



# 'DIGITAL' TRANSFORMATION OF INDIAN HEALTHCARE

**AT THE CUSP OF CHANGE**



**SmarTec India 2020**

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# Foreword



## Foreword

Healthcare in India has never received as much prominence before. The aspiration to progress towards Universal Healthcare is real and formally acknowledged. Glaring capacity gaps are a reality too at the other end. Leapfrogging is essential to achieve our lofty goals. In this context, last decade's success in nurturing a robust pipeline of health tech ventures is of paramount importance. Stimuli such as non-dilutive government and philanthropic grants and organic entrepreneurial momentum have helped nurture a pipeline of more than 2000 ventures of which about 200 have raised equity capital. Aggregate equity funding in Indian health tech ventures is close to US\$ 1.5 billion.

While the landscape is ripe with innovation led solutions, value realization and impact at sale have been largely elusive. Potential for clinical, social and economic impact is yet to be realized at scale. Constraints for scale-up include resistance of clinicians and healthcare delivery institutions and low level of digital adoption. In this context, COVID-19 led behavior change has been a blessing in disguise. Resilient healthcare providers have been quick to act and made sure that clinical care continues to be uninterrupted. In our clinicians' survey, a whopping 95% alluded to behavior change on technology adoption during COVID1-9 and 80% indicated embracing tele-consultation during these unprecedented times. The opportune timing is supported by enable ecosystem created by policy stimulus. Progressive measures commencing from the National Health Stack, National Strategy on Artificial Intelligence, tele-consultation guidelines and most importantly, the National Digital Health Mission blueprint and formal announcement all foster the much needed ecosystem development for the digital revolution.

Digital transformation of healthcare is here. The next immediate step is to strategically advance towards critical milestones of scaled-up adoption in public and private healthcare, promote tangible and economic value realization to set in place the cycle of investment, march towards global imprint with globally competitive contemporary solutions.

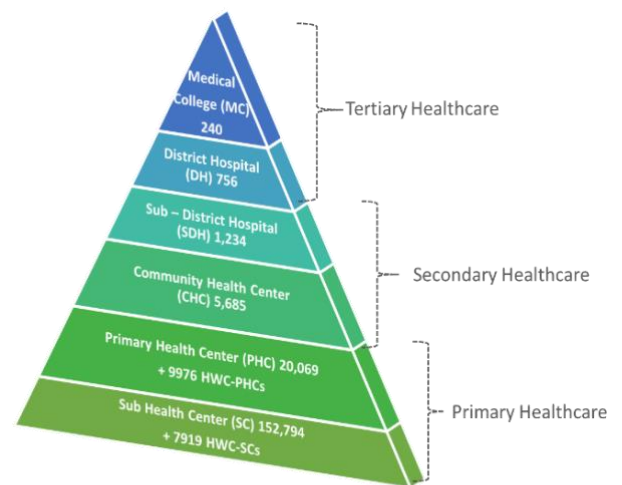
***2020 – The decade of digital transformation of healthcare.***

# Healthcare Delivery Context



## I. Indian healthcare delivery landscape: Urgent need to expand access to care, outcomes and delivery economics

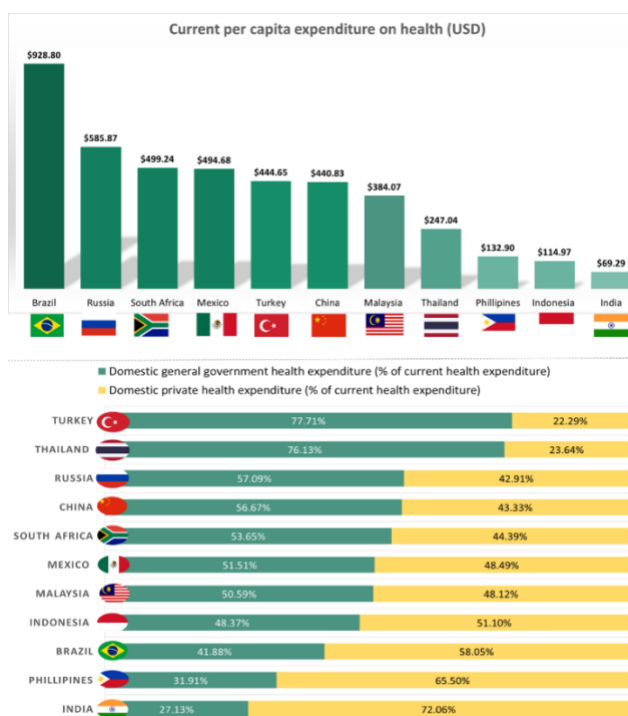
The Indian hospital industry is pegged at about USD 130 billion as of 2020<sup>1</sup> and is expected to record a strong CAGR of about 16%. The expansive Indian healthcare system is serviced broadly by two arms – public and private healthcare. Public healthcare system largely services rural as well as lower income urban communities through primary healthcare centers (PHCs) focusing on providing basic healthcare facilities. Secondary and tertiary delivery is largely concentrated in district hospitals and to a smaller extent in the Community Health Centers (CHCs). Private healthcare on the other hand has established itself as a much more sophisticated arm of healthcare delivery and spans across all three levels of healthcare service delivery. However, high level of out of pocket expenditure and consequent economic burden renders private healthcare largely inaccessible for majority of lower middle income and lower income population.



Health and Wellness Centres (HWC) are an initiative of the Government of India to create 150,000 HWCs by transforming existing Sub Centres (SCs) and Primary Health Centres (PHCs) as basic pillar of Ayushman Bharat to deliver Comprehensive Primary Healthcare (CPHC). These centres will deliver comprehensive primary health care covering both maternal and child health services and non-communicable diseases, including free essential drugs and diagnostic services.

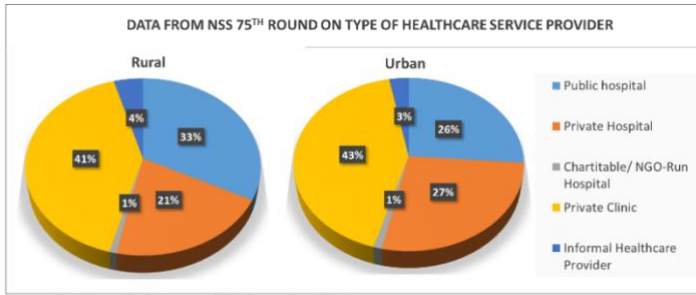
Source: MoHFW – Rural Health Statistics 2018-19

### Deficient infrastructure at the grassroots:



Despite the formidable scale in Indian healthcare delivery, a deeper analysis reveals a stark contrast between quality of care accessible to urban and rural populations, and between level of infrastructure in private and public systems. In spite of being the one most populous nations, India records one of the lowest healthcare expenditure per capita of about USD 69 when compared to other BRICS nations and newly industrialized nations. The public healthcare system has been designed to service the needs of those in rural and remote areas, however, statistics generated by 75<sup>th</sup> round of NSS on Key Indicators of Social Consumption in Health reflect the level of unserved clinical needs – more than 60% of the survey respondents from the rural areas

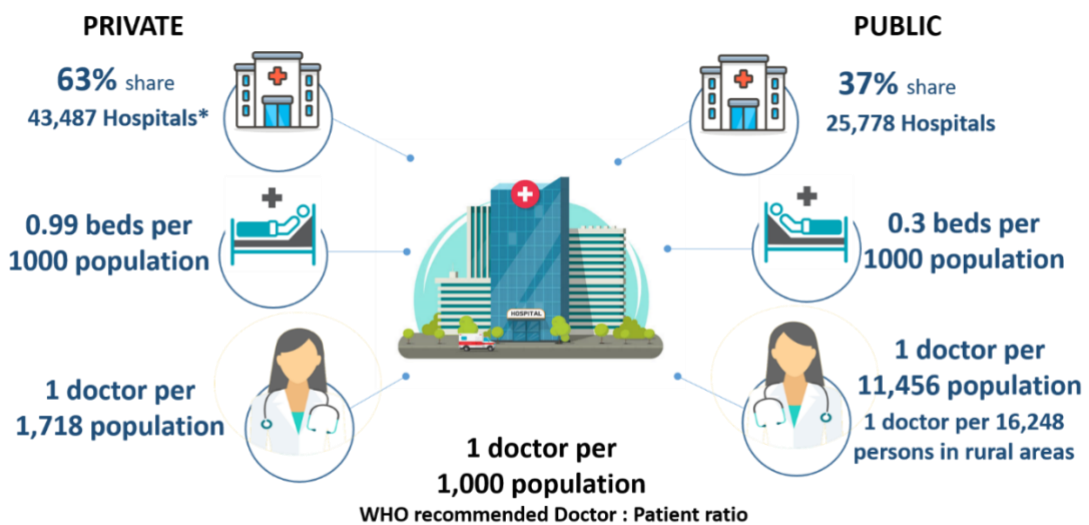
sought care from a private establishment – either a private standalone clinic or a hospital. This is despite high out of pocket burden; and private healthcare treatment cost being about



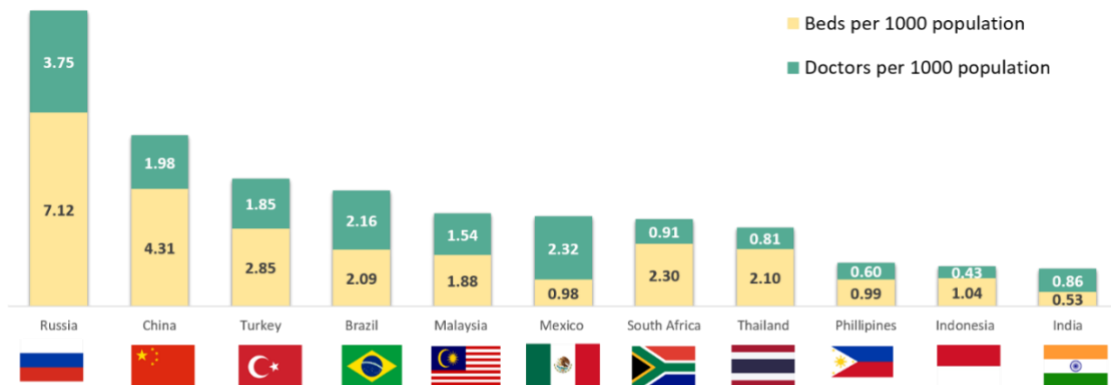
Source: NSS 75<sup>TH</sup> Round: Key Indicators of Social Consumption in Health

4 times of cost to patient at a public establishment<sup>2</sup>. The deficiencies within the public healthcare infrastructure limit the adoption of public institutions in healthcare delivery. The bed capacity at government hospitals pan-India is 265,275; with 66% of the Indian population residing in rural areas,

the bed to population ratio in rural areas is abysmally low at 0.3 beds per 1000 population. Comparing this to the availability in urban areas reflects the stark disparity in the level of basic infrastructure, with just 34% of the population residing in urban areas, they have access to lion's share of hospital beds with about 63% of government hospital beds and almost 85-90% of private hospital beds which are largely located in urban areas.



HOSPITAL BEDS AND MEDICAL FORCE PER 1000 POPULATION



Source: WHO Health Data Platform, Accessed 14/09/2020  
BRICS – Brazil, Russia, India, China, South Africa  
NIC – Newly Industrialized Countries

Rural healthcare infrastructure is also ill-equipped in basic diagnostic facilities. A sizeable proportion of major illnesses in rural areas remain untreated due to unavailability of



diagnostic facilities in the local vicinity. A report on Human Development Survey published by Desai *et al.* revealed that only 3% of the major illnesses in metro areas remain untreated, whereas 12% of the same remain untreated in the less developed villages<sup>3</sup>. Under the National Rural Health Mission, operationalization of Mobile Medical Units (MMUs) was a positive step towards addressing the challenges in last-mile healthcare delivery and meeting the goals universal access to equitable, affordable and quality health care services. As of 2019, there are 1415 operational MMUs and provide a range of facilities like point of care diagnostics, screening populations for chronic Non-Communicable Diseases (NCDs) like Hypertension, Diabetes and Cancers annually. In addition to MMUs, various state governments have undertaken upgradation of PHCs into 'electronic' primary health centres through public-private partnerships (PPP) model. PPP models bring the technology sophistication and expertise in operational efficiency of private enterprises to the remote marginalized communities and enables better access to basic healthcare facilities.

### ***Providing specialty clinical consultation 14,000 ft above sea level***

Apollo Hospitals is one of the pioneers in India in the tele-medicine sector. In a first of its kind service delivery innovation in India, Apollo has set-up one of the highest telemedicine stations in the world<sup>4</sup>. In order to address healthcare access challenges of the people residing in the remote lap of the Himalayas, the National Health Mission (NHM) opted for a PPP model with Apollo to establish the Himachal Pradesh Telehealth Services Project. Till date, the tele-health centres have stabilised close to 1200 emergency cases has been done through tele-emergency services, performed 100+ tele-cervical cancer screening, and above 12000 lab tests provided through tele-laboratory services. Apollo's estimates show that the community would have saved nearly Rs. 15 lakh spent on travel and other expenses.

### ***Dearth in clinical and non-clinical human capacity:***

A closer look at the medical workforce reveals that share of doctors in the country is also highly skewed towards private healthcare establishments. As of 2018, India has approximately 11,54,686 allopathic doctors registers with the Medical Council of India, out of which a hefty 90% are available in the private workforce, leaving a handful of doctors to cater to the public healthcare system. Of the 1,16,757 allopathic government doctors, about 29% service the rural community through PHCs and CHCs – which contributes to a significantly low doctor : patient ratio of about 1 doctor per 26,248 patients, well below WHO's recommended ratio of 1:1000.

At the ground level, there's insufficient manpower, both clinical and non-clinical to service the healthcare requirements of the massive rural and semi-urban population. As of 2019, 9.2% of the Sub Centres are without a Female Health Worker/ ANM and 54.1% Sub Centres are without a Male Health Worker, 9.6% of PHCs are functioning without a doctor. With 66% of the Indian population residing in rural areas, the current manpower capacity is largely ill-equipped to address to the clinical needs of the Indian patient load.

The dearth of manpower is not restricted to public healthcare delivery but instead extends through the entire healthcare delivery system – both public and private. Taking into

consideration the medical manpower available pan-India, the doctor to patient ratio is still low at 0.86:1000, implying there's less than one doctor for 1000 patients. The deficient manpower becomes even more pronounced when specialties like cardiology, neurology, oncology are considered.


***India's escalating burden of NCDs and poor availability of clinical specialists***


A 2016 Global Burden of Diseases study revealed that that leading cardiovascular diseases— ischaemic heart disease and stroke—made the largest contribution to the total burden of mortality in India in 2016, at 28.1%, another significant finding was that mortality due to cardiovascular diseases increased by 34.3% from 1990 to 2016<sup>5</sup>. The data does not look surprising considering the ageing population and significantly increasing levels of the main risk factors for cardiovascular diseases—high systolic blood pressure, air pollution, high total cholesterol, high fasting plasma glucose, and high body-mass index. Apart from lifestyle factors that contribute to CVDs, a pressing concern is that of lack of early screening, prevent diagnosis and availability of cardiologist in the country to clinically intervene at early stages to manage the crisis. India ideally needs 88,000 cardiologists but only has about 4,000<sup>6</sup>. Deficiency of a specialists at this magnitude cannot be overcome even in a course of several years. Addressing the insufficiency will need parallel efforts towards:

- expanding the reach of early diagnosis and education on preventive care at all levels of delivery – primary, secondary care
- complementing super specialty clinical services with advanced technical solutions like artificial intelligence, machine learning, predictive analytics that are adept at prioritizing critical clinical areas and reduce the load on the limited manpower that's available to direct their focus on areas that need a critical specialist intervention at the earliest

The promise of technology led transformation of healthcare delivery provides hope as a strategic means to bridge the glaring gaps in both infrastructure and clinical capacity. With much needed policy impetus for healthcare & the overarching ambition of healthcare of all, strategic and pervasive adoption of technology is the only constant in Indian healthcare: 2020 and beyond

## CHALLENGES IN CRITICAL NEONATAL CARE IN INDIA

 **~24 million**  
births in India per year

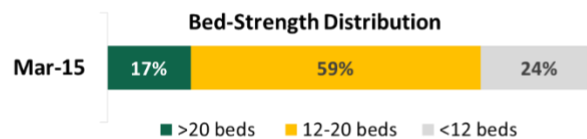
 **~3.5 million**  
Preterm births

**Preterm births are responsible for almost 30% of neonatal deaths**

**85% of the neonatal deaths are due to Birth Asphyxia, Sepsis or Low Birth Weight.**

Sick Newborn Care Units (SNCU) are special neonatal care units in a large hospital generally at district level meant to reduce the case fatality among sick newborns. As per UNICEF guidelines, SNCUs should have a 12-20 bed capacity on average, with a consultant paediatrician, 3-4 trained doctors, 10-12 nurses with at least 2 per shift, round-the-clock, and support staff.

Operational Status of SNCUs across India	
Districts & Union Territories*	622
Total SNCUs*	525
Districts without SNCU*	208
High Priority Districts (HPDs)*	172
HPDs without SNCUs	67
Tribal Districts	73
Tribal Districts without SNCUs	22



More than two-thirds (69%) of the SNCUs had adequate number of doctors, but less than half (45%) of these units had adequate number of nurses.

### 55-60 SNCU beds required per district

As per estimates provided by a committee of representatives from PHFI, UNICEF Country Office, AIIMS and MoHFW – for a district with population of one million (with a crude birth rate of 20/1000 population, 8–10% babies requiring special care with 2 to 3% of them in intensive care and the average length of stay of 5 days). While private establishments can fulfill some proportion of this requirement, the capacity in public establishments is still deficient.

Data as of March 2015

\*Reports not available for Chhattisgarh, Telangana, Manipur and Lakshadweep, hence excluded from analysis.

Source: MoHFW, Govt. of India: SNCUs of India: April 2013-March 2015

Inpatient care of small and sick newborns in healthcare facilities. Journal of Perinatology (2016) 36, S18–S23; doi:10.1038/jp.2016.186

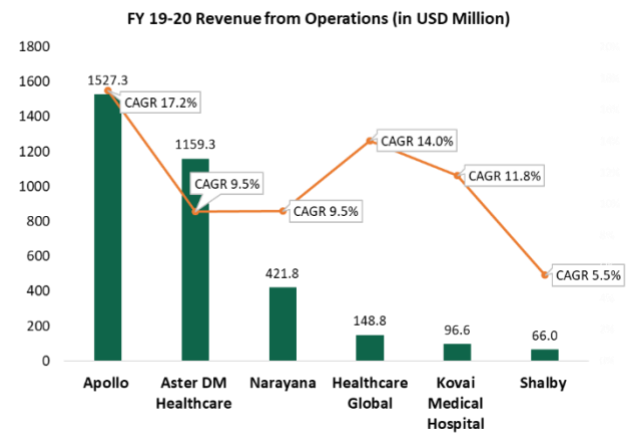
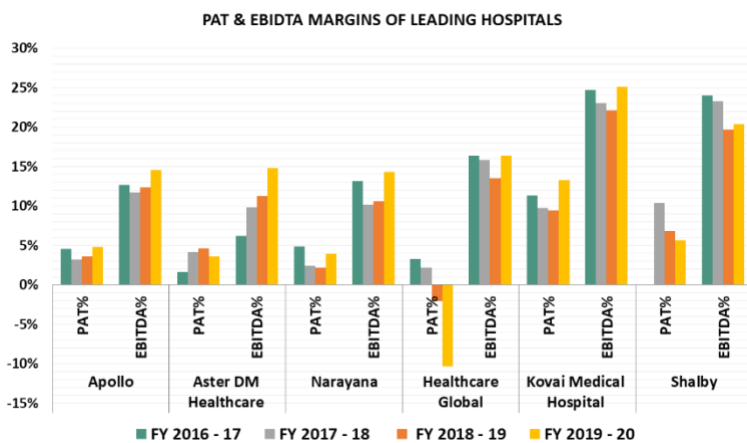
## Enhanced operational efficiency critical for better financial health and sustainable growth

The private healthcare industry structure in India continues to be broadly fragmented with the base comprising of more than 100,000 standalone secondary care delivery institutions including nursing homes and smaller hospitals servicing one to few select specialties. The narrow top-segment has a small concentrated mix of large private hospitals which cater to multispecialty needs and provide state-of-the-art clinical facilities.

Private hospitals have historically been revered for their clinical capabilities, however, providing modern clinical services prompts a high operating cost. While the constant debate on rising cost of care in private healthcare establishments continues, analysis of financial performance reveals that most private hospitals currently function with relatively thin profit margins. As illustrated alongside, average PAT margin over the last three years in large to mid-sized hospitals in India has ranged between 2% to 6%.

For financial sustainability and healthy growth of the private healthcare industry, enhanced operational efficiency will be critical. In 2020 and beyond, we anticipate that Indian healthcare delivery institutions will embrace every opportunity to strengthen the operational backbone, trim inefficiencies to sustainably re-engineer operations and financial metrics. This heralds an era of long overdue technology led transformation.

The need for cost optimization in private healthcare delivery becomes all the more important in the light of the envisioned role in the path to universal access to healthcare in India. At 62%, the out-of-pocket expenditure for healthcare is one of the highest in India compared to other developing economies. Centre’s Ayushman Bharat scheme has been a welcome step in making quality healthcare affordable to more than 40% of the nation’s population that are unable to afford the costs associated with good quality private healthcare. The program’s ambitious target and large-scale deployment calls for a judiciously designed public-private partnership (PPP) model. Such a program at national scale implies rapid expansion of volume demand for the hospitals, albeit at the cost of profit margins. There is urgent need to embrace pervasive change that that can drive efficiencies in the system without compromising on the quality of care and patient safety.



Indian private healthcare 2020 and beyond: Astute focus on operational efficiency enhancement and sustainable optimization of financial health: Technology, again, emerges as the most potent solution for driving improved resource utilization, resource allocation and outcomes.



### ***Tackling NCDs through digital chronic care management solution***

Mexico's Carlos Slim Helu Foundation partnered with the Mexican Ministry of Health to tackle the dramatic rise in NCDs by deploying an integrated chronic care management model shifting the focus of healthcare providers from curative approach to proactive preventive approach using innovative technology.

- The CASALUD model uses a robust digital platform for systematic risk assessment.
- It includes MIDO (Integrated Measurement for Timely Detection) health carts located at accessible public health locations, MIDO backpacks, a portable module with wireless connectivity.
- The module includes devices for measuring blood pressure, blood glucose, urinary proteins, height and weight and a digital patient health screening questionnaire enabling mass-screening individuals and providing early intervention at a pre-disease stage.

### ***PHFI's Swasthya Slate: bringing speed and scale to diagnosis***

- Designed by the Affordable Health Technologies team at the Public Health Foundation of India, a diagnostic kit capable of conducting 33 tests including tests for blood pressure, blood sugar, blood haemoglobin, urinary proteins and heart rate; diagnosis displayed at the interface almost immediately
- Comes with solar-powered backpack that allows the Tablet to recharge at places with low power supply
- Also has decision-support algorithms and a tele-medicine app that guides the health workers, ASHAs to give medical advice or make referrals as required
- Currently piloted at multiple states across India including Delhi's Mohalla Clinics and results show that percentage of the time spent by the health workers on recording test day dropped from 54% to 8% of the work day

## ***Opportunity to leverage enabling technologies & make contemporary care available to all***

Technology is all-pervasive and can help India attain its goals of Universal Health Coverage by addressing the country's unique challenges associated with accessibility, affordability and quality. Even though it is one of the fastest growing healthcare markets in the world, the level of technology adoption is still in its nascent stages. Some of the early adopters of technology within the healthcare delivery continuum have been the large private hospitals through implementation of Electronic Health Records (EHRs) and its seamless integration with routine clinical management and streamlining of processes. However, even the level of penetration of EHRs in the Indian healthcare ecosystem is not at par with other nations.

Although, there have been numerous innovations on the consumer end too based on artificial intelligence, Internet of Things (IoT) and start-ups have sprung up with solutions for unique challenges, the penetration of modern technology has been disproportionate when it comes to clinical interventions. An illustrative example is that of robotic surgeries which can offer dramatic advantages for critical surgeries in terms of precision, duration of hospital stay, recovery period etc. As per Intuitive Surgical, the maker of the Da Vinci surgical robot and has enjoyed monopoly in the Indian market, the earliest surgical robot in India can be traced back to 2002 and 18 years down the line, there have only been 70 installations of the Da Vinci robot in India<sup>7</sup>. This points to a significantly low system-wide adoption of contemporary technologies in the country, which can actually be utilized well to circumvent the deficiency in manpower.

Similarly, the adoption of predictive and prognostic diagnostics in oncology in the clinical workflow has been slow in India. Genomic profiling based predictive cancer testing estimates a person's chance of developing cancer based on specific changes in genes, chromosomes or proteins. While in the West, predictive diagnostics has picked up pace and patients and providers are moving towards a minimum treatment approach through early detection, the adoption has been slow in India. Similarly, prognostic cancer testing helps to objectively evaluate the patient's overall outcome, such as the probability of cancer recurrence after standard treatment. Tumour marker led predictive diagnostic approach can assist physicians in developing optimal therapeutic strategy for patients and can help reduce some of the redundant resource and cost spent in non-targeted cancer treatment. An indicative example is the combination of multi-omics assays (genomics, proteomics and biochemical) combined with AI-powered bioinformatics platform to establish an evidence-based roadmap for therapy that best suits the patient and aids targeted treatment of cancer.

In the public system too, adoption of digital AI-enabled technologies can help circumvent the deficit in clinical specialists. AI based diagnostic testing can act as a triaging tool as the first layer of diagnosis that can flag off potential medical irregularities, freeing some of the radiologists and clinicians from dealing with every report – while it does not replace the human intelligence of a trained radiologist, it can bring in viability into the system and redirect specialists to where critical clinical intervention is urgently required. AI-ML assisted diagnosis combined with tele-medicine and tele-radiology can facilitate access of timely diagnosis to the interiors of the country.

### *Leveraging Indian tech prowess to emerge as global health-tech leaders*

The timing is ripe the healthcare ecosystem to invest in contemporary care technologies and technology led better clinical outcomes can be a reality for all Indians. India has the advantage of both – (1) huge market potential for adoption of new technologies, consumers who are aware and willing to embrace new technologies: case in point is the rapid adoption of e-pharmacies and tele-consultation even in tier-2 and tier-3 cities during the pandemic and (2) technology strength, skilled young workforce to develop technology-based solutions that are contextually relevant – indicative from the pervasive momentum in tech entrepreneurship in India. A key challenge to the adoption of future-forward technologies is the lack of awareness in the patients as to the treatment options they have at their disposal, but in a country like

India where internet has a deep penetration even in the hinterlands, lack of awareness cannot be considered an impediment to fuel innovation adoption.

***Parallel efforts should be made in addressing the challenges at the heart of the delivery ecosystem – to fix the deficit in infrastructure, bridging the gap in access to care in communities and initiatives to leapfrog to the next level of tech-empowered healthcare delivery.***

The stimulus to create an ecosystem to adopt tech-enabled healthcare solutions has to come from a concerted effort from the government, the regulators and the inventors. Triggers to innovation adoption are having a regulatory oversight in new technologies, establishing mechanisms to ensure smooth transition from conventional to new-age systems and educating the masses. The Centre has now taken steps to fuel the digitization of the healthcare ecosystem, also ensuring inclusion of young-age ventures that can address critical challenges at hand. In the next section we discuss the thriving start-up landscape, regulatory stimulus to drive innovation adoption and evolving clinical practices embracing tech-powered solutions.

# A thriving start – up landscape





## II. A thriving start-up landscape

Technology has touched nearly every aspect of our lifestyles in urban India, including healthcare. Over the last five years, the Indian ecosystem for early stage healthcare technology start-ups has gained significant momentum. Technology developments are spanned over multiple categories such as online pharmacy, telemedicine, personal health management, home healthcare, data analysis, medical devices, wearables, EMRs etc. Given that a majority of the medical workforce in India is highly skewed towards the private healthcare establishments and the country observes a significantly low doctor to patient ratio of about 1 doctor per 26,248 patients, there is a high need for technology adaptations in the healthcare industry, especially public establishments. The healthcare industry is also becoming increasingly patient centric; this is reflected in an increase in health tech startups operating using AI, ML and other modern technology to improve access, affordability and quality of health care.

***The India Brand Equity Foundation (IBF) anticipates that the healthcare sector will record a threefold rise, at a Compound Annual Growth Rate (CAGR) of 22% during 2016-2022 to reach US\$ 372 billion in 2022 from US\$ 110 billion in 2016. Similarly, the hospital industry in India stood at US\$61.79 billion in 2017 and is expected to increase at a CAGR of 16-17% to reach US\$132.84 billion by 2022.***

In order to efficiently manage the increasing demand using the scarce human resources and inadequate infrastructure, clinicians and healthcare establishments are adopting new technologies developed by tech start-ups to control the cost burden on patients and simultaneously provide better quality care. Healthcare technology start-ups have a critical role to play in increasing access, quality, awareness and affordability of healthcare. According to NASSCOM's 2019 study, 'Transforming Healthcare and Lifesciences Industry in India', there are a total of 1050+ start-ups in the Indian health-tech space<sup>1</sup>. ***In 2018 alone, a 45.06% increase in total investments in health-tech start-ups*** bringing forward novel technologies under a wide variety of services, products and offerings, such as wearable tech, telemedicine, genomics and artificial intelligence to the Indian healthcare system.

**1050+ Healthcare Technology Start Ups**

### ***Emergence of regional clusters and improved infrastructure***

Health tech innovation is often relay with several stakeholders steering innovation forward at various stages and co-creation often being invaluable. Consequently, a co-evolving region or hub with a network of institutes, companies, universities, research facilities, service providers and private capital is important to push forward technology innovations. Such organic clustering which improves the probability of success is being seen in certain regions of India. The encouraging presence of global development centres of MNCs or congruous factors like large corporates or successful ventures incubation infrastructure and policy initiatives have

<sup>1</sup> <https://nasscom.in/knowledge-center/publications/transforming-healthcare-life-sciences-industry-india-through>

contributed to geographical consolidation and concentration of technologies and innovation in three large areas: Bengaluru, Delhi, Hyderabad and Pune.

**Hyderabad:** Concentration of large healthcare corporations, especially in the pharma and vaccine industries and availability of incubation space has shaped Hyderabad into a leading healthcare innovation cluster. T – Hub, IKP and academic institutes such as IIT – H, University of Hyderabad and LVPEI have provided a nurturing ground for curating new ideas and supporting new ventures. There is no struggle with inadequacy of infrastructure or land for scale – up in this cluster.

**Bangalore:** Bengaluru has a higher number of start -ups with a notable concentration in medtech and diagnostics, and a higher (than national average) concentration of ventures founded by entrepreneurs with prior industry experience. Additionally, the city is home to premier educational institutes such as IISc, NCBS and IBAB and has over 400 R&D centres. The mature ecosystem of the city has also attracted several funding venture capital funding orgs and encouraged MNCs to set up R&D operations there.

**Delhi:** Within Northern India, the Delhi – Faridabad – Gurgaon region is an active hub with significant innovation activity supported by stellar academic institutions including IIT Delhi, AIIMS, ICGEB, NII, THSTI, RCB and incubation anchors such as FITT, IIT Delhi.

**Pune:** Research backbone institutions such as NCL, NIV, NARI, NCCS and IISER play an active role in supporting a research driven ecosystem. Additionally, proximity to Mumbai venture constellation and strong presence of IT, agriculture and pharma helps advance ventures with multi-disciplinary focus. The last few years has seen a sharp rise in the number of health tech start – ups taking root in Pune, such as Docplexus, Allizhealth, Medifee etc.

Apart from these mega clusters, there has also been a recent emergence of newer incubation centers and significant innovation activity in locations such as Kanpur (UP), Bhubaneswar (Odisha) and Trivandrum (Kerala).

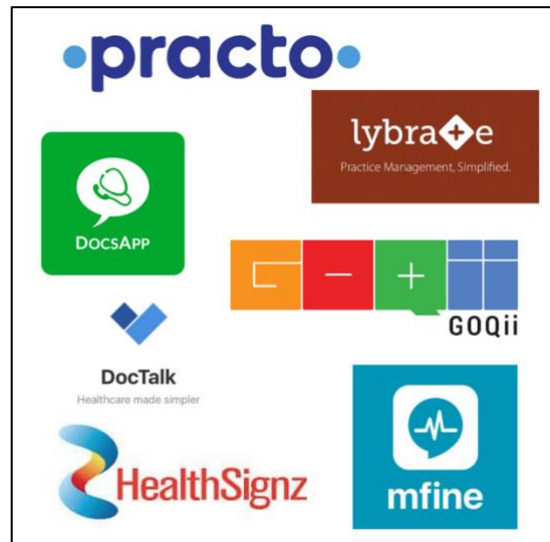
### ***Enhancing digital connectivity between provider and patient***

Access to healthcare is directly reliant on connectivity between clinicians and patients. Due to the shortage of clinicians in India, there is a limit on face to face consultations with patients. Tele-medicine tools and other innovative technologies are allowing healthcare establishments and clinicians to enhance healthcare access and reduce the burden on hospitals through real-time consultation with doctors through smartphones, tablets, laptops or PCs. Such applications are able to bridge the gap between rural and urban areas, and

remove infrastructural challenges. Tele-health/ Tele-medicine is a big segment of play for the Indian Health tech product companies, comprising of 32% share<sup>2</sup>.

Bangalore based Practo, an online health service platform that allows patients to chat with experienced doctors was one of the fore runners in the digital health space. They raised \$55 Mn in early 2017 in a Series D funding round led by Chinese conglomerate Tencent. With this round, the company is estimated to have raised about \$179 Mn in total aggregate funding from a list of investors including Sofina, Sequoia India, Google Capital, Matrix Partners, and more. Following on

the heel have been several ventures that have added to layers of product complexity and overall value proposition while chasing the rather elusive goal of consumer and clinician engagement as well as value realization. Ventures such as Lybrate, HealthSignz, Mfine and Goqii have each in their own way expanded power of the platform integrating of personal health records that are longitudinal and transferable from one clinician to another, AI powered recommendation engines, integration with wearables and have leveraged power of an overall ecosystem.



Within the overall space of health tech apps, several ventures have tried carving a niche for themselves either focusing deeply on fitness or wellness or single specialty care where the privacy in digital format could be valuable (such as women’s health / reproductive health). Quest for a more tangible value proposition and user engagement has triggered integrated innovation on hardware and software and emergence of connected platforms with device integration. These include ventures focusing on areas such as remote care for geriatric/ CNS patients, diabetics and pre-diabetics and even CNS care. Additionally, business models have constantly been evolving as well. While the pursuit to acquire consumers and onboard providers has been a constant, ventures have tried various other models to scale. B2B approaches such as corporate focused programs for employee health and wellness, payor driven health management and finally, white labelled powering of providers’ digital reach are all equally popular with ventures.

While health-tech has been largely centered around preventive and primary care, Indian originated solutions are now emerging to address opportunities in secondary and tertiary care. Notable examples include ventures serving tele-ICU and NICU management solutions. Virtual ICU care can reduce overall mortalities in initial



<sup>2</sup> [https://nasscom.in/system/files/secure-pdf/HealthTech\\_in\\_India\\_Are\\_we\\_there\\_yet\\_2017\\_27122017.pdf](https://nasscom.in/system/files/secure-pdf/HealthTech_in_India_Are_we_there_yet_2017_27122017.pdf)

lifesaving hours in rural areas, optimize infrastructure and resources utilization and thus reduce costs, and help in providing round the clock monitoring by trained staff and improve quality of care even in the most remote locations.

“Indian hospital resource settings, infrastructure and technology familiarity among users are vastly different from hospital to hospital and what is encountered in hospitals in the West. Hence, we developed Cloudphysician's platform, RADAR, to overcome several issues, for instance having vision focussed modules to overcome limited interoperability and integration, mobile friendly modules as opposed to workstation on wheels to enhance user friendliness, incorporation of workflows commonly used in India, a capital light and easy deployment strategy that dropped the barrier to adoption. This has helped bring into the fold a lot of hospitals that would never have viewed technology as the first answer to their problems.”

- Dhruv Joshi, Director, Cloudphysician

### ***Tele – ICU on it's way to becoming a reality in India***

Due to the shortage of trained intensivists and critical care nurses in most ICU's in India and a lack of a lucrative ICU care delivery model which is effective and continuously managed by experts, Tele – ICU organizations are growing significantly.

- Bangalore based **Cloudphysician** is a health tech company, founded in 2017, transforming the delivery of critical care. They use a proprietary technology platform, RADAR to connect command centers staffed with trained critical care personnel to ICU's remotely.
- **CritiNext**, a collaborative venture between Fortis group and GE healthcare, aims to connect a command center in a super specialty hospital in a metro city to a district local hospital. This model ensures advanced consultation, care and monitoring of critically ill patients in local hospitals without having to transfer them.

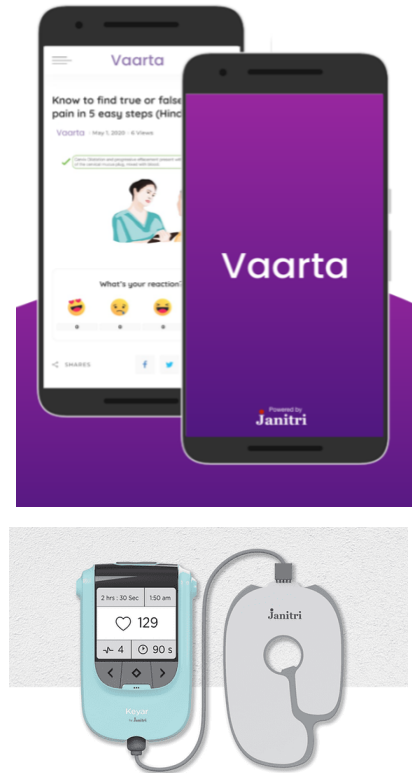
### ***Public Health Relevant Devices***

Prompted by bottom up innovation momentum in the country and catalytic Government and philanthropic grant opportunities in the area of socially relevant innovation, India now boasts of thriving pipeline of ventures addressing challenges in the public health continuum. Area of maternal and child health has attracted attention of several ventures with innovation ranging from tracking, diagnostic and monitoring devices more complex neonatal critical care solutions. Similarly, there are solutions ranging the spectrum of tele-ECG, AI integrated diagnostic/radiology solutions that can facilitate informed triage of patients in resource constrained settings, personal mobility solutions and smart solutions for transport of critical

vaccines and biologicals. Soft landing and early incubation is supported by the active ecosystem for socially relevant health-tech innovation. Multiple stakeholders have contributed to the overall momentum - funding initiatives such as BIRAC's SIIP and SPARSH, Grand Challenges from Grand Challenges and more recently the National Health Authority, social accelerators such as Social Alpha and Villgro playing and mainstream biotech and even medtech incubators (such as IKP, NCL Venture Center, CCAMP etc.).

**Janitri: Technology solutions for maternal and child healthcare**

- Janitri, a company founded in 2016, is working on solutions for problems rooted at the grassroots level in maternal and child healthcare. Their key products are 'Daksh' and 'Keyar'.
- 'Daksh' is a Mobile tablet based intelligent labor monitoring tool which allows the nurse to register and enter vital signs of a pregnant woman and also reminds to monitor the labor vitals, as per the standard intra partum protocol. In India, where 80% of deliveries occur with the assistance of staff nurses and midwives, the tool enables easy monitoring, Automatic generation of simplified partograph, auto-generation of alerts based on complications etc.
- 'Keyar' is an affordable, easy to use and portable labor monitoring device for continuous monitoring of fetal heart rate and uterine contractions during intrapartum period for low resources healthcare



**Nemocare: Reducing neonatal and maternal deaths in India**

- Hyderabad based **Nemocare** is a wearables start up, founded in 2017 that aims to prevent neonatal and maternal deaths in the developing world. In India, approximately 3.6 million premature babies are born every year and are susceptible to Apnea and Hypothermia, the two most common causes to infant mortality.
- These deaths could be preventable with timely intervention and accurate infant monitoring systems. Majority of the current solutions in neonatal intensive care units are expensive and limited to tier I city hospitals. Lack of family and institutional resources could also lead to early discharges and thus delayed attention and intervention.
- Nemocare's smart baby monitor has technology embedded in its design, device component and functioning to monitor and track vital parameters for early detection of Apnea and Hypothermia in newborns. The device is affordable, accurate, accessible and unobstrusive.
- The company has won two grants so far from 'Bill and Melinda Gates Foundation' and 'BIRAC'.

In the context of glaring gaps in infrastructure and clinical capacity, these contextually relevant innovations are a treasure trove of solutions to enhance clinical outcomes in India's hinterlands. Often integrating hardware, software and business model innovation, the health-tech pipeline driven by contemporary technology provides a sustainable solution to address the capacity constraints. Beyond addressing constraints, the robust innovation pipeline also presents an exiting opportunity to leapfrog overall healthcare ecosystem and reshape dynamics of healthcare access. Long awaiting a clear pathway to scale, the onus now rests on key stakeholders in the Indian healthcare ecosystem to create adoption avenues for indigenously developed health-tech solutions to address real health challenges across the spectrum of public and private healthcare delivery. Scaled up impact is around the horizon, but will need assertive and concerted action to be realized as tangible reality.

The logo for 'nemocare' is displayed in a white box with a black border. The word 'nemocare' is written in a lowercase, sans-serif font. 'nemo' is in blue and 'care' is in red.

### *Not just in sickness – holistic personal Health Management solutions*

With a growing health awareness amongst the Indian population, there has been an stark increase in the number of mobile applications, online platforms etc catering to personal health population. This includes health advisory content aggregators, health tracking apps that help monitor periods, pregnancy, medicine schedules etc. There has also been a rise in fitness and nutrition health tech start – ups, which may are also compatible with wearable devices.



As the health and wellness ecosystem evolves, technology driven solutions are embracing innovative hybrid models of online and offline engagement to help individuals integrated the solutions into their daily lives. While the first wave of innovators largely comprised of

#### ***Personal Health Tracking Applications***

- Applications like **Pregbuddy**, **Healofy**, and **Maya** help women track their periods and pregnancies.
- Healthcare advisory aggregators such as Delhi's, **myUpchar** has raised a total funding of \$5 Mn from Nexus Venture Partners, Omidyar Network and Shunwei Capital. CureJoy, a similar company raised a comparable \$5.5 Mn from investors such as Accel Partners.
- Fitness and Nutrition companies such as Cure.fit, Fitternity and SARVA have also seen received promising feedback and have been backed by investors. Mumbai based fitness discovery and booking start up Fitternity, raised \$4 Mn from Sixth sense ventures. Cure.fit, a health and fitness start up with an existing and growing national presence raised \$75 Mn in a funding round led by Accel Growth, less than a year after raising \$120 Mn, placing the company's total valuation at as estimated \$500 Mn.

software and app developers integrating with white labelled wearable devices or commercially marketed third party devices, sophisticated product development at the integration of software and hardware is now becoming the order of the day. Health and fitness is also becoming a key component of health tech apps with a wider value proposition – the same interface to connect with a doctor, capture the prescription, have longitudinal data on diagnostics and count number of daily footsteps or calories consumed. Standalone or integrated in an all-in-one app, digital enablement of better health is here to stay.

### ***Predictive tools in CNS/ Mental Health/ Child Development related ventures***

Beyond, wellness and fitness, an underserved area that is finally getting much needed attention is mental health. In addition to more powered ventures such as Cure.fit’s vertical Mind.fit, several young startups such as Yourper, Headspace are addressing this opportunity. Mumbai based psychological wellness platform, InnerHour also raised \$450 K in its first funding round from Batlivala & Karani Securities, Venture Works and others. Emerging innovation pipeline has global relevance with stealth ventures such as Sparcolife engaging in upstream innovation of early diagnostics, screening and digital therapeutics for unaddressed and often unacknowledged mental health issues. With the US FDA now approval digital therapeutics, the gates have now opened for development and credible, rigorously validated solutions that can address expansive unmet needs in this area.

#### ***Sparcolife:***

- Sparcolife is developing research driven integrated digital diagnostic solutions for mental health and a suite of digital therapeutics, in collaboration with leading Indian institutions.
- MESA/20 is their flagship solution designed to be a diagnostic tool that uses video analytics as primary modality for screening & assessment, retinal imaging-based biomarker identification as a secondary modality and using synchronized inputs from biofeedback & neurofeedback as an auxiliary modality.
- They are a full stack company in health care building Digital Diagnostic and Digital Therapeutic Systems to address the multifarious problems brought upon due to a digital life.

### ***Disrupting Diagnostics – AI and ML led image analysis and automated/rapid diagnostics***

Through the course of the next ensuing decade, diagnostics as it’s done today will be largely transformed. Digitization in diagnostics is a pervasive trend. While digitization of radiology has gained far more attention than pathology, widespread unmet need is rapidly driving innovation in pathology as well. With Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) generating digital outputs as is, these have emerged as the areas where more digital analytics have been pursued. Use of digital X-Rays has also expanded and this paves the way for more grass roots application of Artificial Intelligence (AI) and Machine Learning (ML) in radiology that is relevant for the broad contours of low and middle income countries (LMIC). Potential of AI and ML based solutions to analyse radiology images, identify irregularities and screen for disease markers holds potential to reduce errors and inconsistencies, improve efficiency and throughput, free up radiologists’ time for more cognitively challenging tasks and given the glaring dearth in radiology capacity, create a first

layer of interpretation that can be used for triage. Solutions today are being used to both enhance images of lower consistency (reducing radiation exposure and getting better clinical outcomes with lower capital expenditure) and actually interpret and read images without the concern of human fatigue. Again, with FDA opening doors to approved products, tangible opportunity has expanded multi-fold.

In addition to the large and expansive globally evolving opportunities in image analysis, AI

and ML in diagnostics, ventures in India are also busy addressing problems that are critical in our low resource context. For instance, Bangalore based venture Aindra Systems has been focused on automating pap smears for ovarian cancer screening in public health. Similarly, pathology solutions in microbiology and histopathology are invaluable in the Indian context where a culture test or an ImmunoHistoChemistry (IHC) is largely inaccessible to majority of the population as on date. A testimony to potential impact from automation of contextually critical diagnostics is Molbio Diagnostics. Molbio, a joint venture between pioneering venture Bigtec and established Indian diagnostics company Tulip is a demonstration of tenacity as the first India developed RT PCR diagnostic test for tuberculosis and drug resistant TB (Rifampicin Resistant Mycobacterium tuberculosis) that is now WHO prequalified and an affordable alternative to Cepheid's GeneXpert system. During the current COVID-19 crisis, Molbio's

#### ***MOLBIO: Diagnostics for the real world***



- Molbio, founded in 2010, is a molecular diagnostics manufacturer that specializes in low-cost diagnosis of tuberculosis and other diseases.
- The company has raised an estimated \$2.4 Bn so far in a private equity round.
- Molbio offers a '**global first**' platform that can perform Molecular Diagnostics for infectious diseases at the **point-of-care - Truelab Real Time Quantitative micro PCR System**.

#### ***Data driven intelligence for healthcare: SigTuple***

- Riding the digitization wave, SigTuple was founded in 2015 by Big Data Analytics experts, to develop medical solutions for high volume screening medical tests that require manual analysis of visual medical data.
- The aim is create data driven, machine learned, cloud based solutions for detecting anomalies and trends in medical data, which could improve the accuracy and efficiency of disease diagnostics.
- The company is built on a flagship AI platform, Manthana, with image analysis capability for various diagnostic applications, eliminating the need for skilled medical experts for accurate and timely diagnosis.
- SigTuple has raised an estimate of \$40.8 mn in funding over 6 rounds since 2016 from prominent investors such as Accel, Trifecta Capital, Venture Highway, pi Ventures etc.



Truenat system has emerged as a blessing for both public and private healthcare system as an affordable system that can be used in low resource settings by an unqualified individual with limited training.

Indian ventures are now headed to the global stage armed with passion and geared to attract much needed capital to develop globally respected product range. Notable examples being SigTuple in pathology and Qure.ai in radiology. As a segment that has attracted substantial interest from innovators, entrepreneurs and investors alike across geographic borders, the decade of the 2020s will need substantial deepening of engagement to maintain pace and sophistication of solutions that are globally monetizable.

### *Predictive analytics applications in Oncology*

In addition to automation of diagnostics, clinical approach for treating several diseases is being rapidly transformed with data and technology empowering clinicians with novel prognostic and predictive tools. Largely nucleated in the realm of oncology and now expanding to CNS, this expanding body of innovation is focused on predicting patient response to various drugs and treatment options such as radiation thereby

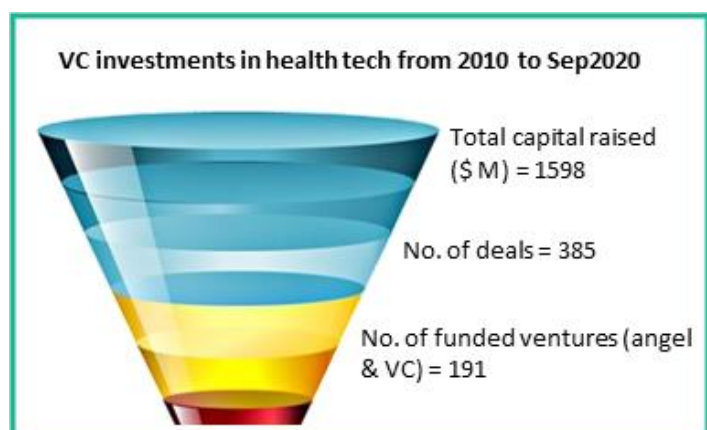
enabling more informed clinical decision making and improved outcomes. For instance, in an indication such as breast cancer, options today include comprehensive and globally established platforms such as OncotypeDx, focused tests in the global pipeline that can predict response to drugs such as taxane and closer home, CanAssist Breast from OncoStem that predicts risk of recurrence in early-stage breast cancer patients. These tests combine power of genomics, proteomics, known biomarkers as well as AI and ML to expand horizons and predictive/prognostic possibilities.

**OncoStem**

- Oncostem, founded in 2011, is a diagnostic oncology company focused on discovering and developing novel tests for improved treatment planning.
- The company has raised an estimated \$7 Mn so far in funding over two rounds.
- Their flagship product, CanAssist Breast is a prognostic test for early-stage breast cancer patients. Samples are analyzed for expression of 5 protein biomarkers and in combination with three clinical parameters to derive the risk for recurrence.

### *Venture Capital fuelling the innovation pipeline*

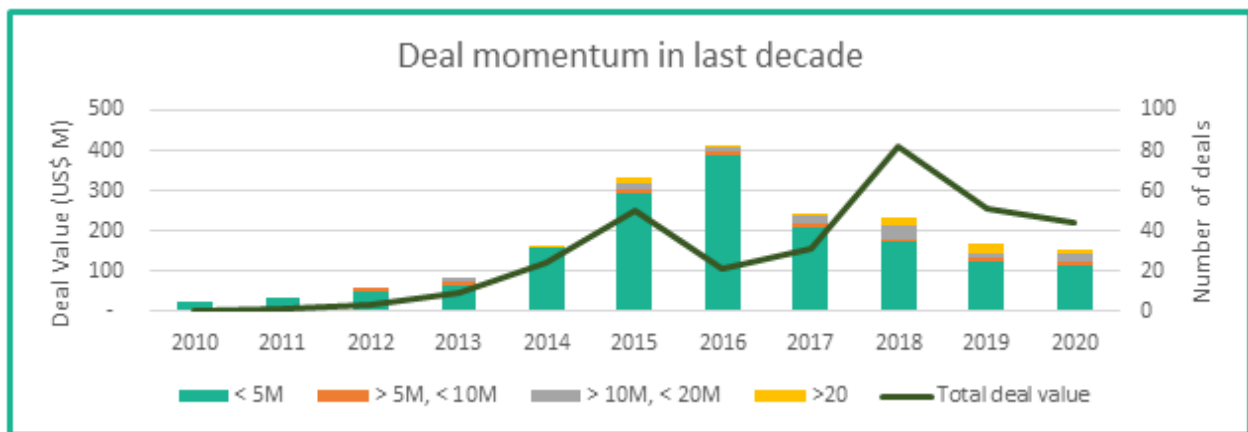
In the context of Indian healthcare delivery, the potential for technology led transformation is pervasive. Health technology solutions hold promise of disrupting the status-quo and leapfrogging fundamental access to care and overall quality of care. The



potential is multi-fold - greater connectivity between patients and providers, expanding scope and utility of health data, improving the patient experience and powering next generation clinical solutions. While non-dilutive Govt. and philanthropic grants have been triggered absolute base of the funnel, continuum of angel investors and venture capital funds have supported advancement of innovation and provided much needed risk capital. Cumulatively, over US\$1.5 billion has been invested by angel and VC investors in health tech companies over the last decade and there close to 200 equity funded ventures in the segment. This funding momentum has provided much needed fuel for ventures to embrace both technology and market risk; and passionately pursue innovations that can shape healthcare delivery of tomorrow.

*Note: All analytics refer to deals announced until mid-September 2020. Deal values may not be included in analysis if not disclosed during transaction. Insights in this section are based on data from the VCEdge database and Sathguru analysis.*

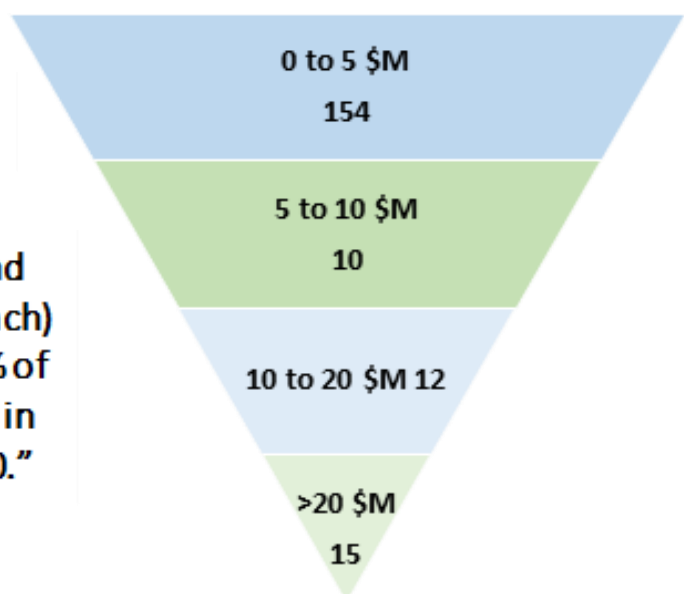
### 2010 to 2020 – Significant decade for health tech investments



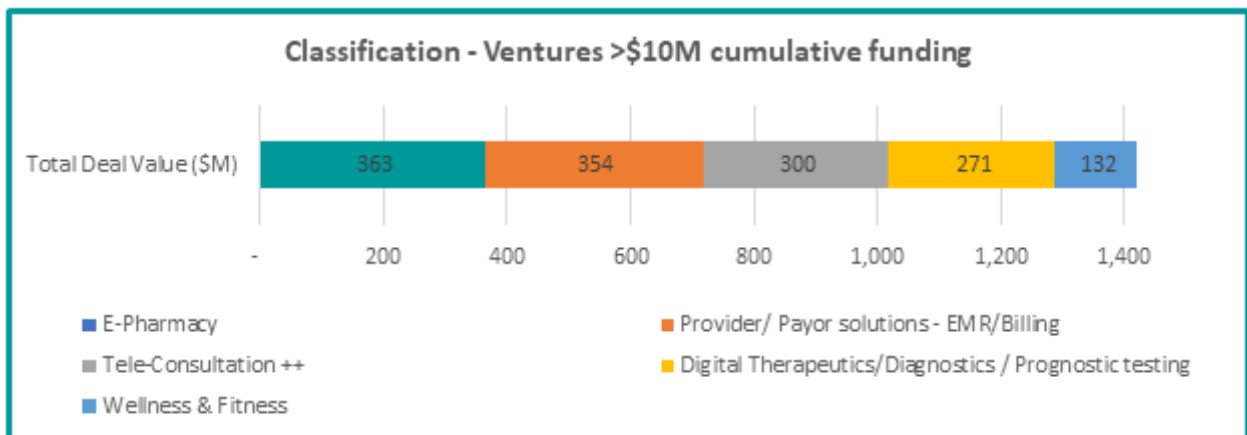
The last decade has been pivotal in evolution of health tech venture ecosystem in India. The funding landscape is reflective of this momentum; and has also been a catalytic driver.

#### Funnel of funded ventures: Based on cumulative funding per venture (US\$ M)

**“27 ventures (with cumulative fund raise of more than US\$10 million each) have raised US\$ 1.4 billion, i.e. 89% of the US\$1.5 billion capital deployed in health-tech between 2010 to 2020.”**

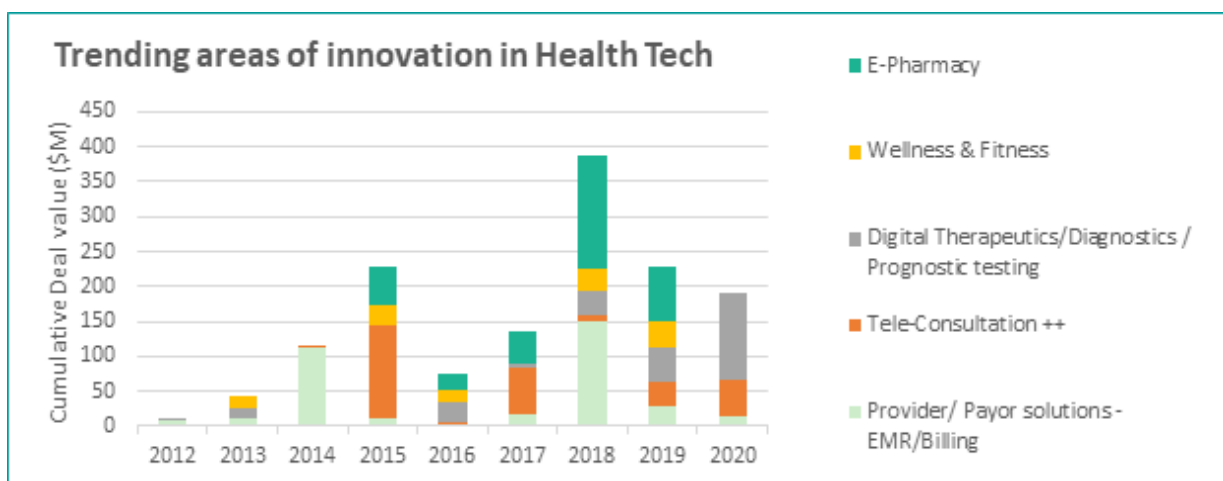


There has been exponential growth in the number of deals and its value in the last decade (2010 to Sep 2020) as compared to the prior decade (2000 to 2009). Less than 1% of the aggregate VC investment over the last decades was in the 2000 to 2009 period. Around 87% of total capital deployed between 2010 to 2020 is during the last 6 years (2015 to Sep2020). There has been substantial spike in invested capital and number of deals since 2015, propelled by expanding innovation pipeline as well traction in few categories of innovation like e-pharmacy, digital therapeutics, etc.



Analysis of number of ventures across of cumulative fund raise (per venture) indicates a base that comprises of 75% of the overall funnel. While about 150 ventures have raised capital of up to US\$5 million each during the 2010 to 2020 period, less than 50 ventures have raised more US\$ 5 million each.

### Investment Themes gaining traction



Note: Chart only includes classification of ventures that have successful raised more than US\$ 10 million each and not total investments in health-tech. As with all other analysis in this section, only includes deals where deal value has been disclosed.

To identify areas of investment that had maximum traction over the decade, we have further analysis of investment themes that dominate the c. Close to two thirds (~ 72%) of this US\$ 1.4

billion has been invested across three main themes - e-pharmacies, tele-consultation apps that have now evolved to offer a substantially wider value proposition and payor/ provider/ EMR solutions.

Investment themes have substantially evolved over the last six years. Larger investments made in 2014 were more concentrated in traditional healthcare IT realm and covered the spectrum of payor or provider focused solutions including EMR and billing products.

### **Tele-Consultation ++**

Tele-consultation apps and consumer focused digital platforms attracted substantial capital between 2015 and 2017. Practo has individually raised US\$ 200 million of the ~ US\$ 300 million invested in this category. A slew of ventures emerged between 2012 to 2017, each focusing on a unique niche and gradually to expanding to emerge as potentially powerful digital platforms. However, relatively lower level of value realization has led to a wider focus on business model innovation and quest for more tangible value proposition for the focus customer segment. Lower visibility of revenue scale-up has somewhat slowed down investments over the last couple of years in digital connectivity driven health-tech venture. Very few of next wave of ventures have raised cumulative funding north of US\$ 20 million (Healthians and Mfine).

### **E-pharmacies**

Investment momentum in e-pharmacies commenced around 2014, but peaked around 2018 - 2019. COVID-19 led behavioral change is like to be prove pivotal for this segment. 2020 is critical in more ways than one. Market traction is likely to expand due to the COVID-19 impact. The segment has leapfrogged in maturity with arrival of two mainstream behemoths, Amazon and Reliance. Reliance acquiring Netmeds for the foray also has created the first exit. Regulatory uncertainty has been a dampener in the segment. Most ventures currently operate on the marketplace model to co-exist with India's fragmented base of pharmacies. However, regulations for the segment are still to be formalized. Ministry of Health and Family Welfare vide its notification G.S.R. 817 (E) dated August 28, 2018 published a draft to amend the Drugs and Cosmetics Rules, 1945. We are optimistic that the current stimulus at both ends - industry thrust and consumer demand, will soon drive a formalized regulatory framework. With the entry of large corporates, the segment is likely to mature and less attractive for young entrants in the future.

### **Digital therapeutics, diagnostics, prognostic testing and other next generation solutions**

AI and ML have paved the way for contemporary solutions that meaningfully impact care outcomes. With FDA approving products through the 'software as a medical device' pathway, there is greater regulatory clarity and global engagement has peaked.

India has unique strengths of being a technology powerhouse and also offers access to large sets of data or clinical samples needed for developing such solutions. With such a fertile landscape and potential for clinically impactful disruption, we foresee that this segment of innovations is likely to attract relatively larger quantum of capital over the next five years. Ventures such as Qure.ai and SigTuple are forerunners in pursuing global opportunity. We expect the overall pipeline to widen rapidly and ventures to address solutions that are relevant for both – markets where highest value is concentrated, and low- and middle-income

countries (LMIC) where highest need is concentrated. The era of multi-disciplinary innovation advancement is here; and venture capital is ready to fuel the ride for sophisticated solutions to critical problems with a tangible pathway to value realization.

# Transformative Outlook of an otherwise reticent Industry



### III. Transformative outlook of an otherwise reticent industry

While technology's role in healthcare has expanded exponentially through the launch of numerous healthcare technology start-ups in the last decade, it still hasn't kept pace with the social technology advancements of consumerisms that other industries have moved towards. Several patient provider solutions that made an initial splash in the industry were unable to derive value due to the slow adoption of new technologies by clinicians and healthcare establishments alike. The life and death nature of the industry coupled with the heavy regulations with regards to privacy of the patient made it challenging to take advantage of cross-border technology services and also hindered the accessibility of information for patients outside of their home country. These cultural and protectionism barriers are often to blame for the lack of a technology disruption to the industry up until now.

However, in the last six months, the COVID-19 pandemic has exposed the deep vulnerabilities and inherent gaps of the Indian healthcare system. This has posed as a challenge and opportunity for healthcare start-ups and is also helping the healthcare system shape and define policies and practice for years to come. Preparing for a COVID-19 response spurred action causing clinicians and healthcare establishments to start adopting more agile methods for caring for patients. ***The urgency of decision making and implementation of new ideas, which would have taken months prior to the pandemic, have led to a rapid migration to digital technologies.*** Adoption of tele-health clinical care models and other technologies are not based on a strategic plan or roadmap, yet these decisions are helping achieve a higher level of safety, quality and effectiveness during this time. Patients and payors are starting to experience the efficiencies of a lower – cost health model and the convenience of telehealth and remote monitoring, making it likely that they will want to continue this migration towards technology well into recovery. The key drivers for the ongoing transformation of an otherwise reticent healthcare technology industry are broadly:



#### Clinicians Embracing Technology:

The pandemic has caused a behavioural change amongst clinicians and operations change in healthcare establishments.



#### Policy Impetus During Trying Times:

Cognizant of the need of the hour, policies such as 'Tele-consultation Guideline', 'National Digital Health Mission' and 'E-pharmacy Formalization' are being implemented.



#### Continuing Investment Momentum:

The pandemic has caused a behavioural change amongst clinicians and operations change in healthcare establishments.

## COVID19 impact on clinicians and healthcare establishments

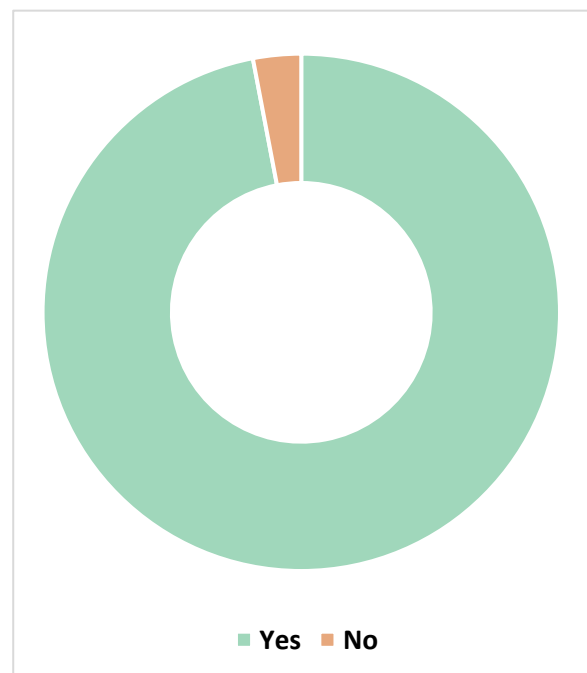
Since the rapid uptake of technology was inevitable and crucial in helping communities navigate the pandemic, clinicians were compelled to understand, learn and adopt digital health on the daily. The pandemic has provided an opportunity for clinicians and patients alike to experiment with technology in the care setting and has empowered them to take risks and find out what sticks. This agile rate of change has creating a long lasting impact on the healthcare industry around the world, extending to clinician behaviour and patient adaptability. Now that the principle of ‘being able to deliver care remotely for a lot of patients’ has been established, there is a significant recognition of the benefits of health tech that will extend even post the pandemic. With the necessary government policies and funding and willingness from the healthcare industry to adopt, the mantel of the Indian healthcare system will evolve to display a continued commitment to rapid adoption of technology, starting with our clinicians.

*Around 40 clinicians across multiple clinical areas were surveyed for this ‘SmarTec 2020’ white paper. The results from the survey indicated a high receptiveness for technology led transformation of healthcare today and are discussed below.*

### **Behavioral change in tech adoption and receptiveness**

Prior to the pandemic, technological solutions had been long struggling to prove their value in the structured and slow-changing healthcare industry. The highly consequential nature of the industry and long-standing regulations allowed for little risk hindering rapid adoption of health tech despite the numerous solutions being created. Now, amid the unfortunate events of the COVID-19 pandemic, an accelerated adoption of many technological solutions is being seen in healthcare establishments that have actively been embraced by clinicians.

***95% of clinicians who responded to the ‘SmarTec 2020’ Survey alluded to a behavioural change on tech adoption driven by the unprecedented challenges posed by the COVID-19 pandemic.***



“This pandemic might end in a year or two but it’s a wakeup call; we need to adopt more technology. The future will be less contact with the patient, they will have to be treated with least exposure to healthcare staff.”

- ENT Specialist

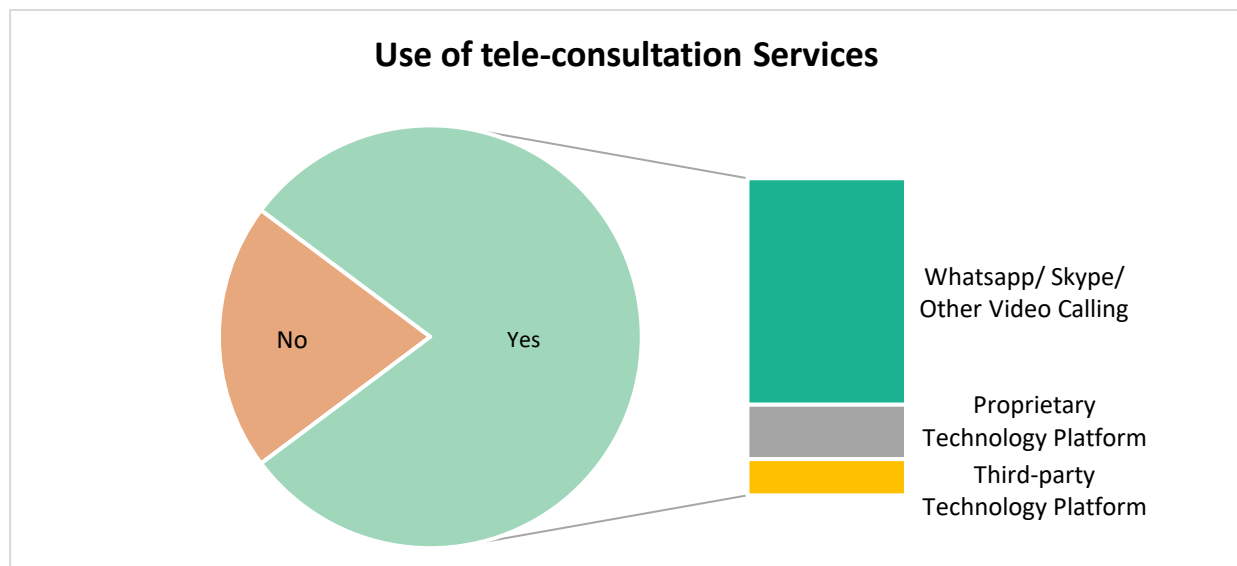
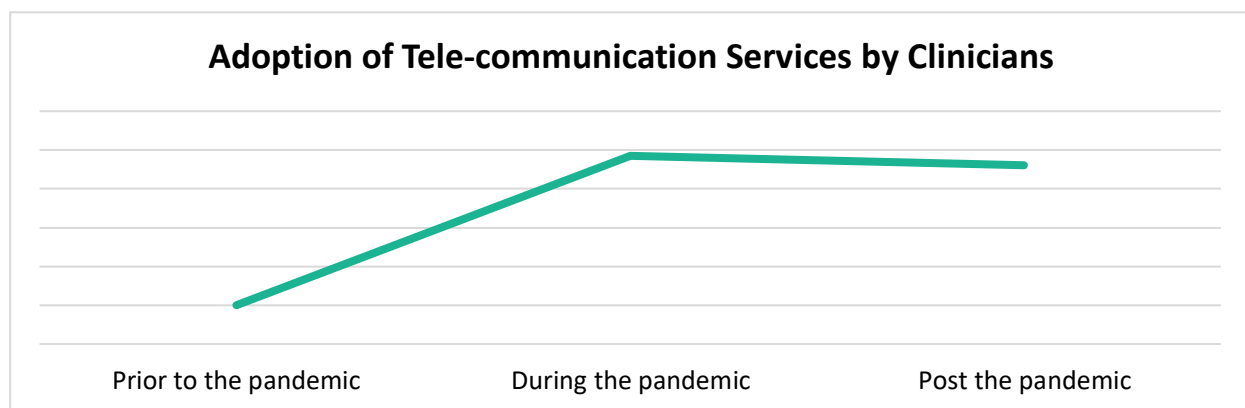


## Embracing digital connectivity platforms

Tele-consultation services have existed for a long time but have seen a sharp increase in use due to COVID-19 as indicated in the graph below. Clinicians, even those who were not conversant with health tech, have embraced digital connectivity platforms in order to stay connected with their patients and provide virtual care to the best of their abilities. **75% of the surveyed clinicians are offering tele-consultation services currently, most of whom indicated that they would continue using this service well after the pandemic.** Hospitals and individual practitioners are using various platforms from WhatsApp, Skype, in-house developed software and third-party applications.

“We started using an in-house developed software for tele-consulting due to the COVID-19 pandemic but will definitely continue its use after it.”

- **Orthopaedic Clinician**



Currently, only 25% of clinicians offering tele-consultation services are using a technology platform while the rest alluded to using basic video calling solutions such as WhatsApp or Skype. As clinical receptivity continues to expand, healthcare providers are likely to embrace more sophisticated solutions. Owing to the robust pipeline of innovation led solutions serving this purpose already being nurtured in the country, this change is in the foreseeable future.

## Clinicians contributing to healthcare innovation ecosystem

A respectable number of clinicians are now taking up positions of ‘medical directors’, ‘physician founders’, ‘advisor’ or ‘chief medical/health officers’ in healthcare start-ups. Clinicians can be seen working increasingly, in tandem on innovative technology solutions that promise a transformative change to healthcare. Working on the ground gives healthcare specialists an understanding of the nuances in the system that go beyond models, metrics and user experience.

### ***Collaborations with start-ups to validate health tech***

***The results from the survey indicated that about 28% of clinicians were a part of some collaboration*** with a start-up to validate healthcare technologies and innovations. With the increasing number of tech platforms being adopted to embrace the ongoing changes, we anticipate this percentage will increase in the coming years.

Since the frontlines of healthcare; clinicians and healthcare establishments are responsible for whether or not the product will get adopted at the grassroots, health tech entrepreneurs are looking to hospitals and specialists for honest feedback, usability and feasibility of the product. The innovation ecosystem is undergoing a transformation with clinicians emerging as co-creators of health tech solutions.

## Perceiving high impact of technology on Indian healthcare delivery

With the healthcare industry now primed for change and tech adoption and considering the rising income levels, greater health awareness and increasing illnesses, this space is bound to witness paradigm shifts with technology disrupting the industry. The culture and framework being created today will enable end users to leverage the power of existing technologies and embed them into their framework. Clinicians are perceiving a high impact of technology on the Indian healthcare delivery end in a broad range of sectors including radiology, mental health, AI and ML infusion into predictive diagnostics etc.



## *Policy impetus during trying times*

With digital healthcare and telehealth services thrust to the forefront in recent times, policy makers and government bodies are acting swiftly to remove any negative barriers hindering telehealth usage and also drafting regulations for the responsible and safe use of technology in the healthcare industry. The Indian government has lent statutory backing to digital health technologies by issuing and notifying the first-ever official guidelines governing telemedicine practice, formalizing e-pharmacies and launching the National Digital Health Mission.

### **Formalization of tele-consultation in India**

A silver lining presented by COVID-19 was the push to healthcare providers to adopt tele-consultation in routine clinical practice. Cognizant of the need of the hour, the Ministry of Health and Family Welfare (MoHFW) laid down norms for tele-medicine or tele-consultation, officially formalizing an erstwhile grey area of operation. The guidelines were issued as an amendment to the Indian Medical Council (Professional Conduct, Etiquette and Ethics) Regulations 2002 (Code of Conduct) in order to regulate Telemedicine in India. As per the guidelines, any medical practitioner enrolled in the State Medical Register or the Indian Medical Register under the Indian Medical Council Act, 1956.

In addition to the benefits of providing remote consultation, bridging gaps to accessible medical service, saving indirect costs related to consultations, tele-consultation also brings about an additional layer of legality and safety into medical consultation since it mandates the medical practitioner to display the registration number and also facilitates routine health data storage and management. Until now the segment had a regulatory obscurity which would have been a road-block to adoption of tele-consultation platforms and apps by both the consumers and by stakeholders in the value chain, namely, the hospitals and physicians. COVID-19 led impact on healthcare services prompted some hospitals that had previously hesitated to adopt tele-consultation to not only adopt it in their routine patient management but also upskilling of clinical and non-clinical support staff to adopt and use such platforms in routine care management. The regulations also permit nurses and care staff to consult with the doctor on behalf of the patient – this further opens avenues for at-home healthcare service providers like Portea, Care24 etc. who can now boast of providing a comprehensive care package and the confidence of connecting with a medical practitioner remotely in case of emergencies at home.

### **Policy Stimulus and the National Digital Health Mission**

Policy stimulus has been a critical driver of the evolving ecosystem. An enabling environment is the foundation of technology led transformation. The current context is marked by a near zero level of adoption of electronic medical records (EMR). While this implies that India doesn't have the liabilities of legacy systems and structural challenges, it calls for resolute policy support to drive much needed wave of adoption to realize the digital potential.

The policy stimulus has been through a series of progressive steps driven by multiple stakeholders. Preliminary yet critical building blocks were the 'National Health Stack' and the draft National Strategy on Artificial Intelligence #AIForAll published by the NITI Aayog in 2018.

Both served as enabling steps towards creating the ecosystem of possibilities needed for implementing the ambitious Ayushman Bharat Yojana (ABY) at scale across the country. Following at the heel was one the most significant developments of recent times – the blueprint for the National Digital Health Mission (NDHM) and now the formal announcement of the NDHM by the honorable Prime Minister on 15<sup>th</sup> August 2020. With the vision of implementing systems with interoperability and conforming to mandated standards, the NDHM is precursor to regulatory framework needed for widescale EMR adoption. With ownership of records vesting in patients and flexibility to port records between clinicians / providers, the NDHM envisions a national framework that will foster trust, transparency and required controls. When followed with progressive building blocks, this can pave the way for creation, aggregation and effective utilization of medical data for improving the overall healthcare system and clinical outcomes.

### *Continuing investment momentum in start-ups and R&D*

The healthcare start-up ecosystem has witnessed an increase in investments from both public and private funders. There are well-established government-led funding mechanisms for early proof-of-concept and seed stage funding, namely, Biotechnology Ignition Grant (BIG), Small Business Innovation Research (SBIR), and Industry Innovation Program on Medical Electronics (IIPME) etc. for catalytic funding in research and development at companies and start-ups. In addition to fiscal incentives, the government has also taken measures to attract more investments in the space, in 2019, the government has eased the rules pertaining to angel tax – that required start-ups to pay certain tax if they receive an investment that is higher than their fair market value as recognized by the tax authorities. The angel tax was a road-block to many investors willing to invest in early-stage start-ups whose valuation is fairly low compared to what it projects to achieve in the future.

The need for new-age digital technologies in healthcare in India has birthed a healthy ecosystem of healthcare start-ups in the country. According to VCCEdge, 53% of angel investments in India in 2019 were towards healthcare. In the previous few years, a number of Indian start-ups have been able to attract foreign investments too, e.g. Qure-ai, MapMyGenome etc.

# Way Forward



## IV. Way forward

### *Triggering innovation in contextually relevant challenges*

The challenges in Indian healthcare system are unique and fixing legacy issues like infrastructure and manpower deficit is not only difficult but is also not enough to transform the healthcare system to be at par with the global standards. Technology can help expand access, bring down cost of care and improve clinical outcomes. A largely out-of-pocket market such as India, there is potential for rapid adoption of innovations for technology-powered reforms, upgradation and catering to critical national needs to address systematic inefficiencies.

The last decade saw a contextually relevant robust innovation pipeline being nurtured in the country due a combination of triggers; non-dilutive stimulus from the government, VC & PE funding fuel and a wave of entrepreneurial momentum. This innovation pipeline has created a promise of addressing the expansive challenges of capacity and infrastructure dearth in the Indian healthcare delivery ecosystem. With COVID-19 acting as a blessing in disguise, there is a rapidly evolving landscape of technology acceptance and policy impetus for digital health innovations. Start-ups finally have the much-needed stimulus for innovations to have widespread impact and realization of value; this will help them leapfrog to next generation contemporary care. India is on its way forward to realizing value, driving tangible impact and creating global imprint in the health tech space.

In order to move towards the value realization stage, we need to acknowledge the path to markets in long, progressively more capital intensive, includes higher binary risk and is intrinsically more complex. While we have strategically pieced together major parts of the puzzle; robust innovation pipeline, policy impetus and clinical embracing of technology, several other challenges need to be addressed before wide scale implementation and creating global impact. It is critical to urgently design catalytic solutions during this opportune time to create a sustainable ecosystem for healthcare technology start-ups.

### *Creating avenues for scale-up success and innovation absorption*

At the end of the complex innovation continuum, realization of potential impact as well as creation of economic value finally depends on widespread innovation down streaming. Commercialization success is also fundamental for sustainability at both the venture and ecosystem level. Start-ups face the threat of very immature and fragmented markets where established scale-up pathways don't exist. It is imperative that appropriate channels are built within the ecosystem to support commercialization success of start-ups developing innovative solutions for the Indian market. Establishing such pathways are critical not only for the sustainability of start-ups but also to trigger innovation in the field by creating poster-boys of success in the ecosystem.

### ***Ongoing Efforts to create Market Channels***

In the wake of COVID-19, Startup India, under the DPITT organized a start-up challenge inviting innovations in the following areas: PPE, diagnostic equipment, AI-based solutions for contact tracing, treatment related interventions, geo-fencing, crowd management etc. Under the program, a one-stop repository is being built for ready access by the government and the private sector for further development and deployment.

Another recent initiative is by the NITI Aayog that announced 15 new challenges under the ARISE Atal New India Challenges in various areas, including healthcare along the lines of health data analytics, AI solutions and healthcare monitoring with a grant value of 50 lakh for each. Although such challenges create an ecosystem to trigger innovations, there are no established pathways to open avenues for adoption of innovations into the healthcare delivery ecosystem. There are various start-ups addressing challenges with maternal health and infants, PoC diagnostics that have not translated to commercial success.

#### **Public Health Innovations:**

*Need to facilitate scale up across market channels*

The pathways for rapid scale-up and innovation absorption is critical for sustainability. The lack of transparency in public and private procurement channels is way more complex than it appears on the surface. It is particularly challenging given the de-centralized procurement mechanism, dependency on public tenders for market entry and often the challenge of meeting requirements of being CE or FDA cleared.

The dampening effect is more brutal in the case of innovations for public healthcare problems where the products are not part of current clinical practices – case in point is at least handful of maternal and child health innovations, such as ‘Bempu WristBand’ that don’t enjoy active markets in public health and haven’t translated to commercial success as they still await widespread adoption. Creation of markets requires substantial effort on advocacy, demonstration of benefits and market shaping with stakeholders. Even with a strong push demonstrated from the supply side, ventures are unlikely to have wherewithal to shape or create markets. This is why stakeholders have to get involved to implement proactive measures needed to create an active demand pull.

While NHSRC had rolled out a health technology assessment mechanism to support innovation adoption in public health, it was not scaled up and startups have indicated no tangible progress through the intended pathway. Involvement of entities of such as NHA and Niti Ayog creates optimism that creation of pathways for wide scale adoption could be a near term reality. It is critical we create and effectively implement adoption and procurement mechanisms for innovation in public health.

### **Private Markets:**

*Need for value realizations and successful exits*

Currently, there is a high critical need for investment fueled startups to display value realization through widespread commercial scale up in order to set in place an innovation investment cycle. Charting the course for exits and creating a continued momentum for investments in critical to display that investment stories have not been futile. However, market channels are underdeveloped for most product categories and more so for innovative ones. Private markets are highly fragmented and channel partners are distributors of sub-optimal size and reach, with no experience in concept selling. There is also a severe dearth of large domestic companies that can be commercialization partners.

It is imperative for companies to have as astute focus on scale up and business model economics in order to demonstrate value. With COVID-19 changing the scenario and creating an opportune time for wide scale adoption and value realization stories, Health tech start-ups can try to nimbly adapt business models and capitalize on the evolving digitalization.

### **Scale Up Funding:**

*Glaring Void, even in socially relevant ventures*

While there are established government-led and international grants and funds to support start-ups in seed and early-proof of concept stages, there's a dearth of funding options in the next leg of scale-up. In addition to creating avenues for absorption of innovations, the government must ensure catalytic funding in start-ups and technologies that target socially relevant healthcare needs but do not have a strategic alignment with private venture capital funds.

Inadequacy of scale-up funding can push health tech ventures to re-domicile themselves in more evolved innovation hubs such as US, Singapore and Switzerland thereby shepherding innovation outside of India, drain of potential economic value or worse still, leading to venture mortality.

Through a concerted effort of the stakeholders, there is a possibility to establish scale-up mechanisms and an ecosystem to support progressive value-realization milestones. India needs more success stories emerge out of socially relevant healthcare technologies and solutions to ensure that the potential of these innovations is not left to die out for lack of the required thrust.

### ***Nurturing innovations with potential for global impact***

While there's a need for innovations unique to India's challenges and there are a number of technologies in the pipeline and start-ups working on solutions relevant to the country's challenges, overall value realization hinges on creating tech-powered solutions that are globally relevant and can catapult the start-up ecosystem to globally benchmark-able levels.



### **LMIC and RoW Countries:**

The healthcare systems of a number of RoW countries and LMIC countries are presented by challenges that are similar to that of India – deficient infrastructure and manpower, inefficient operations etc. Such markets could present an attractive opportunity for Indian inventors and developers for expanding access and quality of available care. Through serving multiple immature markets, scale up could be driven by aggregating demand across LMIC. Viable business models can be created de-novo with sophisticated Indian innovations based on a high regulatory threshold and scientific innovation.

#### ***MiraCradle***

- MiraCradle is a Neonate Cooler: an affordable passive cooling device which uses the advanced savE<sup>®</sup> phase change material (PCM) technology to induce therapeutic hypothermia among newborns suffering from birth asphyxia.
- It has been developed by Pluss<sup>®</sup> in collaboration with CMC Vellore. It is easy to use, safe, light weight, portable and gives the precise temperature control of 33-34½C for a period of 72 hours with minimal manual supervision and no requirement of constant electricity supply.
- Their innovation is a globally relevant solution which LMIC and RoW countries could benefit from.

Additionally, innovations leveraged on bringing down operational costs and improving efficiencies in workflow, like IoT, AI-ML, predictive analytics are all-pervasive and relevant to developed nations too which can benefit from lowering down overall cost of care and reduce public and private expenditure on health. It is imperative that such globally relevant solutions are given the due impetus through fiscal benefits, bridging gaps in regulatory framework to facilitate cross-border collaborations, facilitating creation of a strong IP-backed tech portfolio.

### **Impact beyond LMIC and RoW:**

In areas of contemporary innovation, global pipeline competition from leading developers is a reality. There is a subset of ventures in India today are pursuing high complexity areas of innovation in health tech; robotic surgery, diagnostics automation, next gen CNS and oncology predictive tools, in silico drug discovery etc. Indian innovators (Sigtuple, Qure.ai etc) are finding the healthcare of tomorrow by combining their tech prowess, global exposure and agility and aspiring to succeed in the high value markets to achieve optimal value realization. With the developments seen in the last 6 months alone, India is well on its way to carve out space in the global markets of health tech in the coming decade.

### ***Qure.ai: Designing globally competitive AI-based diagnostic solutions***

Qure.ai was founded to provide affordable and accessible diagnostics using deep learning technology. Deep learning is a branch of machine learning that comprises algorithms triggered by the structure and function of the brain, called artificial neural networks. Founded in 2016, the Mumbai based start-up has a number of accolades to its name:

- US FDA 510(k) cleared head CT scan product 'qER' – that triages radiology scans with intracranial bleeds, mass effect, midline shift, and cranial fractures. It is one of the industry's first 4-in-1 clearance for an AI tool.
- Notable International partnerships with Nordic MedTech to deploy AI tools in Nordic and Baltic regions, deployment by Government of Oman to manage COVID-19
- First AI-Based Chest X-ray Interpretation Tool to Receive CE Certification – the tool is being used in areas without trained professionals to screen for tuberculosis. It has also been deployed in a hospital in Italy to detect findings indicative of COVID-19 using an X-ray.

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## **ABOUT ASSOCHAM**

# **The Knowledge Architect of Corporate India**

## **EVOLUTION OF VALUE CREATOR**

ASSOCHAM initiated its endeavour of value creation for Indian industry in 1920. Having in its fold more than 400 Chambers and Trade Associations, and serving more than 4,50,000 members from all over India. It has witnessed upswings as well as upheavals of Indian Economy, and contributed significantly by playing a catalytic role in shaping up the Trade, Commerce and Industrial environment of the country.

Today, ASSOCHAM has emerged as the fountainhead of Knowledge for Indian industry, which is all set to redefine the dynamics of growth and development in the technology driven cyber age of 'Knowledge Based Economy'.

ASSOCHAM is seen as a forceful, proactive, forward looking institution equipping itself to meet the aspirations of corporate India in the new world of business. ASSOCHAM is working towards creating a conducive environment of India business to compete globally.

ASSOCHAM derives its strength from its Promoter Chambers and other Industry/Regional Chambers/Associations spread all over the country.

## **VISION**

Empower Indian enterprise by inculcating knowledge that will be the catalyst of growth in the barrierless technology driven global market and help them upscale, align and emerge as formidable player in respective business segments.

## **MISSION**

As a representative organ of Corporate India, ASSOCHAM articulates the genuine, legitimate needs and interests of its members. Its mission is to impact the policy and legislative environment so as to foster balanced economic, industrial and social development. We believe education, IT, BT, Health, Corporate Social responsibility and environment to be the critical success factors.

## **MEMBERS – OUR STRENGTH**

ASSOCHAM represents the interests of more than 4,50,000 direct and indirect members across the country. Through its heterogeneous membership, ASSOCHAM combines the entrepreneurial spirit and business acumen of owners

with management skills and expertise of professionals to set itself apart as a Chamber with a difference.

Currently, ASSOCHAM has more than 100 National Councils covering the entire gamut of economic activities in India. It has been especially acknowledged as a significant voice of Indian industry in the field of Corporate Social Responsibility, Environment & Safety, HR & Labour Affairs, Corporate Governance, Information Technology, Biotechnology, Telecom, Banking & Finance, Company Law, Corporate Finance, Economic and International Affairs, Mergers & Acquisitions, Tourism, Civil Aviation, Infrastructure, Energy & Power, Education, Legal Reforms, Real Estate and Rural Development, Competency Building & Skill Development to mention a few.

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ASSOCHAM has been a significant contributory factor in the emergence of new-age Indian Corporates, characterized by a new mindset and global ambition for dominating the international business. The Chamber has addressed itself to the key areas like India as Investment Destination, Achieving International Competitiveness, Promoting International Trade, Corporate Strategies for Enhancing Stakeholders Value, Government Policies in sustaining India's Development, Infrastructure Development for enhancing India's Competitiveness, Building Indian MNCs, Role of Financial Sector the Catalyst for India's Transformation.

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Together, we can make a significant difference to the burden that our nation carries and bring in a bright, new tomorrow for our nation.

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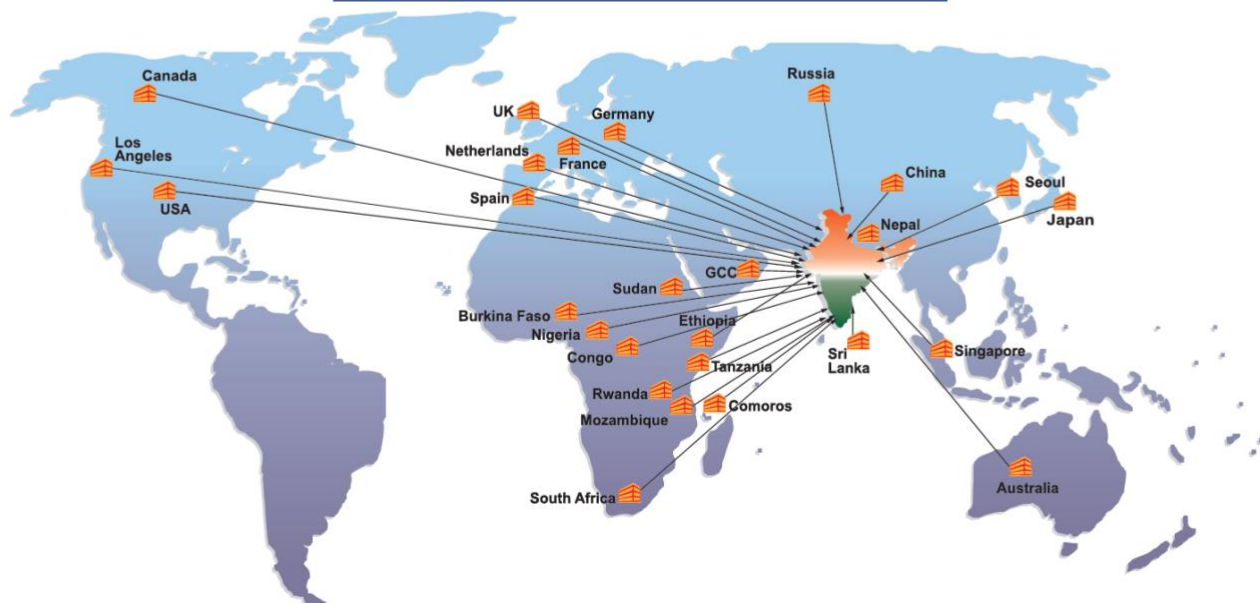
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The pictorial presentation of the world map does not purport to be the political and geographical maps of the world and India and is not drawn to scale. This is only indicative.

ASSOCHAM International Department

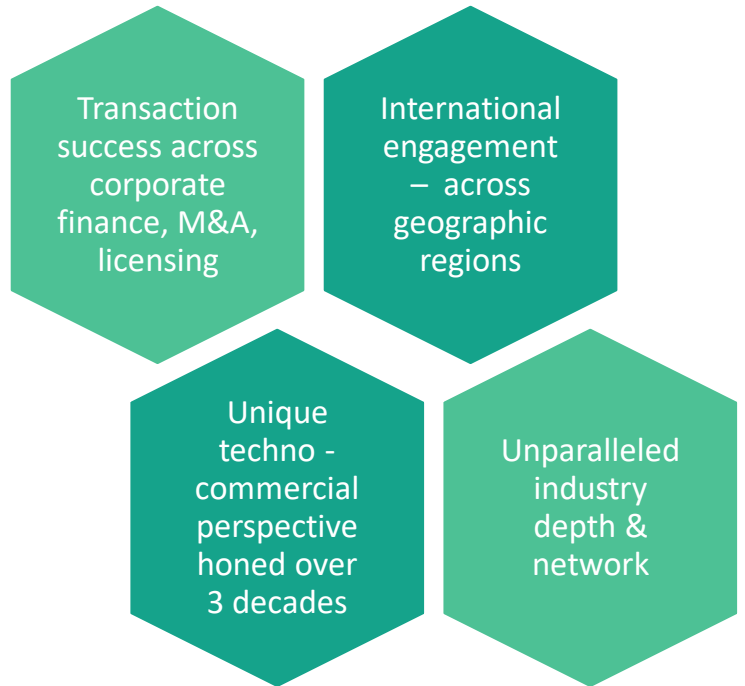
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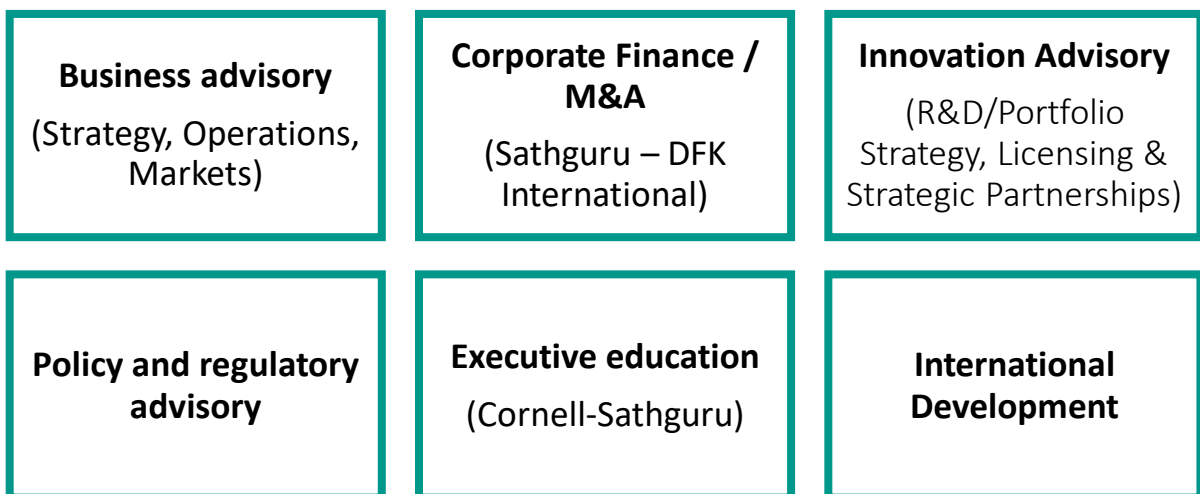
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