-the-box. In India, hospitals had to face several challenges to effectively respond to the crisis. Hospitals here had to make huge infrastructure changes that included separation of ERs, wards, and ICUs for COVID & non-COVID patients, creation of different entry points for patients & staff members, building staff quarters and so on to ensure safety for all. We also had to look at ways to protect and help our hospital staff members to work around this change.

Apart from this, hospitals also had to support the government in COVID19 testing, extending isolation beds for treatment, enhancing medical staff support, and providing them safe boarding to ensure infection control. Moreover, the healthcare industry, along with the central & state governments, undertook a robust response plan to tackle the pandemic by setting up of dedicated COVID19 hospitals, isolation centres, and tech-enabled mapping of resources. Digital technologies were incorporated to compliment health services in ways we had not imagined before.

The healthcare industry, along with the central & state governments, undertook a robust response plan to tackle the pandemic by setting up of dedicated COVID19 hospitals, isolation centres, and tech-enabled mapping of resources

These technologies play a key role in providing access and care to patients who could not make it to the hospitals due to fear of infection, or lack of transport facilities. With increased pressure on the entire healthcare landscape, including labs, hospitals and other healthcare services, digital health proved to be a gamechanger. The focus was on enhancing patient experience and bridging gaps in access through holistic & personalised solutions, regardless of location. It played a key role in identifying hotspots, contact tracing, improving access to testing, e-consults and vaccine registrations.

At Fortis Hiranandani Hospital Vashi, we were assigned to become fully dedicated COVID-19 hospital for which, we had to change our infrastructure in shortest span of time. To provide contact-free health services, we incorporated a pre-registration link for patients. We set up isolation facilities and assisted medical practitioners in treating patients. For our in-patient services, we created a digital network for patient-provider-relative interaction and counseling. This was mainly done for COVID19 patients and their relatives. At patient bedsides, we installed Alexa-like devices to enable interactivity with patients through minimum contact but constant communication. This also helped patients to deal with isolation. Apart from this, we came up with a digital OPD clinics to help patients stay connected with their doctors through video consultations and get valuable feedback to continue treatment regimes. Additionally, we are seeing a range of digital mediums being made available to patients and providers today that improve clinical outcomes - such as hospital@home, E-ICUs and remote health monitoring systems. All these changes have involved huge investment but this is certainly worth the weight. The results are noteworthy as we see a huge improvement in patient experiences as well as accessibility to healthcare.

Going forward, these transformations are only going to redefine healthcare. In this digital journey, we will no longer distinguish between digital and non-digital care — both will be integrated in healthcare delivery and that's where a patient will benefit the most.

Top trends in the hospital infrastructure sector: Technology emerges as a key driver

Dr Rajendra Patankar, CEO, Jupiter Hospital highlights the new trends which will take the Indian healthcare business forward

Over the years, India has made significant progress in improving hospital infrastructure in terms of its physical, human and technological manifestations. Hospitals are an integral part of a robust healthcare delivery system and to meet the growing demand for quality and patient-centric healthcare, setting up world-class infrastructure becomes a very critical component. For a robust hospital infrastructure, proper integration of people, processes, and technology plays the most important role. Moreover, the ongoing COVID-19 crisis has also flagged the importance of robust hospital infrastructure to meet the challenges of population health management during an epidemic or pandemic.

It is widely admitted that India's hospital infrastructure, in public and private domains, has not been able to meet the challenges of quality healthcare delivery for all. The Indian healthcare business is beset by a massive demand-supply gap, with only 1.3 hospital beds per 1,000 inhabitants, far less than the World Health Organization's recommended 3.5 beds.

The hospital industry or providers in India accounting for 80 per cent of the total healthcare market, is growing at a CAGR of 16-17 per cent and is expected to reach USD 132 billion by 2023 from USD 61.8 billion in 2017. The sector is witnessing a huge investor demand from global as well as domestic investors.

Big tertiary and quaternary care hospitals, accredited by the National Accreditation Board for Hospitals & Healthcare Providers (NABH) which is a constituent board of Quality Council of India, have emerged as pioneers in innovation and technology. These hospitals adhere to the use of leading-edge modalities for the state-of-the-art, precision-based treatments, that are at par with international standards. They are providing the best infrastructure, technology, quality and skillsets. With the 'Patient First' maxim, the majority of them have grown successfully over the years with philanthropic ideals and a compassionate business model.

> Telemedicine's rise, as well as government initiatives such as e-health, combined with tax perks and incentives, are propelling India's healthcare business forward

The hospitals thrive towards improving the healthcare scenario by adhering to stringent benchmarks when it comes to offering the finest quality care. They are well equipped, be it in terms of the cutting-edge diagnostic facilities, state of the art infrastructure, integrated treatment plans or up to date approaches. They have carved a niche in providing quality care with their multiple centers of excellence. India's status as a popular medical tourism destination has been bolstered by the presence of world-class facilities and highly experienced medical experts.

New trends

◆ Health institutions are adopting several kinds of technologies. They are using newer technologies that are purely for clinical use. Newer X-rays, MRIs, robots, radiation and minimally invasive surgery, for example, all improve clinical results. Clinical Decision Support Systems (CDSS), which are the 'Artificial Intelligence' systems of medicine, are known to improve patient outcomes.

◆ Hospitals have put in place practical tools like IT-driven processes and procedures. There has been widespread adoption of productive technology that is being used by providers' employees to enhance productivity. They have also adopted technologies such as data analytics and data related tools which support in making hospital management systems robust. To put in place an efficient system, providers are collaborating with medtech, digital companies, and efficient supply-chain logistics.

◆ Providers are keeping a close eye on how the clinical treatment is being given. They have integrated entire settings and services with an efficient information system with collaborative disruption. Providers have their way of collaboration with medtech, pharma, insurance and other supply chain logistics among others which manages the entire continuum of care from admission to discharge.

◆ Global and domestic demand for quality and cost-effective healthcare services is growing. Hence, disruptive trends provide huge opportunities to all stakeholders including providers, insurance companies and med-tech players. It brings in efficiency with optimal utilisation of people, processes and new technologies. Old equipment will be replaced by new ones. At hospitals, all assets, resources and technologies are now being used sensibly.

◆ In 2020-21, the entire world witnessed COVID-19 pandemic that called for expansion of ICU beds and ventilators. Indian health institutions both in the public and private sector rapidly enhanced their capacity. Now, health institutions have found ways to utilise their doctors and infrastructure in a balanced manner to offer the best medical care across specialties. Big hospitals across the country ensure enhanced patient comfort and experience.

Major growth drivers

◆ The healthcare sector has the potential to be amongst the highest revenue and employment generator for the country. The private healthcare sector in India has the potential to generate huge employment and attract significant investment to address both the immense domestic and international demand for high-quality healthcare at affordable prices.

◆ New technologies such as Robotic process automation (RPA) improve efficiency and reduce costs.

◆ Non-Communicable Diseases (NCDs) account for 50 per cent of the disease burden and 60 per cent of all deaths in India. With increasing life expectancy, the burden of these diseases is expected to grow even further.

◆ The Union government aims to spend 5 per cent of GDP on the healthcare sector. Higher government spending is closely linked with better hospital infrastructure in rural areas as well. Moreover, 100 per cent FDI is allowed in greenfield and brownfield projects and this mover is enabling growth. Ease of doing business is yet another policy reform.

◆ Along with advanced medical technologies and equipment, wider adoption of digital health is yet another growth driver. Telemedicine's rise, as well as government initiatives such as e-health, combined with tax perks and incentives, are propelling India's healthcare business forward. In terms of modernising hospital infrastructure, digital health has been a catalyst.

The pandemic has brought along a digital revolution in the industry

Dr Mradul Kaushik, Senior Director-Operations and Planning,Max Healthcare talks about the technology and role of better medical infrastructure in the future

The healthcare systems across the world are struggling with an unprecedented and extremely volatile situation since 2020 beginning. A viral infection that started as a point source disease in late December 2019, had assumed pandemic proportions by April 2020 and inundated the healthcare systems across the world with unique and unforeseen challenges, with many of the developed nations grappling with their health crisis, wave after wave.

The pandemic exposed the fault-lines in public health systems with the resultant near collapse of the healthcare delivery mechanisms, world over.

COVID-19 pandemic highlighted the role of private healthcare players and brought it to the fore. In the year 2022, focus of the healthcare industry will be on improving its digital offerings, enhanced medical infrastructure to handle any surge (or likely wave) in COVID cases, catering to the pent-up demand for medical international travel (medical tourism) and provide access to quality medical services from the safety of home with @home services.

Increased digitisation

Before the pandemic began, digital initiatives in the healthcare space were on the periphery and merely used as a support function for the business. The pandemic has brought along a digital revolution in the industry, pushing all such initiatives to the centre.

Max Healthcare introduced a robust IT-enabled teleconsultation service to ensure continuity in clinical management for all our non-COVID patients. It was during periods of stringent lockdown, we understood that patients will need support in accessing healthcare services. An app-based tele-consult platform was introduced, which allowed patients to consult their clinicians remotely. Max Healthcare served over 3,00,000 patients remotely during the pandemic and which continues till date. There has been a paradigm shift in the way patient access healthcare and tele-consults and remote management of patients is here to stay and will continue to grow even as we return to normal times. Technology in this space will continue to evolve and improve making it easier and convenient for patients to access healthcare from the safety of their homes. In the coming year we expect to provide more convenient and easily accessible services through a 'super app' which will help access all services (consults, diagnostics, @home) from mobile devices.

Medical infrastructure & trained HCWs

During the second wave of COVID-19, hospitals faced critical shortages including that of oxygen supplies and critical care beds. Most private healthcare providers including Max Healthcare has set up supplementary oxygen plants across our network hospitals to augment critical oxygen supplies and to reduce our dependence on external oxygen sources. These will serve as a back-up in case the hospitals face future oxygen supply disruptions.

The pandemic also taught how quickly we required to convert existing infrastructure into safe and modular isolation areas for the needs of our patients. Processes have been put in place to ensure that in cases of future exigencies, hospitals are flexible to segregate COVID and non-COVID patients, ensuring safety of all patients. All of our hospitals have also enhanced critical care beds (including paediatric ICUs) and ensured training and retraining of the staff responsible for manning these areas. we are confident that these steps will be of lasting value in taking care of seriously sick patients in the future. We are sufficiently prepared in terms of oxygen requirements including our LMOs, O2 generators as well as concentrators, in case there is any surge.

Hospitals also saw a larger demand from patients in opting for minimal invasive and Robotic surgeries that helped patients recover faster thereby shortening their hospital stays. Acceptance of Robotic surgeries by insurance companies has also helped patients in opting for this safer modality which promises immense scope in the years to come.

Healthcare workers

During this pandemic, organisations recognised their most valuable asset to be trained healthcare workers. As a result, ensuring their safety and mental wellbeing is amongst the top priorities. Hospitals including Max Healthcare have paid detailed attention in training of their healthcare workers. Such resources can be mobilised in times of emergencies and are the most valuable asset of any healthcare infrastructure.

Homecare

Home healthcare is a relatively new concept in the country, with its recent widespread proliferation largely driven by the pandemic. The company, through its business division, Max@Home offers a comprehensive range of 17 services including nursing & attendant care, ICU/dialysis, x-ray at home, physiotherapy at home, sample collection, medicine delivery etc., and has managed to successfully treat close to 3,000 COVID-19 patients at home during the pandemic. The key learning has been that these services will continue to add value to patients even in normal times.

Homecare segment has immense potential and we do see larger fulfillment of patients when recovering from their homes. We also expect patients to become more discerning about the medical quality aspects and thus able to make informed choices.

We anticipate a higher number of patients of who require care from the confines of their homes in case of a surge in infectious diseases to choose homecare services. Hence, we have ramped up our homecare services to provide much needed services at their doorstep and within confines of their home

Health insurance and preventive health checks

We also witnessed higher penetration of TPAs and Corporate insurance during the pandemic and also increased awareness/ concerns about health in general. We expect more and more people to accept health insurance as way of life and obtain appropriate and adequate insurance cover for themselves and their families. Healthcare providers will need to work far more closely with health insurance companies to adequately educate and assist patients. We look forward to enhancing our partnerships with health insurance providers and deliver seamless services to our patient. The country needs a unified health insurance exchange to bring transparency and convenience in getting treatment from empaneled hospitals.

Medical value travel

With re-opening of international flights, we expect medical value travel to pick up significantly in the year 2022. Travel restrictions during the pandemic led to delay in surgeries and resulted in deterioration of the patients' health conditions. As a downside, a larger chunk of international patients arriving, require urgent surgical interventions.

Ayushman Bharat-Long live 'Indian Healthcare'

Dr Avinash Supe, Director-Clinical Governance, P D Hinduja Hospital and Medical Research Center, Mumbai talks about Ayushman Bharat and highlights its journey so far and road ahead

Healthcare sector in India is a spectrum of contrasting landscapes. At one end of the spectrum are the glittering and glassy corporate hospitals delivering high tech, high cost medical care to the affording, mostly urban Indian. At the other end are the neglected health posts in the remote corners of the "other India", trying desperately to live up to their identity as health sub-centres, waiting to be transformed into shrines of health and wellness. India began with a glorious tradition of public health, as seen in the references to the descriptions of the Indus Valley civilisation (5500–1300 BCE) which mention "Arogya" as reflecting "holistic well-being." Surgeons like 'Sushruta' and Physicians like "Charaka" were world renowned epitomes of Indian healthcare systems. The Chinese traveller Fa-Hien (tr.AD 399–414) takes this further, commenting on the excellent facilities for curative care at the time. The British brought allopathic treatment into India, and medical colleges started in 1835. Today, we are a country of 1300 million people who present an enormous diversity, and therefore, an enormous challenge to the healthcare delivery system.

In the post-independence era, until 1990, Indian healthcare was mainly dominated by large public hospitals run by governments and public sector institutions like corporations, ESIS, railways etc. and small nursing homes run by private individual practitioners. It was after the 1990's when liberalisation took place, that the government allowed privatisation of higher education and health. This was the time when large, multi-specialty corporate hospitals started growing in India. Over the years, government health expenditure reduced and public health measures did not cope with the needs and started crumbling down due to shortage of manpower, poor amenities and woefully inadequate budgets.

Major challenges of healthcare in India

- ◆ Inequitable access to healthcare especially in light of the rural and urban divide
- ◆ Lacunae in awareness about important issues regarding personal and community health
- ◆ Shortage of human resource in healthcare both numbers as well its distribution
- ◆ Inadequate public funding for health: Low central and state funding for health
- ◆ Affordability or the cost of healthcare: Almost 75 per cent of healthcare expenditure comes from the pockets of households, and catastrophic healthcare cost is an important cause of impoverishment, in the sector.
- ◆ Lack of accountability for quality in healthcare

Ayushman Bharat expansion and Indian healthcare

The Central Government's health insurance scheme, the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (AB-PMJAY), aims to extend hospitalisation cover of up to Rs 5 lakhs per family per annum to the country's nearly 50 crore poor, vulnerable population. Apart from this and the State level government health insurance schedules, small segments of the Indian population are covered under social and private health insurance schemes and this has definitely provided some relief to the poor segment in the country. The government recently discussed about the population called the 'missing middle'; sandwiched between the poor and the affluent. The NITI Aayog report entitled "Health Insurance for India's Missing Middle" proposes voluntary, contributory health insurance dispensed mainly by private commercial health insurers, as the prime instrument for extending health insurance to the 'missing middle'.

In-patient and out-patient care

No country has achieved Universal Health Coverage (UHC) by relying mainly on private financial sources of healthcare. For hospitalisation insurance, a model similar to the Arogya Sanjeevani, with lower projected premiums of around Rs 4000 - Rs 6000 per family per annum, for a sum insured of Rs 5 lakhs for a family of 5 is being proposed. There would be a standard benefit package for all, and the insured sum will be between Rs 5 lakhs and Rs 10 lakhs. Insurance will be dispensed largely by commercial insurers. This model is similar to commercial private insurance, except for lower premiums, which are achieved by reducing administrative costs of insurers through an array of measures, including private use of government infrastructure and switching to lower-powered modes of physician payments.

The low premiums are not achieved due to government subsidies or regulations. This model is vulnerable to almost every vice that characterises conventional private insurance. For example, in Switzerland, despite relying on private insurers and a competitive model of insurance, certain important checks and balances exist where benefits are etched in legislation, basic insurance is mandatory and not-for-profit, cream-skimming and risk-discrimination are prohibited. The model is likely to be characterised by widespread adverse selection. The report also proposes OPD insurance with an insured sum of Rs 5000 per family per annum. However, the OPD insurance is envisaged on a subscription basis, meaning that the insured families would need to pay nearly the entire insured sum in advance to obtain the benefits.

Any cost saving or benefits that accrue, would be due to using low-powered physician payment modes and an integrated and coordinated pathway of care. Their contribution will be nominal and partly be offset by the administrative costs involved in insurance.

The coronavirus disease-2019 (COVID-19) was an unanticipated and unexpected public health emergency which had social, economic, mental and political implications. The COVID pandemic has brought to the forefront the need for strengthening of preventive healthcare services. COVID-19 has exposed weaknesses in our system and glaringly highlighted the need to remain prepared for a few more such national emergencies. Building competent doctors and skilled nurses is the need of the hour. Every one also realised the strengths of public healthcare system in India where, the Indian government took immediate measures for the containment, reduction and prevention of COVID-19. Development of jumbo facilities and the massive vaccination program are other examples of our strengths. Hence, government must continue to develop and maintain public health sector for tackling such emergencies in the coming years. A national level, well-co-ordinated response was seen in increasing the national capacity for the production of medical equipment, drugs, diagnostic, and preventive kits.

"Atmanirbhar Bharat" was a much-needed impetus to the indigenous industries related to essential medical supplies, pharmaceuticals, and vaccines including new vaccine development.

COVID times also made us realise that we focus more on treatment rather than prevention. There is a need of a dedicated cadre for public health in India. One should use this opportunity to build health facilities and preventive health programs. We should aspire for a healthcare system in which most people do not pay out-of-pocket for most healthcare needs. Resources are always a key issue in consideration of universal healthcare, especially in India, where the proportion of GDP spent on healthcare is low compared to other middle-income countries. However, emphasising prevention, strengthening of health infrastructure network, increasing human resources, producing own cheaper consumables and expansion of "Ayushman Bharat" will make healthcare accessible and affordable to the common Indian citizen.

A number of foundational shifts are arising from and being exacerbated by COVID-19 spread

Sudish Sharma, Executive Partner, Lakshmikumaran & Sridharan Attorneys shares his views on major trends which will address the requirements for clinical diagnosis, treatment, and disease management

Overview

With COVID-19 pandemic having a huge impact on mortality rates and healthcare system, India has seen numerous reforms and is further expected to see new reforms in the healthcare sector. COVID-19 is placing enormous strain on the global healthcare sector's workforce, infrastructure, and supply chain, and exposing social inequities in health and care. The major trends include new technologies and solutions that address the requirements for clinical diagnosis, treatment, and disease management. A number of foundational shifts are arising from and being exacerbated by COVID-19 spread. For instance, consumers' increasing involvement in healthcare decision-making; the rapid adoption of virtual health and other digital innovations; the push for interoperable data and data analytics use; and unprecedented public-private collaborations in vaccine and therapeutics development. The advancements in the healthcare industry range from e-consultations, telemedicine, real-time diagnosis to accessing digital therapeutics provided by immersion technology tools. Amid these dynamics, governments (both at Central and State level), healthcare providers, payers, and other stakeholders around the globe are being challenged to quickly pivot, adapt, and innovate.

The launch of Ayushman Bharat Digital Mission's unique Health ID and unified electronic medical records for all citizens will become the backbone of the healthcare infrastructure of our country

Recent health sector reforms in India

◆ **Proposed new drugs, cosmetics and medical devices bill:** A high-level Government committee was constituted to draft New Drugs, Cosmetics and Medical Devices Bill which will be used for governance of health sector. Medical device industry has asked for Medical Devices Technical Advisory Group (MDTAG) representation in this high level committee. An inclusive framework of industry experts and representatives in this expert network is required and will help in a holistic understanding of all issues and perspectives while framing the new act as drug is a chemical product whereas medical device is an engineering product. Therefore, it is most inappropriate to regulate medical devices by the pharmaceutical authorities. This participation will prevent non-compliance of regulatory frameworks by the hospitals, pharma companies, laboratories and other medical institutions and lead to better corporate governance which will advance the health care sector in India.

◆ **Telemedicine Practice Guidelines:** Telemedicine is the use of information and communications technologies to improve patient outcomes by increasing access to healthcare and medical information. The high volume of patient load (millions) on a few doctors (thousands) may burden the whole system and reduce its efficiency. Telemedicine or virtual consultation will enhance patient experience and engagement; fewer tests would be prescribed; the rate of hospital re-admission will be less; better medication and patient adherence would lead to desired clinical outcomes. According to a study conducted by the WHO, 59.2 per cent of all health workers are located in urban areas, where 27.8 per cent of the population resides, and 40.8 per cent of all health workers were in rural areas, where 72.2 per cent of the population resides. Telemedicine can help smooth over these inequalities by allowing doctors in urban areas consult the rural population, including providing specialised care as necessary. The Telemedicine Practice Guidelines were issued in March 2020 to provide guidance to healthcare practitioners on the practice of telemedicine in light of the COVID-19 pandemic.

◆ **Regulating e-pharmacies in India:** There is no statutory definition of "e-pharmacy" either under the Drugs and Cosmetics Act, 1940 or the Pharmacy Act, 1948. It has been contended that e-pharmacies or online pharmacies create risks of forged prescriptions and exploitation of prescription drugs for the end customer. At present, the vexed regulatory issue remains pending on two fronts. First, before the country's higher judiciary owing to interim orders in matters such as Dr. Zaheer Ahmed v. Union of India and Practo Technologies v. Tamil Nadu Chemists and Druggists Association. The provisions of the Information Technology Act, 2000 along with its rules as well as The Consumer Protection (E-Commerce) Rules, 2020 are also applicable to e-pharmacies and its portal. In 2018, the Ministry of Health and Family Welfare vide its notification G.S.R. 817 (E) dated August 28, 2018 came out with a draft to amend the Drugs and Cosmetics Rules, 1945. However, the same has not been notified yet and therefore, awaits enforcement. The draft rules provide two relevant definitions, which are "e-pharmacy" and "e-pharmacy portal" and mandate the registration of e-pharmacies. Once brought into effect, the above clarity would help to settle the debate.

Boosting India's digital health infrastructure

The Government of India is planning to increase public health spending to 2.5 per cent of the country's GDP by 2025. Additionally, the launch of Ayushman Bharat Digital Mission's unique Health ID and unified electronic medical records ("EMR") for all citizens will become the backbone of the healthcare infrastructure of our country. People or citizens or a person will have access to their health records at their fingertips; anytime and anywhere. EMR will enable ease of capturing data and transferability.

India has a bigger role to play in worldwide medicines and medical devices' security and availability

Nakul Pasricha, President, Authentication Solution Providers' Association (ASPA) shares his views on ways to strengthening of Indian healthcare ecosystem

Playing a critical part in the world healthcare ecosystem, India has a bigger role to play in worldwide medicines and medical devices' security and availability. While we are talking global patient care, we must address the issues in the country e.g., low ranking in health and survival, domestic regulations, hoarding, and falsified medicines *. Developing a strong authentication and traceability eco-system can benefit the Government of India in following strategic priorities going to contribute to India's health agenda.

Accelerating progress on Universal Health Coverage- Need for strengthening current procurement and supply chain systems

The Government of India has announced a Rs 69,000 crore outlay for the health sector that is inclusive of Rs 6400 crore for Prime Minister Jan Arogya Yojana (PMJAY) in Union Budget 2020-21. In the health sector, there is an instant need to secure and strengthen the current supply chain to reduce the circulation of counterfeit and substandard medicines and medical equipment. Currently, there are more than 3,600 Jan Aushadhi stores across the country. It is vital that any plans to scale up the number of stores also ensure security and streamlining of the entire supply chain. It will not only ensure the delivery of quality medicines to the patients but will also help build confidence in the patients' minds regarding the Pradhan Mantri Bhartiya Jan Aushadhi Pariyojana Kendra (PMBJP). There is no way to track products beyond the Bureau of Pharma PSUs of India (BPPI) warehouse up to the Jan Aushadhi Kendras (JAKs), which makes the system vulnerable to spurious and substandard medicines sneaking into the system. There is a need to link good health with good economics and it cannot be achieved without investing in strong authentication and traceability measures at all important stakeholders' points. One of the important aspects of good healthcare systems is providing safe, quality, and affordable medicines to the people of India.

Enhance India's global leadership in health assuring quality made in India products

During the COVID pandemic, we have again emerged as one of the vital pharma and medical product manufacturing serving global patient care, providing essential medicines, PPE kits, masks, and vaccines to the countries efficiently, in a short period while adhering to GMP and quality regulations. However, there is always a risk from the issue of Substandard, Spurious, Falsely labelled, Falsified, Counterfeit (SSFFC) medical products. In 2011, the Indian Government implemented traceability solutions for exports and the pharma industry adheres to international standards and authentication protocols. Unfortunately, the domestic regulations and legal structures are not as well defined as required. Lack of this structure and gaps in implementation gives criminals a chance to take advantage of the system by plaguing it with substandard, falsified, spurious, or counterfeit medicines and medical equipment. Making the whole system sick from the inside and weakening its ability to attend to patients properly. It also robs the end-users of their right to good quality medication, damages the reputation of the healthcare system, harms brand equity of pharma companies, and erodes public trust in the healthcare system. The surge in spurious drugs in the country is not only a potential threat to the lives of its citizens but also dents its image as being one of the largest suppliers of drugs and pharmaceuticals in the world.

India is a member state of the WHO policy group on eradicating falsified medicines and products, and this is the right time to show the global world our commitment towards high-quality products. Clearly defined mandatory regulations regarding secure packaging, authentication solutions implementation and robust track and trace mechanism from the government are the foremost actions required. The regulator can encourage and create incentives for genuine manufacturers and sellers of products in high demand to reduce the scarcity, adoption of authentication solutions and thus drive down the profitability for counterfeiters. Health must be our top priority and the government must ensure that consumers are not duped by counterfeit products.

Reference:

(Source: World Economic Forum, https://medicaldialogues. in/india-slips-to-150th-rank-in-health-care-world-economic-forum)

Infrastructure-The key to healthcare improvement

Dr Azad Moopen, Founder Chairman and Managing Director, Aster DM Healthcare talks about how emerging technologies could transform the management of long-term health conditions, improving patient outcomes whilst relieving the pressure on the existing healthcare infrastructure

The pandemic was a wake-up call for the healthcare sector; shortage of beds, life-saving medicines, oxygen and other medical supplies exposed the crumbling infrastructure in both urban and rural areas.

It showed the dire need for an overhaul of the healthcare infrastructure and the strengthening of public and private hospitals. This requires all the stakeholders to come together and work on a long term plan, not just a stop-gap solution. From building new hospitals in rural and semi-urban regions, increasing bed capacity in urban regions, training paramedics and technicians to serve India's increasing population and plugging the ever increasing talent gap, a strengthened infrastructure needs to be put in place to serve the needy. As the memories of the second deadly wave continue to haunt us, we all should come together to innovate and upgrade the healthcare infrastructure.

Public-private partnership (PPP) is the need of an hour to encourage investment in rural areas and semi-urban cities

Government push

Since the start of the pandemic in 2020, the government has made several policy decisions. Currently, the government is considering at least $6.8 billion (Rs 50,000 crores) in credit incentives to improve health care infrastructure in response to the Coronavirus. The programme will enable hospitals to access funds to ramp up hospital capacity or medical supplies, where the government will act as a guarantor. This will also strengthen the health infrastructure in smaller towns and cities.

The introduction of Ayushman Bharat's Digital Health ID for the citizens will act as a backbone of the health infrastructure through a unified electronic medical record. Under this programme, data will be collected and made easily accessible. This will not only help strengthen the infrastructure but also provide quality healthcare via telemedicine channels.

It will also help define the future of how healthcare is accessed by the population. The data gathered from the records will help provide population and disease trends which can enable the government and private sector to introduce early interventions and prevent diseases from progressing into severe stages. This will help specially with cancer care and other genetic diseases.

These were much-needed interventions, as they will provide health coverage to the growing Indian population.

Current trends

Healthcare tech infrastructure

During COVID-19, the battlefield was set in the intensive care and critical care unit of hospitals. Faced with a shortage of beds, hospitals set up eICUs. The integration of eICUs will help mobilise intensivists from bigger cities to treat critical and complex cases and deliver quality care to patients in smaller towns, and even in villages.

With the digitisation of healthcare across the value chain- consultation, diagnostics, patient admissions and management, discharge and follow-ups can be simplified and the process can be accelerated, saving time for doctors and paramedics. Patient data can be effectively collected and analysed, reducing the turnaround time and improving efficiency. COVID-19 fast-tracked digitalisation by introducing virtual consultation and remotely treating patients, effectively.

Implementation of electronic medical record systems and lab information systems at healthcare facilities will ensure that patient data is easily accessible to the doctors and patients will also be able to view their lab results from home.

Hospital infrastructure and hospital design

The shift in the healthcare ecosystem has prompted the industry to tackle long-term challenges, as seen during the pandemic. Though complex, healthcare facilities should always aim to improve the patient experience and outcomes. This includes maintaining high levels of cleanliness and infection control while efficiently providing facilities to patients and their families.

During COVID-19, a plethora of challenges surfaced in hospitals in India; staff were jostling to implement COVID safety protocols while handling the surge of patients. Infection control is one of the most critical aspects hospitals have to consider while planning operations to ensure the safety of both patients and staff. Along with the flexible design, a proper HVAC system has become an essential requirement for all hospitals to tackle any future airborne pandemics.

During the pandemic, we witnessed a shortage of beds and advanced equipment; this has established the need to 'emergency-proof' our healthcare system. Several corporate hospitals are now focusing on building facilities in tier- II and tier-III cities in alignment with government efforts to improve accessibility.

One of the major issues faced during the pandemic was the disruption of medical supplies and the breaking down of many important areas due to lack of beds, ICU etc. There is a requirement of capacity building in such areas by proactively stocking essential requirements and medicines so that such unfortunate situations can be avoided.

There is a stark disparity between the infrastructure available in urban and rural areas. Public-private partnership (PPP) is the need of an hour to encourage investment in rural areas and semi-urban cities. In the meanwhile, technology could be harnessed through tele-consults, remote monitoring and similar digital systems to focus on bridging the accessibility gap. There is an urgent need to expand the skilled medical workforce; boosting the number of doctors, nurses and accredited medical facilities. Filling up vacant positions will help in bringing down the burden to the existing ecosystem. The inconsistency between manpower and infrastructure capabilities should be improved to enhance overall efficiency.

Overall, emerging technologies could transform the management of long-term health conditions, improving patient outcomes whilst relieving the pressure on the existing healthcare infrastructure.

The demand for insurance is expected to keep rising and even peak during potential waves of the virus

Jonathan Sternberg, Chief Business Officer, Medix Global talks about the key trends that will shape the Indian health insurance landscape in 2022

Over the course of the last year, India's vaccination program picked up pace and as the number of active cases began to ebb, we saw an easing of lockdown restrictions spurring economic recovery. However, the Omicron variant is a reminder that for now COVID-19 is still very much here. Despite the pandemic related economic concerns, the health insurance industry is anticipated to grow in 2022.

In 2021, the industry found its footing as it managed to adapt with many firsts due to the pandemic. Most importantly, the industry turned from push to a pull industry. Consumers now realise the importance of having adequate health insurance against any unforeseen medical expenses. In fact, having health insurance for access to quality and affordable healthcare for themselves and their loved ones is a top of mind concern. A growing middle-class, that is increasingly conscious of its health, is expected to further boost the demand for health insurance coverage and drive penetration.

Here are some key trends that will shape the Indian health insurance landscape in 2022:

Insurance sector is poised for growth in 2022

Due to increased awareness of health and protection, the demand for insurance is expected to keep rising and even peak during potential waves of the virus. The pent up spending and increasing economic recovery will also aid growth as more consumers upgrade their existing health insurance policies to higher insured sums.

As consumers too begin to take a closer look at the industry's offerings, insurers will do well to focus on improving the customer experience by ensuring that they find the right balance between the digital offering and a human touch

Evolving demand for personalised and comprehensive covers

Consumers across all demographics, not just millennials, are seeking greater personalisation and a frictionless experience with providers in their journeys to find, purchase and access care.

In the last few months, consumers who bought COVID-specific policies are porting to more comprehensive health insurance plans. According to data available, more than 20 per cent of COVID policy buyers have already upgraded to more comprehensive health insurance plans.

A proactive preventive approach to healthcare for lifestyle and specific diseases will also provide much needed relief from overloading and in turn streamline the healthcare system of the country.

Talent management will be key

As we are already seeing the trend in corporate India, employers need to move towards employee benefits which put the employee at the center and provide tangible health related tools. This includes health coverage but also access to support services to help maintain their physical and emotional wellbeing. Recent discussions with CHROs from the country's largest employers show that employee health is a main focus for 2022, supporting employee retention, satisfaction and productivity.

Insurers will have to find ways to balance technology with providing a human touch

Information technology is digitally transforming and adding value to healthcare like never before. Machine learning, blockchain, digital twins, immersive reality, cybersecurity are some of the new age technologies coupled with digital healthcare, EMR, mobility and remote telemedicine are providing an enriching, secure and holistic journey with best health outcomes for the times to come.

As consumers too begin to take a closer look at the industry's offerings, insurers will do well to focus on improving the customer experience by ensuring that they find the right balance between the digital offering and a human touch. In line with the nation's Digital Health Mission, insurers are also looking at new and innovative digital solutions to support their members.

Retail health is likely to surge in term of penetration and revenue

Shreeraj Deshpande, Head-Health businesses, SBI General Insurance highlights the key megatrends that will shape the segment

The outbreak of COVID 19 compelled people to assess their health as well as their financial readiness to deal with unforeseen medical emergencies. Obvious fear of a significant financial drain due to hospitalisation for COVID-19 treatment has emphasised the importance of having adequate health insurance. People have realised that conventional means of paying for hospitalisation expenses, such as personal savings or borrowings, cannot be relied on to cover huge medical costs.

The COVID-19 pandemic had a significant impact on the Indian health insurance industry. Individuals and businesses seeking health insurance, as well as insurance companies, must adjust in distinct ways to the unfamiliar order of minimal face-to-face encounters. Moreover, people have grasped the need of having a solid financial backup in the event of a medical emergency and have become increasingly concerned about being adequately insured for their own health and that of their family members.

There is a fast-paced transformation happening aided by increased adoption of technology. Insurers will now emphasise more on service differentiation rather than product differentiation

Rising awareness of health insurance

When we look at the numbers in the aftermath of the pandemic, the importance of the health segment becomes clear both in terms of premium share and growth. Closer examination reveals that retail health, which accounts for over half of all health insurance, grew by 28 per cent. The pandemic has accelerated this growth and boosted awareness, and health insurance is on track to overtake motor insurance and take control of the sector soon. As the pandemic has shown, out-of-pocket spending can force people into economic crises, there will be an increasing focus on accessing non-metros and semi-urban areas.

Greater adoption of technology and innovation

On the other side, if you overlook at the obvious impact of the deadly pandemic, it has certainly forced companies to innovate and transform like never. Whether it is product front, distribution channel front or service front. There is a fast-paced transformation happening aided by increased adoption of technology. Insurers will now emphasise more on service differentiation rather than product differentiation. The customer understands the product only when he uses the service for a claim. Hence influencing the customer's perception at the service touchpoint will be under greater focus rather than the purchase touchpoint in the evolving health insurance market.

Leveraging big data, artificial intelligence and machine learning for enhancing customer experience

While on the product front, insurers are increasingly motivated to provide easy-to-understand products catering to specific segments, seamless journeys for customers, a radically increased emphasis on digital, and the adoption of AI/ML-based technologies across the value chain. Insurers have become more informed because of the vast population and availability of digital data. Lifestyle, health, and related data-driven intelligence has significantly improved insurers' ability to offer relevant health insurance propositions to consumer segments. Value-added services such as wellness programmes are also gaining traction, indicating a shift toward a service ecosystem approach.

In a nutshell, following are the key megatrends that will shape the segment:

- Health will be the fastest growing non-life industry segment
- Retail health is likely to surge in term of penetration and revenue
- Increased adoption of technology by insurers, particularly Artificial Intelligence (AI) and Machine Learning (ML), in underwriting and claims settlement
- Insurers will consider increasing the value proposition for customers through easier purchase/simplified processes and faster claim settlement
- Increased usage of digital means for business procurement by intermediaries would aid in the acceleration of digital transformation
- With a focus on wellness, new and simpler products are introduced
- Insurers will have to differentiate themselves through service levels and ease of use

Health insurance is the need of the hour

Dr Sameer Kulkarni, Regional Director, Paras Healthcare highlights why insurance will keep playing a crucial role in healthcare sector

The expansion of health insurance coverage is a crucial step in India's efforts to achieve Universal Health Coverage (UHC). In the public sector, low government expenditure on health has constrained the capacity and quality of healthcare services. As a result, nearly two-thirds of the population is diverted towards seeking treatment from the costlier private health sector. However, due to the lack of financial protection, they have to bear high out-of-pocket expenditure (OOP). Even the poorest and least educated people in both rural and urban settings consult private practitioners more than government practitioners and spend about twice as much on treatment from them than from government practitioners. Health-related costs have pushed many low and middle-income households into poverty. It is estimated that OOP expenses are responsible for the deepening of poverty in both rural and urban areas, pushing between 32 million and 39 million Indians into poverty every year. Hospitalisation is presumed to be the most important cause of health related impoverishment in India, but research has revealed that expenditure on drugs is actually the largest component of OOP payments, accounting for 61 per cent to 88 per cent of the total OOP spending. Thus, payment of healthcare costs through health insurance emerges as an important tool for risk-pooling and safeguarding against catastrophic expenditure from health shocks. Finally, health insurance can also improve the efficiency of healthcare provision.

Increased health insurance coverage can also reduce catastrophic and impoverishing health expenditure by imposing a ceiling on the maximum health expenditure incurred by an individual or household

Why health insurance is the need of the hour

The Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) launched in September 2018, and State Government extension schemes, offer comprehensive hospitalisation cover to the bottom 50 per cent of the population (nearly 70 crore individuals). Around 20 per cent of the population – 25 crore individuals are covered through social health insurance, and private voluntary health insurance. The remaining 30 per cent or 40 crore individuals is devoid of any health insurance. This uncovered population is termed as the missing middle. The missing middle is not a monolith – it contains multiple groups across all expenditure quintiles in both urban and rural areas. In the absence of a low-cost health insurance scheme, the missing middle remains uncovered despite their ability to pay nominal premiums.

The healthcare sector in India is characterised by low government expenditure on health, high out-of-pocket expenditure (OOPE), and low financial protection for adverse health events. India's spending on health at 1.5 per cent of GDP is among the lowest in the world. Persistently low spending on health has constrained the capacity and quality of healthcare services offered in the public system. Overburdened public hospitals often divert patients to seek treatment in the costlier private sector. Almost 60 per cent of all hospitalisations, and 70 per cent of out-patient services are delivered by the private sector.

With the help of health insurance, the high level of OOPE in India can be avoided to provide greater financial protection against health shocks, improve efficiency and delivery of healthcare for better health outcomes. Increased health insurance coverage can also reduce catastrophic and impoverishing health expenditure by imposing a ceiling on the maximum health expenditure incurred by an individual or household.

A comprehensive health insurance product for the missing middle should include outpatient (OPD) benefits. OPD cover will ensure that people do not avoid OPD visit to save money. Early diagnosis can result in better outcomes & prevention of need for secondary/tertiary care. The inclusion of out-patient benefits will curtail catastrophic health spending as well as lower overall costs and improve health outcomes. A combined product with both in-patient and out-patient benefits can lower overall costs and improve health outcomes. A combined product can help in the development of a coordinated or integrated care model by aligning providers at different tiers, to make sure that patients can seamlessly transition across different levels of care. The insurer can contract with providers at all levels and develop an incentive structure to facilitate linkages between them. This model can help improve efficiency by reducing redundancy and nudging patients to seek timely care at the right level. It can also improve outcomes through greater use of primary care which helps screen and manage chronic conditions early, and greater sharing of information between providers. Lowering the cost of the product, where feasible, will be important to ensure affordable prices and high demand.

Final thoughts

Health insurance is a necessity for every individual in India. A health insurance cover offers a financial safety net against expenses, which are caused because of any unplanned medical emergencies. Nowadays, when the medical inflation rates are sky-high, failing to get a sufficient health insurance plan can prove to be extremely costly and financially draining. That's why it's all the more important to invest in health insurance. The government has a key role to play in increasing consumer awareness and building consumer confidence in health insurance through information, education, and communication (IEC) campaigns, especially in hospitals.

How smart document transformation accelerates health insurance

Srini Dokka, Global Sales Head, MSB Docs talks about the importance of integrating the smart document transformation in health insurance sector

NITI Aayog in its report says that "The existing health insurance schemes can potentially cover 70 per cent of the population – nearly 95 crores individuals, though actual coverage is lower". Of these 95 crores about 11.5 per cent are covered for health insurance by the private sector at about 26 crore individuals. The remaining 88.55 per cent are covered under various government driven health Insurance initiatives as per table below from NITI Aayog report.

The private sector covered individual also forms the most well to do layer of the Indian society and are mostly catered to by nearly 43000 private hospitals of the total 69000 hospitals in India. The disproportionate share off the healthcare sector 62 per cent focussed on just 11.5 per cent of population would indicate an experience par excellence. The experience includes the capability, equipment, and service levels. The remaining 88.5 per cent of the insured population can only hope to someday avail the same level of attention and facilities.

Yet, this 11.5 per cent of insured 'haves' can often be seen to be struggling with the very foundation of private sector medical treatment-the money equation. Financing for treatment is primarily driven by medical insurance applicability and execution of this applicability. Nearly every patient struggles for a period of 3-8 hours at the time of discharge from hospitals in getting the claim process sorted. The sheer amount off effort and time wasted in this process creates all around dissatisfaction towards the hospital and the insurance company.

It is not that the hospital and the insurers are trying to unnecessary delay the process. They too spend an inordinate amount of time and resources in ensuring that the whole insurance claim process at the time of discharge is swiftly dealt with. It is the sheer amount of paperwork that needs to be completed, processed, signed, scanned, uploaded, reviewed, corrected, and approved that causes the delay.

The problem lies in the conventional method of providing discharge summary and other documents to the patients. The discharge summary is a necessary document that must be ready before the insurance claim can be addressed. It must have all the necessary details beginning with the patient's name, the prognosis and the diagnosis received, followed by description of the treatment given and the further course of treatment if any. Additional documents needed are cashless treatment approval reference, copy of case sheet, prescriptions, diagnostic reports, and complete set off bills. This entire process usually goes through the cumbersome print-sign-scan-print-store routine to obtain signatures from patient's attending doctors. Major problems in this document aggregation include delays between patient discharge summary and the manual signed discharge summary to be sent, additional inaccurate information, errors and omissions on the completed discharge summary and archival formalities of paper-based records.

In an endeavour to improve its process, Indraprastha Apollo Hospitals turned to MSB for to implement other smart document transformation. They use MSB to optimise the entire document process from preparing the discharge summary to signing, enacting, and managing them. With this implementation, Indraprastha Apollo Hospitals successfully converted its time-consuming paper-based process into an efficient, streamlined electronic signing process which not only resulted in significant savings but also enabled transcriptionists to improve their productivity and compliance. Upon the patient's discharge, the transcriptionist now uploads the completed discharge summary from EMR to MSB and assigns it to the attending doctor. MSB then automatically sends a signature request email & a push notification to the attending doctor on web and mobile, respectively who then may at once review the completed discharge summary and sign it at a click of a button or reject it suggesting for further modifications. Once the attending doctor is done applying his/her signatures, the system sends the fully executed documents to the Insurance desk for further processing. Indraprastha Apollo Hospitals thus helps delivers superior digital document experiences to customers.

A similar smart document transformation at the Insurance company would enable seamless exchange of approved and signed documents resulting in drastically reduced processing time for insurance claims. It is at their end that the documents submitted by the hospitals need to be reviewed, clarifications sought, approved, and signed for the patients claim to be processed. In time staff crunch or any personal emergency, the processing time tends to take a hit. Smart document transformation would enable the workflow and responsibilities to be managed from remote location on mobile phones, while maintaining a complete audit trail for regulatory and internal compliances.

Successful implementation in private insurance companies and private healthcare institutions will also set the ball rolling for public institutions to adopt similar processes thus enabling a complete transformation of patients' health insurance experience across India. The beneficial impact will additionally free up national medical resources from cumbersome necessity. It is thus imperative that smart document transformation is given priority in national health insurance initiative.

Table 1: Number of individuals and families eligible or covered, by health insurance scheme type

Insurance Scheme	Individuals Eligible or Covered (cr.)	Percentage of Population Eligible	Families Eligible or Covered (cr.)
Government Subsidized Schemes	69	51%	15.3
AB-PMJAY (w/o State Extension Schemes)	49	36%	10.9
AB-PMJAY State Extension Schemes	20	15%	4.4
Social Health Insurance Schemes	14	10%	3.6
Employees' State Insurance Scheme (ESIS)	13.6	10%	3.5
Central Government Health Scheme	0.4	0.3%	0.13
Private Voluntary Health Insurance (PVHI)	11.5	9%	2.6
Total Eligible or Covered (assuming no overlap)	**94.5**	70%	**21.5**
Total Population / Families	**135**		**30**
Uncovered Population / Families	**40.5**	**30%**	**8.5**

Source: NITI Aayog

Health insurance in India is set to transition from the existing indemnity model to a holistic health management system

Sanjay Vinayak, Founder and CEO, Connect and Heal talks about the key trends in health insurance sector in 2022

In recent years, the health insurance sector has witnessed steady growth due to a number of reasons – change in demographics and the perception of need among the target audience. While the rising prevalence of diseases due to lifestyle challenges, pollution and climate change were making people move towards insurance until 2019, the COVID-19 pandemic has now changed the entire landscape. Since the outbreak, the health insurance sector is witnessing major demand spike and the market currently valued at about $7 billion is set to grow 3x by 2030. There is increased cognizance of the fact that health insurance is not an optional expense, but a necessary protection. As is the case with any evolving and growing sector, some key trends have also emerged in this sector.

Changes in demand: Health insurance was considered to be a benefit offered by only the large corporates and government sector employers in the past. However, in the wake of the pandemic, even SMEs and small businesses have begun to focus on bringing their employees under healthcare coverage. Since employees falling sick could lead to business disruptions for such firms, the change in focus is timely. Not only that, there is an increasing demand for insurance services that cover outpatient medical services as well.

Wellness initiatives by insurers: A major and positive trend that we are seeing now is that traditional insurance companies are now investing in wellness initiatives for their customers. When the customers remain in good health, the number of claims go down, which is a mutually beneficial scenario for both parties. Today, the insurance regulator (IRDAI) and the insurance companies are both aiming to incentivise their customers to take care of their health. Many of such programmes are currently pilot projects or initiatives aimed at testing the waters, but the numbers are growing and we will see more of those efforts as we go along.

Rise of the health management model: The existing health insurance framework is built on the indemnity model. There are several stipulations such as waiting period for pre-existing diseases which result in leaving gaps for millions of those who hold insurance policies. Given the change in needs, health management organisations (HMOs) are now ushering in a new era of coverage wherein the insurer also takes the responsibility of managing the entire healthcare needs of the subscribers. From doctor consultations, telemedicine to emergency hospitalisation and ambulance services, the HMOs provide end-to-end healthcare support to their users. The trend has taken off in India, and it is going to be the next normal of healthcare insurance services in the years ahead.

Higher insurance premiums: Majority of the institutional insurance companies have financial limitations, and COVID-19 outbreak has increased underwriting risks significantly for them. The Government of India and IRDAI mandated the insurers to offer products like COVID Kavach, etc., which exposed them to extent higher than desired. This has resulted in insurance premiums increasing sharply in the post-pandemic times.

Digital insurance and insurtech: Insurance products were considered to be misleading until a few years back. Insurance agents would push for selling the policies without spelling out the finer prints and conditions to the people. However, now almost all major insurance companies have a network of corporate agents and online brokers/marketplace platforms that maintain transparency, drive consumer awareness and make insurance products available online.

With the focus on customer-centric operations, we are also seeing certain reforms and modifications in the way health insurance claims are processed. AI and data analytics have been key to digital transformation in most sectors and now insurance companies are also using the AI tools to improve their claim management processes. In the face of stiff competition, it is imperative that customers go to a service provider that offers the most convenient, seamless and quick insurance claim settlement. AI-based solutions are being leveraged to expedite auto adjudication of claims, flagging frauds and processing of claims.

The future

There are plenty of indicators that health insurance in India is set to transition from the existing indemnity model to a holistic health management system. A much larger number of people especially those in the tier 2 and 3 cities will increasingly buy health insurance in the new normal due to the easy access and awareness brought about by online insurance agents. With the emergence of HMOs, the insurance sector is now set to play the role of facilitator of healthcare and not just remain confined to offering financial coverage when a medical crisis occurs!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Bionet's SonoMe brings all the benefits of hand-held ultrasound device

SonoMe is a beamformer with up to 192 elements, which shows an image quality level that is as clear as conventional cart-based ultrasound

Ultrasound scans in clinical environment

Getting ultrasound scans is now common for many people. Ultrasound scans are frequently performed in large-sized hospitals and small-sized clinics. The general public often perceives ultrasound imaging as an imaging tool to monitor fetuses in obstetrics and gynecology, but there are many other applications. It is sometimes used for first screening to determine whether there is a problem or not, or it is applied for diagnosing, monitoring, or treating mild or severe diseases. Considering the various and wide ultrasound imaging applications, we can think that ultrasound imaging is used in most diagnostic and therapeutic procedures in most medical fields.

Advantages of ultrasound

Ultrasound imaging is an image of sound waves reflected from the inside by sending high-frequency sound waves (ultrasound) that are inaudible to our ears from the surface of the human body to the inside of the body. Because the ultrasound scan can obtain ultrasound images in real-time, it is possible to observe the structure of organs and their movements, and it can measure the blood flows of vessels. It is safe because it does not use radiation. It is a straightforward and convenient exam method for diagnosing a patient's disease or making decisions on the treatment process because it can be tested quickly and without pain.

Ultrasound is non-invasive and painless. It can be applied to a wide range of applications and is easy to use. It is generally cheaper than other imaging exams such as CT or MRI. Since it does not use radiation, it is harmless, even safe for pregnant women and fetuses, and repeated scans are possible. You can see images of soft tissues that are invisible to normal radiography. Because real-time images can be viewed, it is possible to perform exams that help with procedures such as biopsy.

Advantages of portable ultrasound

Smaller and more portable medical ultrasound devices have recently been developed. Small ultrasound devices these days can be carried around in the pocket of a doctor's gown, carrying one ultrasound per doctor, much like a stethoscope. These portable ultrasound devices are less expensive than conventional ultrasound systems and potentially make it easier for doctors to carry their devices with them.

◆ **Accurate but fast:** Portable ultrasound enables accurate and fast scanning anytime, anywhere. It can be dangerous to make a diagnosis without ultrasound imaging in the absence of imaging equipment. Portable ultrasound is easy to move, allowing timely scans of patients. Although it is portable, it can provide high-quality images that are sufficient for medical decisions with advances in technology. In addition, it is portable and easy to access, enabling rapid diagnosis and treatment, resulting in high patient recovery and satisfaction.

◆ **Ease of use:** Without moving the medical staff or the patient, the medical team can check the ultrasound image in their own office to provide intensive attention and diagnosis. It can save medical staff time and money, and patients feel more comfortable with connected medical services in one place. In addition, there is no need to wait for a doctor's follow-up examination, allowing for rapid diagnosis and treatment.

◆ **Ready for emergencies:** In the case of critically ill urgent patients, it is difficult to move to another place for imaging exams because they are sensitive to movement. Portable ultrasound can be moved to the patient's location, such as an intensive care unit or emergency room, and scanned, eliminating the need to transport the patient. In addition, it plays an important role as a guide during anesthesia or other injection procedures in the operating room. The safety, non-invasiveness, and non-radiation advantages of ultrasound make it useful in emergency situations.

◆ **More economical:** Conventional ultrasound equipment is not only bulky but also much more expensive. In the case of portable ultrasound, due to economic feasibility, hospitals and individual clinics can purchase separate equipment for each treatment room, helping doctors examine patients and supporting patients recover quickly. Portable ultrasound can satisfy the increasing demand for ultrasound exams and provide inexpensive ultrasound exam services.

◆ **High patient throughput:** Portable medical devices take up less space and don't need to move the patient. Because of their low cost and miniaturisation, clinicians can purchase more than one portable ultrasound machine, allowing them to treat a more significant number of patients quickly.

◆ **Better engagement with patients:** Portable ultrasound allows doctors to examine patients from any location easily. Doctors can provide quality medical services in a comfortable environment for patients. Also, with real-time ultrasound imaging, doctors can give patients a better view of the inside of the body. It promotes communication between doctors and patients and promotes complete rapport, trust, collaboration, and participation in treatment. It ultimately improves patient outcomes and satisfaction.

Benefits of Bionet's Wireless Mobile Ultrasound, SonoMe

Clear, high-quality image: SonoMe is a beamformer with up to 192 elements, which shows an image quality level that is as clear as conventional cart-based ultrasound. By clearly distinguishing image boundaries, reliable images are always provided, helping medical staff to accurately diagnose and determine treatment directions.

◆ **True mobile:** SonoMe can connect wirelessly. Even in an environment without internet, the transducer and smart device can be connected via Wi-Fi. Ultrasound scans can be performed quickly and conveniently in various environments and situations. It is compact and light in size and has a battery operation of up to 5 hours, so it can be used as a completely portable device.

◆ **Equipped with all required:** SonoMe provides all necessary modes for ultrasound examination, such as B, B/M, Color, PDI, and PW modes. Image optimization, annotation, and measurement functions are also provided and DICOM is supported.

◆ **Choose what you need from 8 models:** There are 8 types of transducer models in SonoMe, including dual head, linear, high-frequency linear, and convex type, so, there is a wide range of choices. One can choose a transducer that suits the clinical needs and purpose.

Technology and its contribution in enhancing work-life balance for healthcare professionals across India ?

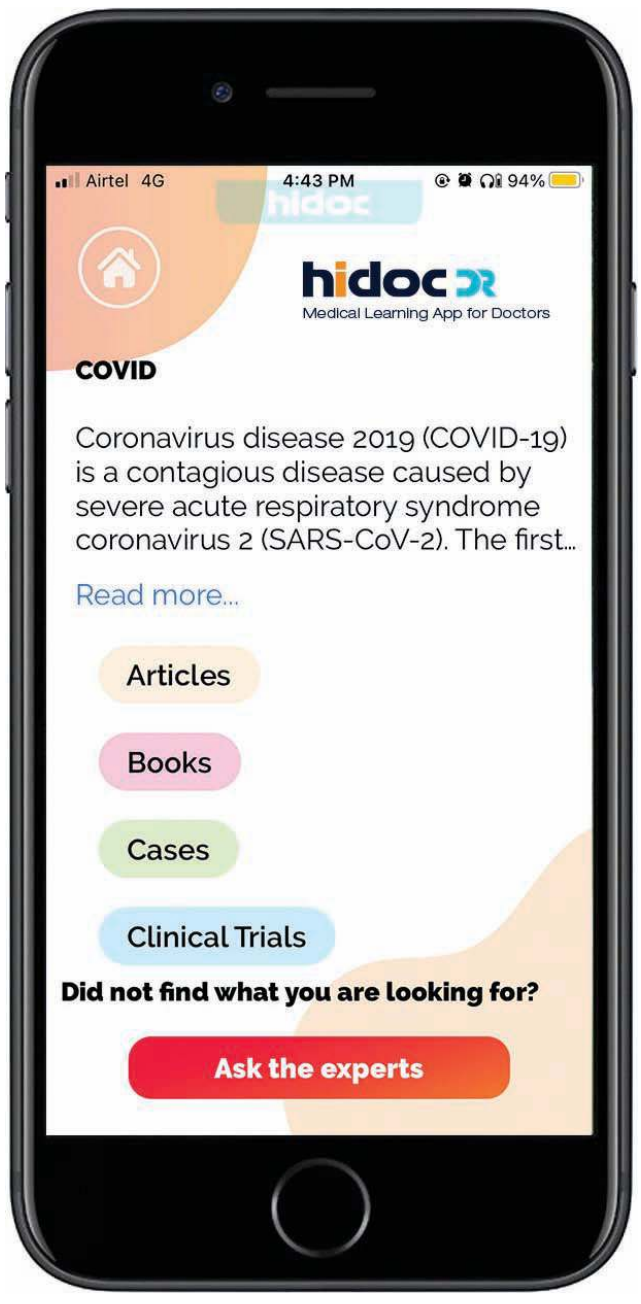
Hidoc Dr. is India's most comprehensive doctor networking platform where more than 8 lakh doctors from all over India come together to discuss, consult and exchange ideas

Work-life balance... an idea that has gained prominence in the corporate world in the last few years. Today, people across the globe understand that there needs to be an equilibrium between the hours they clock at the office and the time they spend with their family and themselves, doing things that makes them happy. The last couple of years, especially the COVID-19 pandemic, has made us all realise how valuable our personal life is.

However, there is one sector that is struggling to achieve this balance. And that is the healthcare sector. Our doctors work day in and day out to ensure our safety and well-being. The last two years have made us realise that healthcare professionals are the real heroes. But how do they achieve their work-life balance? Ready on call 24*7, how do the medical professionals take out their much-needed 'me' time?

The answer is through technology. Utilising technology to provide online platforms where they can manage aspects of their work with the least hassle, can go a long way in helping them achieve their work-life balance. And this is exactly what Hidoc Dr. aims to achieve. It is India's most comprehensive doctor networking platform where more than 8 lakh doctors from all over India come together to discuss, consult and exchange ideas.

So, how does this work? Let's take an example. Initially, when a doctor received a complex case, he would refer his patient to a specialized hospital (within or outside the city) for a second opinion. Getting an appointment would take time. The patient would have to physically travel there, explain everything to that doctor and then come back and share the same with the current doctor, The doctors too would need to be in constant touch to ensure the well-being of the patient. But today with Hidoc, the doctor can simply post about the complex case and get a second opinion within minutes.



Hidoc Dr. offers exhaustive information through case studies, clinical trials, articles, journals, and medical calculators in one window with just a click of the mouse. Powered by artificial intelligence, one can easily access the most specialized information in more than 40 fields of medicine

Not only this, with more than a million case studies available online, doctors now have access to the most comprehensive data. Hidoc Dr. offers exhaustive information through case studies, clinical trials, articles, journals, and medical calculators in one window with just a click of the mouse. Powered by artificial intelligence, one can easily access the most specialized information in more than 40 fields of medicine. Previously, where collecting such inclusive information was difficult and expensive, it can now be accessed through Hidoc Dr. in a few minutes for free!

Hidoc Dr. has implemented the National Digital Health Mission (NDHM) protocol, which makes data storage and security the topmost priority. Doctors can share and store information on this platform without compromising on safety.

It is no wonder that Hidoc Dr. has become the number one app for doctors in such a short time. It is one thing to have technology at our disposal and another to smartly utilize it to serve others. Our doctors are the backbone of our existence and their well-being is our concern. We need to ensure that they too get the much-required time for themselves.

Hidoc Dr. endeavor to contribute in every way they can to help the healthcare professionals achieve and enhance their work-life balance.

Sequoia Healthcare launches Precision 32 Slice Spectral CT Scanner with Dual Energy Applications

Precision 32 comes with mega pixel HRCT lung imaging against the conventional HRCT which are of 512 matrix which significantly improves the diagnosis of lungs

Bangalore-headquartered Sequoia Healthcare has launched a 32 Slice CT Scanner with Dual Energy – Low Dose CT Scanner.

The company said that the Precision 32 Dual Energy CT scanner produces good quality diagnostic images with stable performance and high throughput. That can help radiologist to achieve persistent diagnosis. It will redefine the new standards of 32-slice CT imaging.

CT is a critical tool for Covid-19 diagnosis. Precision 32 comes with mega pixel HRCT lung imaging against the conventional HRCT which are of 512 matrix which significantly improves the diagnosis of lungs.

Talking about the CT Scanner With Dual Energy Applications, S Viswanathan, Chief Executive Officer, Sequoia Healthcare said that the dual-energy applications that were available only with high-end CT scanners are now available at entry-level scanners. "Dual-energy applications like urological calculi analysis, fatty liver analysis, metal artifact removal, virtual non-contrast scans, the base of skull beam hardening artifact removal and others to come in future are going to help radiologists in the diagnosis of the diseases," he further explained.

Talking about the feature, Viswanathan, said, "In order to minimise the radiation dose to patients, Precision 32 adopts a unique low dose technique."

We thrive to bring in advanced and affordable international technology, which ultimately serves in Cost-Effective Healthcare. Sequoia believes in delivering radiology equipment accessibility for cost-effective healthcare. "In short, we want to bring diagnostic reach for all. With high-tech services accompanied with new world Artificial Intelligence, Robotics, etc, Sequoia aims to become the #1 Imaging Devices Manufacturer globally," Viswanathan concluded.

FEATURES

- With mega pixel reconstruction for lung imaging to give sharper HRCT images compared to the convention 512 matrix images in other CT scanners
- Full functional couch with up/down (easier biopsy procedures), 205 kg weight bearing capacity and 165cm scan
- Comes with physical gantry tilt against digital tilt to avoid unnecessary radiation to patient doing spiral scans when a simple sequential scan will suffice
- Combination of 42 KW, 350 mA, X Ray generator and 3.5 MHU 735 KHU/min metal tube you can have good images with obese patients as well as higher throughput without waiting for tube cooling
- Fast rotation time of 0.72 sec for quick spiral coverage with lesser breath hold times for patient comfort
- Patented P Axial technology to get acquisition slice of 0.275 mm thickness for crisper inner ear imaging
- Ultra-low dose algorithm from 60KV, dose modulation and dual domain iterative reconstruction technique
- 71.5 cm gantry opening for patient comfort and 50 cm Field of View. Intelligent console with all post processing software's; dual energy applications, Virtual endoscopy, 3D, Auto bone removal and more features

Advanced SpaceD Radioprotection Lightweight Aprons

Satyaki Banerjee, CEO-Medical Imaging, Trivitron Healthcare highlights the uses of SpaceD Radioprotection Lightweight Aprons

Trivitron Healthcare mission is to assure the safety and health of medical professionals and with this approach to bring revolution in healthcare imaging and safety Trivitron launched NASA-approved SpaceD technology to make radiation safety as convenient as possible. Overexposure to radiation for the long term can lead to cause multiple health issues that can range from burns, permanent damage to the skin, hair loss, cell mutation, and even cancer. Exposure to a high dose of radiation can produce acute effects and this makes the use of radiation protection aprons and gears important to ensure healthy health.

SpaceD Radioprotection Lightweight Aprons are made using the microencapsulated technology that proactively manages heat while controlling the production of moisture or sweat before it begins and provides comfort to medical practitioners during long surgical hours. These lightweight radiation protection aprons are made using Nanoparticle-based antimicrobial fabric Satin Touch®, ZeroLead Air® core material, and Maxin® fabric, and Outlast® technology, originally developed for NASA. The phase change materials present in the aprons offer optimal thermal comfort by absorbing, storing, and releasing heat to provide excellent thermal comfort to the user.

During long surgical procedures or working for longer working hours, doctors and radiation technicians experience stress and fatigue due to wearing heavy aprons. Wearing lightweight SpaceD Radioprotection Aprons can regulate the surgeon's body temperature during long procedures and avoid fatigue as it is lightweight along with the best radiation protection. This technology also provides comfort as it manages temperature, heat, sweat, and moisture can make one feel relaxed while performing long surgical procedures in operating rooms.

The Outlast® phase change materials used in SpaceD Radioprotection Aprons contain Thermocules™, a microencapsulated phase change materials that are permanently embedded and guarded in a polymer shell. This encapsulation method makes the Thermocules™ enduring for many applications. These Thermocules™ can absorb, store and release excess heat and offer the fabric the ability to continually regulate skin's microclimate. As the skin gets hot, the heat is absorbed, and as it cools, that heat is released, offers the best regulation of skin microclimate

Switching to Advanced SpaceD Radioprotection Lightweight Aprons will magnify both the surgical outcomes and make the doctor and technician more comfortable so they can perform their procedures more efficiently.

Winters and periods

Periods happen as the hormone levels increase in the female body which are oestrogen and progesterone

The topic of period itself makes most of the people uncomfortable. The main reason behind it is lack of awareness on your own body and not understanding how hormones work on us and their effects on whole reproduction system and changes during changing climates.

Know the differences and observe the changes

As we all know the winters have longer nights and shorter days, which means we need to be extra conscious and extra careful during these humid/wet days and nights. Our metabolism slows down, physical activity slows down and whole life style become sluggish. Due to these changes, our period cycles either fasten up or slower down. Generally, periods happen as the hormone levels increase in the female body which are Oestrogen/estrogen and progesterone. These two hormones make inner lining with blood and mucous preparing for the pregnancy and when the ovum does not get fertilised, it loses its capacity through the cycle, ruptures and the already prepared lining in the uterus releases the prepared lining through the vagina which is known as a "period."

> Menstrual cups prevent most of the bacterial build ups keeping the vaginal area dry and causing very less or no infections probably

Menstrual cups and winter periods

Due to the climatic conditions, winter wet/humid days are generally bacterial favourable conditions. Menstrual cups prevent most of the bacterial build ups keeping the vaginal area dry and causing very less or no infections probably. Using menstrual cups not only prevents infections, but also makes the period less painful and more comfortable.

These medical-graded silicone menstrual cups make a human life much easier and also less harmful to the environment due its naturally biodegrading nature. These are cost-effective, environment-friendly and human-friendly. With a little practice and a lot of awareness on our bodies, periods and menstrual cups may change our daily life to a great extent.

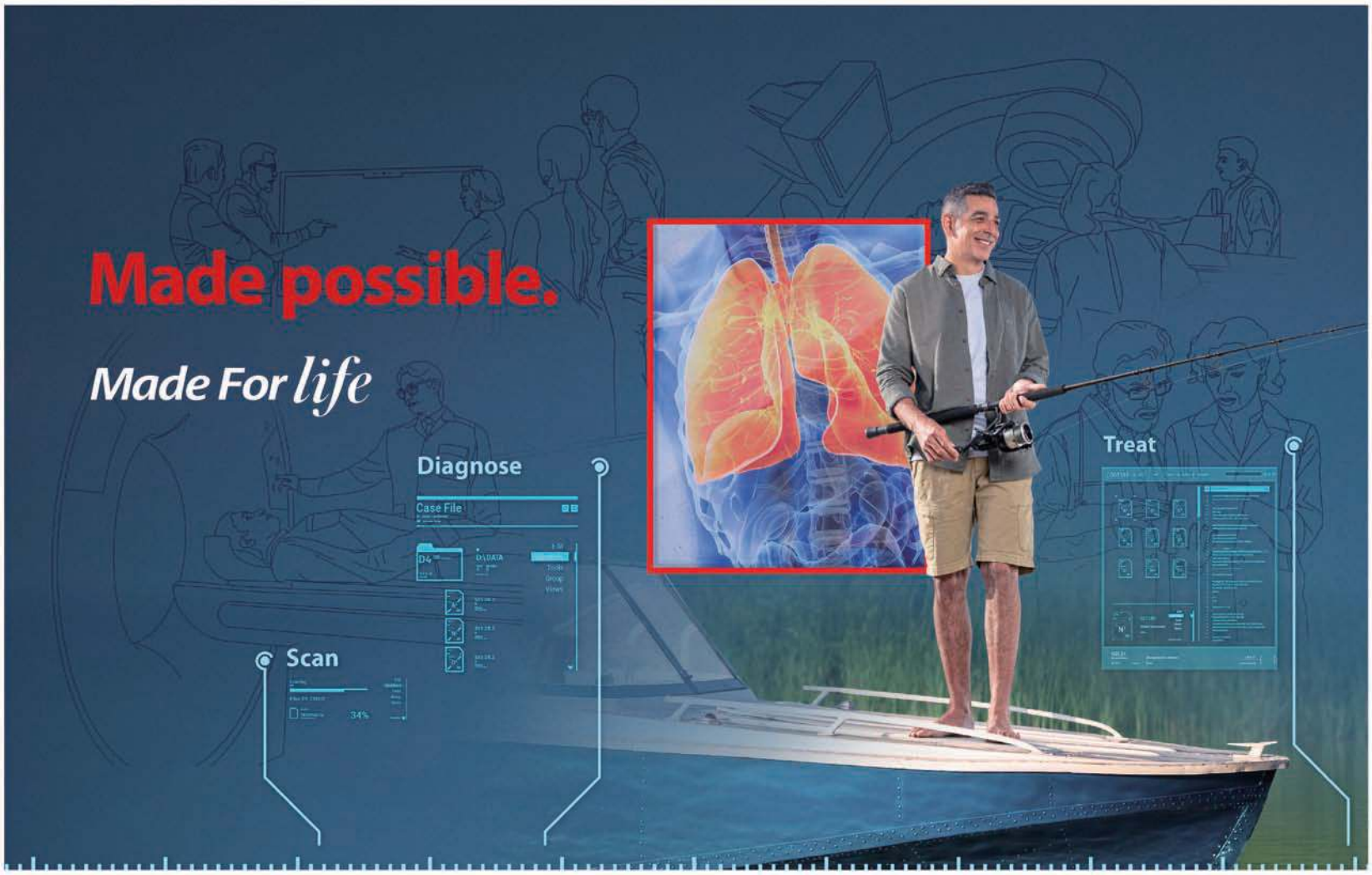
Breaking myths and breaking the barrier the glass ceiling

Being in an orthodox, judgemental, boundary making and biased society, we, as women, need to speak our hearts out. When it comes to periods, we should never compromise on our health.

Speaking out breaks the glass and getting awareness breaks the myths formed all around us. We, in a middle age, should responsibly educate our younger-generation girls and also the boys. We need to generalise few words and actions which are:

- Periods
- Hormones
- Vagina
- PMS
- Sex
- Consent
- Physical changes and needs
- Equality
- Speak out
- Respect

Canon



Aquilion Lightning

Redefining a cost-of-ownership CT solution

Aquilion Lightning, Canon Medical Systems' multi-slice helical CT system for whole-body imaging, employs cutting-edge technologies to optimize patient care and accelerate clinical decision making.
Innovative features ensure that high-quality isotropic images are routinely acquired with low patient dose. The workflow is streamlined, increasing patient throughput. And a wide range of advanced 3D and post processing applications provide clinical flexibility.

CANON MEDICAL SYSTEMS CORPORATION
https://global.medical.canon/

Please contact your local sales representative to learn more.

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