DIALOG

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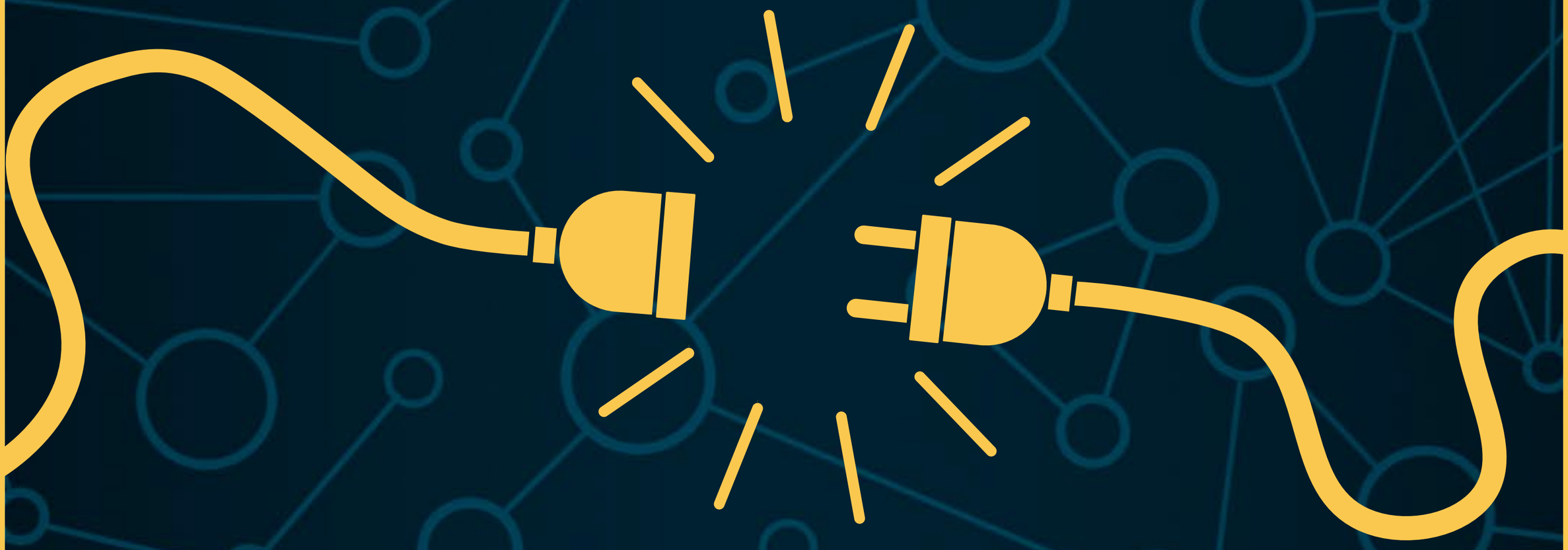

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MANISH KOHLI MD
Curator

ELLIOT SLOANE PHD
Curator

AJAY NAIR MD
Curator

I am happy and proud to kick off this issue on digital health, curated by some of the best minds in the field.

Today, digital health is no longer a futuristic concept or a luxury. It is a necessity.

Digital health revolutionizes every aspect of stakeholder management as well as interaction in healthcare - becoming a digital ecosystem of functional digital or real-world units, connected through real-time data and intelligence, allowing sandboxes within the ecosystem, for continuous innovation.

Advisor for this issue:
Dr Vijay Agarwal

DIALOG
PROJECT VISION

THE TECHNOLOGY EDITION

"We are [in] the age of digital, leaving behind the prior one with its application of digital technology to make resources more information-intensive and connected. Those terms [digital technologies] continue to describe what it means to be digital, but not how those characteristics are being applied to the world"
(McDonald, 2019)

Healthcare is no different. Traditionally, the term digital health was used to denote the application of ICT to healthcare processes. However, digital health is not about technology. It is about health. In other words, digital health can be defined as health and healthcare in the context of digital societies. (Rowland 2019). The tools, methods and technologies used in the field of digital health impact the widest possible range of societal and economic activities of a healthcare enterprise to deliver better patient outcomes and value for the healthcare ecosystem.

From analytics and business process automation to patient experience, social media and robotics, "digital" is ubiquitous within the modern-day health care organization. It touches everything - from clinical care, supply chain, finance, business, human resource management, home-based care and more. To equate digital health with an organization's IT vertical is misplaced. Digital health truly represents a horizontal for a healthcare enterprise. In fact, in leading organizations, the lines between the role of a chief information officer and chief operating officer are becoming blurred. IT, clinical and operational strategies are no longer parallel in the pursuit of convergence. They are one and link together desired outcomes with data, people, processes and technology. The digital health platform by definition is an ever-present, continually learning ecosystem that empowers a modern health care organization to deliver the best outcomes by enabling contextual, insights that drive optimal decision-making by every employee and caregiver.

Guest Editors and Curators of this issue:
Manish Kohli MD, Elliot Sloane PhD, and Ajay Nair MD

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PROJECT VISION

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency."

Bill Gates

Innovations have created tectonic shifts in our civilization and enabled us to live far more fulfilling lives. In the current age, technology is that great disruptor. It has already changed every aspect of how we live and spend our day in the past 20 or so years. Technology creates new ways to do things and brings efficiency to existing processes.

In healthcare, we always have a resource crunch - of money, skilled manpower and knowledge. Technology can clear all 3 shortages by making processes more cost-efficient, introducing automation to reduce the need for trained manpower (further reducing cost in economies of scale), and boosting the speed of research through innovations in AI and ML.

This is apart from the innovative treatments that become possible with newer innovations like surgical robotics or newer medicines or delivery approaches that are churned out much faster now, thanks to technology.

However, like the quote from Bill Gates above, we can expect true value only if we ensure our processes through which services are provided or data is collected are functioning with the best efficiency. If we can not ensure this, we have what we see in hospitals today - EHR and HMS systems becoming a burden; requiring additional support, management time, and manpower to keep them functional and updated.

This means that innovation has to be crafted at the system level and implemented well. This is why we look at healthcare as an ecosystem and digital health as a multi-stakeholder concept. In this issue, we look at digital health and how it creates an ecosystem that can start a virtuous cycle of efficiency through technology in healthcare.

DR SHANOOB AZAD
Co-Founder
DIALOG

PROJECT VISION

INTRODUCTION

DIALOG

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AUGUST 2022

Pressure Injury Treatment

CONTRIBUTION BY
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INTRODUCTION

Pressure injuries are a frequently occurring health problem throughout the world. A recent systematic review reported a global point prevalence of pressure injuries in acute hospitals at 14.8% and period prevalence at 11.6%, with a mean incidence of 6.3%.

Treatment of pressure injuries is a prolonged process and must have goals based on ulcer severity. We must set goals for:

1. Prevention
2. Healing wounds
3. Non- Healing wounds
4. Non- Healable wounds

Category I and II pressure ulcers have the potential to be healed with conservative care but category III and IV require a longer time to heal and may need surgical intervention.

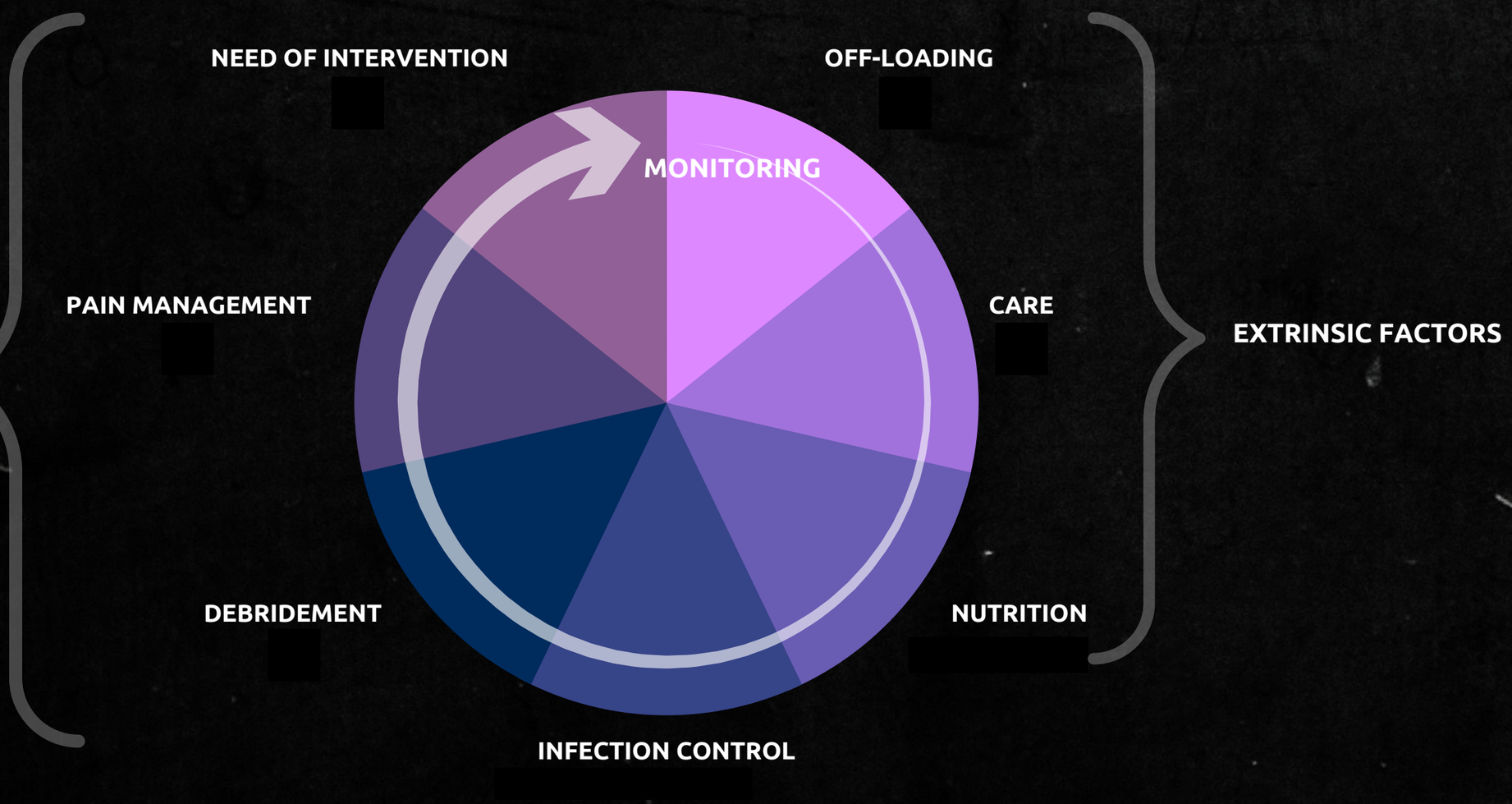
Treatment of pressure injury must consist of management of both intrinsic and wound-related factors such as:

1. Offloading:

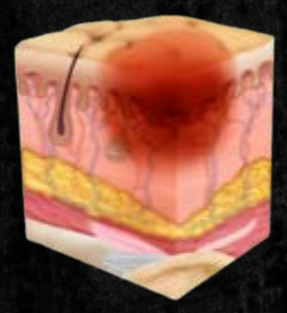
a. Support surfaces are essential for pressure redistribution and are designed for the management of tissue loads, Microclimate, and/or other therapeutic functions. *Examples are; Integrated bed systems, Mattress replacements(Air beds), overlays, seat cushions and prophylactic dressings.*
b. Turning and positioning: Avoid turning a patient on the side of existing pressure injury, turn every 2-4 hrs. based on the patient's need.
c. Mobilization: Patients must be mobilized based on their respective physical capabilities as soon as possible.

2. Skincare:

Keep the skin clean using a PH-balanced cleanser. Use moisturizer to keep skin soft. Prevent damage to the skin due to incontinence by using barrier products for the same.

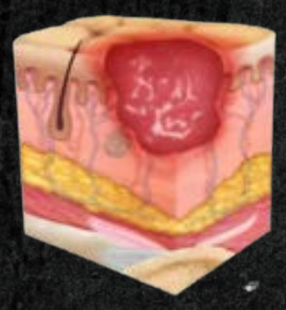


STAGING SYSTEM



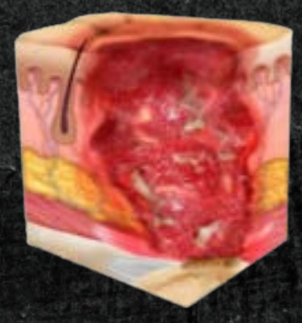
STAGE 1

- Skin is still intact (no open ulcer)
- Non-blanchable redness of a localised area usually over a bony prominence



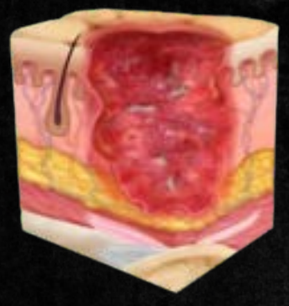
STAGE 2

- Partial-thickness loss of dermis presenting as a shallow open ulcer with a red-pink wound bed, without slough
- Depth: Partial-thickness skin loss



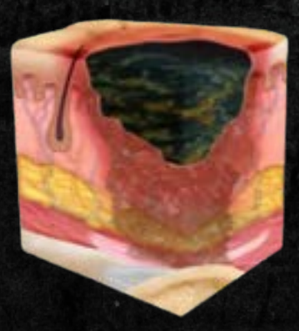
STAGE 3

- Full-thickness tissue loss
- Subcutaneous fat may be visible but bone, tendon or muscle are not exposed
- Depth: Full-thickness skin loss



STAGE 4

- Full-thickness tissue loss with exposed bone, tendon or muscle
- Depth: Full-thickness tissue loss



UNSTAGEABLE

- With slough (yellow, tan, grey, green or brown) and/or eschar (tan, brown or black)

SUSPECTED DEEP TISSUE INJURY

- Purple or maroon localised area of discoloured, intact skin or blood-filled blister caused by damage by pressure and/or shear

Incontinence-associated dermatitisis often wrongly diagnosed as pressure injuries and vice versa.

3. Nutrition:
Nutritional supplements with additional protein, arginine, and micronutrients along with adequate hydration can promote pressure ulcer healing.

4. Infection Control:
Different treatment is needed based on different stages of infection.

5. **Debridement:**
Non-viable tissue can prolong the healing process by increasing inflammation, level of bacteria, and toxins and inhibiting re-epithelialization. Debriding within the wound bed or edge of pressure ulcers is an essential component of wound bed preparation.
Caution: debridement must only be performed when there is adequate perfusion to the wound.

6. Pain management:
The pain must be assessed and managed. Use cleansing solutions at body temperature and avoid unnecessary dressing changes. a wound that is too dry or too wet can prevent healing and cause pain. It is important moisture balance is adjusted to create an equilibrium in the wound. There is a range of dressings which preserve moisture level or absorb excessive exudate to reach an optimal moisture balance.

7. Surgical interventions:
Sharp surgical debridement is required for undermining, tunnelling or sinus tract and extensive debridement of necrotic tissues. Apart from that, category III and IV pressure injuries ultimately require surgical closure for treatment.

TREATMENTS DEPENDING ON THE STAGE OF INFECTION

Colonisation	No antimicrobials are indicated
Localised infection	Topical antibiotic interventions indicated
Spreading infection	Systemic & topical antibiotic interventions
Systemic infection	Systemic & topical antibiotic interventions
Biofilm	Interventions for biofilm disruption and prevention of biofilm formation, such as a combination of debridement, therapeutic cleansing with typical antiseptic and application of antimicrobial wound dressings.

Traditionally, pressure injuries were treated with muscle flaps because they were faster to raise and provided cushioning to jutting bone edges at the wound bed. However, lately, there has been a moment toward muscle-sparing surgeries as they cause less bleeding and elegantly spare muscle fibres for better ambulation of patients.

The most frequently performed perforated flap surgery is the superior gluteal artery perforator(SGAP) flap. Pictures 1 and 2 are the few examples in which the pressure Injuries were covered using the SGAP flap. It requires intricate dissection of the perforator which goes into the skin. The perforator is localized and dissected back to its source vessel. Subsequently, the whole flap is Islanded and advanced towards the defect where it provides the coverage. Unlike muscle flaps, these flaps are devoid of any muscle fibre yet have been found to be robust as well as durable in long term. Hence, This is the current era and status of modern treatment for pressure Injury defects.

The course of treatment for pressure injury is determined by a holistic assessment of the patient by a multidisciplinary team keeping in mind both prevention and treatment of pressure injury. We must prevent the development of a new pressure injury while treating the existing ones. A step-by-step approach keeping all the factors essential for wound healing and surgical management in mind can lead to a profound improvement in patient outcomes.

References:

1. *Al Mutairi KB, Hendrie D. Global incidence and prevalence of pressure injuries in public hospitals: A systematic review. Wound Medicine, 2018; 22: 23-31.*

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SECTION I

DIALOG BY DOCNDOC

MEASURING TRANSFORMATION

CONTINUE READING

PROJECT VISION

“PETER DRUCKER IS OFTEN QUOTED, ‘YOU CAN’T IMPROVE WHAT YOU DON’T MEASURE.”

Measurement allows quantification and quantification raise awareness. The internationally recognized HIMSS maturity model provides prescriptive frameworks to healthcare organizations to measure progress as they build their digital health ecosystems. When it comes to achieving an organization’s digital maturity, what is most important is to get started on the journey using the maturity models as guideposts to measure progress along the journey and to link technology investments with better outcomes.”

MANISH KOHLI MD
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Curator

Roadmap to Benchmarked Transformation: Digital Maturity Models

FEATURE BY

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According to the Internet and Mobile Association of India-Praxis Global Alliance in 2020, India's health-tech sector was valued at $1.9 billion—under 1 per cent of the healthcare industry. The health tech market is still nascent but set to grow at a CAGR of 39 per cent to reach USD 5 billion by 2023. As the sector matures it also has the potential to tremendously impact the health and wellbeing of the population at large. Increasingly, providers like hospitals and clinics are driven to leverage the power of information, technology and data analytics to better serve their patient populations. At the core of transformation, and a key factor for sustainability is the convergence of healthcare and technology which has the potential to create patient-centric models of care focusing more on well-being than care during illness.

The Indian Government's renewed focus to achieve universal healthcare through the digitisation of health records and technological advancements to enable digital care will provide an impetus for healthcare providers to digitalise their services. The National Accreditation Board for Hospitals and Healthcare Providers (NABH) has initiated the work on standards for digital health by setting a committee on digital health standards. The NABH Digital Health Standards aim to consider all relevant aspects of the application of patient interfacing technologies across the continuum of care (for Health & Wellness) applicable for outpatient, inpatient, and remote patient monitoring and will also consider standards with regards to legal obligations, interoperability and communication standards, privacy, and data security, remote monitoring, mobile apps, and other associated activities and fields.

Healthcare Information and Management Systems Society (HIMSS) Digital Maturity Models are closely aligned with these domains and will serve as a useful tool for healthcare providers to assess the state of their systems and provide a roadmap for investment in strategic priorities. These models are the most widely used global framework- impacting over 830 million patients- and they provide prescriptive frameworks to healthcare organizations allowing for global comparability, benchmarking, and strategic clinical and financial improvement. The models provide the standards that assist regulatory bodies and healthcare providers in making lasting and sustainable improvements in efficiency, performance and care outcomes.

Digital Maturity Models were designed and developed- and are regularly updated- by HIMSS to measure the IT adoption maturity of healthcare providers as they advance their use of information and technology to deliver best practice care outcomes. Each model represents eight distinct stages (Stages 0-7) measuring an organisation's adoption and utilization of information and technology functions required to achieve a near paperless environment that harnesses technology to optimize patient care. (see Inset 1).

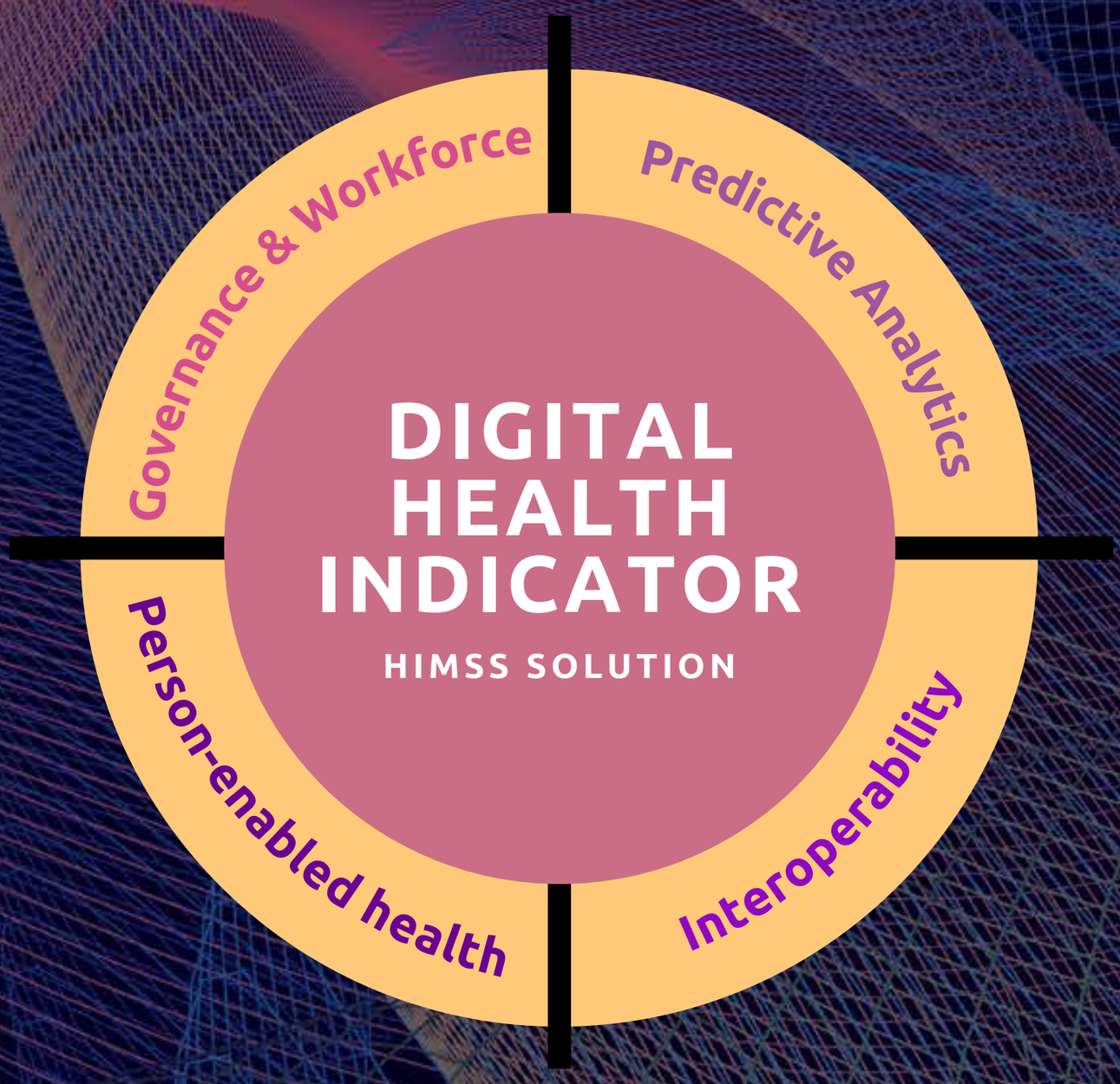
Additionally, the HIMSS' new Digital Health Indicator (DHI) measures progress toward a digital health ecosystem. An ecosystem that connects clinicians and provider teams with people, enabling them to manage their health and wellness using digital tools in a secure and private environment whenever and wherever care is needed. Operational and care delivery processes are outcomes-driven, informed by data and real-world evidence to achieve exceptional quality, safety and performance that is sustainable. With a focus on four key dimensions of digital health (see inset 2)transformation, the DHI offers health systems globally a roadmap toward engaging individuals in their care to improve outcomes and health system sustainability.

From an outcomes perspective, HIMSS Stage 6 and 7 organisations report reductions in medical errors, reductions in duplicate orders, improved readmission rates, higher operating margins, lower staffing costs, and higher bond ratings. To progress to Stages 6 and 7 with HIMSS Maturity Models, healthcare providers undertake measurement using the model. A Gap Assessment report is subsequently provided after a formal assessment that gives a baseline score and highlights gaps in the organization's digital maturity. Strategic advice is provided by HIMSS Advisors and Strategists to help the organisation advance towards validation.

A baseline score of Stage 6 or Stage 7 has to be confirmed by Validation. Validation reviews and confirms the organisation's progress and recognizes its achievements as a digitally advanced health system.

Over 7,000 institutions in 19 countries, 8 in the APAC region, have achieved the highest level of digital maturity validation- EMRAM or OEM RAM Stage 7. Furthermore, over 14,000 institutions in 53 countries, including 40 in the APAC region, have earned recognition as EMRAM or O-EMRAM Stage 6.

Amongst Indian health systems, Apollo Hospitals, Aster DM Healthcare and the Karuna Trust in Karnataka have all embarked on a journey towards advancing digital capabilities and benchmarking them globally using the Electronic Medical Record (EMR) adoption maturity levels of their facilities. All three organizations were recognized for their strong performance using various maturity models for their respective facility (ies). Aster DM received Stage 6 recognition for its inpatient EMRAM assessment in the UAE, Karuna Trust become the first healthcare provider in India to achieve Stage 6 of the Outpatient EMR adoption model at the Taverekere Urban Primary Health Center in Bengaluru and Apollo Hospitals Group became the first Indian organization to achieve Stage 6 validation in three maturity models namely, Infrastructure (INFRAM), Digital Imaging (DIAM) and Out-Patient EMR Adoption (O-EMRAM)



830 MILLION

WORLD PATIENT POPULATION IMPACTED BY HEALTHCARE INSTITUTIONS USING THE STANDARDS OF HIMSS MATURITY MODELS

AMAM
ANALYTICS MATURITY ADOPTION MODEL

Determining how to leverage data for better care and process optimization.

CCMM
CONTINUITY OF CARE MATURITY MODEL

Assessing levels of care coordination, systems integration, and patient engagement.

CISOM
CLINICALLY INTEGRATED SUPPLY OUTCOMES MODEL

Transforming clinical encironments to support quality, safety and sustainability.

DIAM
DIGITAL IMAGING ADOPTION MODEL

Evaluating maturity of IT supported processes in medical imaging in hospitals.

EMRAM
ELECTRONIC MEDICAL RECORD ADOPTION MODEL

Measuring EMR capabilities and impact on systems, and patients.

INFRAM
INFRASTRUCTURE ADOPTION MODEL

Improving care delivery, reducing risk, and creating a pathway for infrastructure development.

O-EMRAM
OUTPATIENT EMR ADOPTION MODEL

Scoring healthcare clinics on maturity of their EMR environments.

The journey towards digital healthcare transformation in India has just begun and with the right drivers of change that are emerging, the Indian ecosystem represents a leapfrogging opportunity for innovations in digital health and driving sustainable adoption at scale. HIMSS's maturity models provide the strategic roadmap and global benchmarks toward transformation that is predicated on aligning people, processes, technology and analytics to achieve better outcomes.

About HIMSS

The Healthcare Information and Management Systems Society (HIMSS) is a non-profit, member organization committed to transforming the health eco-system through its expertise in research and analytics, global advisory services and thought leadership. HIMSS has served the global health community for more than 60 years, with focused operations across North America, Europe, the United Kingdom, the Middle East and Asia-Pacific.

Our members include more than 110,000 individuals, 480 provider organizations, 470 non-profit partners and 650 health services organizations.

HIMSS works with several governments on digital transformation initiatives at a national and jurisdiction level. These include Germany, France, Indonesia, Australia, Hong Kong, Turkey, New Zealand, the Netherlands and the United Kingdom.

HIMSS

HIMSS Who We Are

HIMSS is ready to lead the transformation. Join us and other changemakers as we reimagine health, as one HIMSS and one world—together.

- Accelerate Health
- Alliance for Nursing Informatics
- Electronic Healthcare Record Association
- Gravitate Health
- Health Technology Alliance
- HIMSS Foundation
- HIMSS Interoperability Showcase
- IHE USA
- Immunization Integration Program
- ONC’s Interoperability Measurement
- Technology Informatics Guiding Education Reform (TIGER)

https://www.himss.org/

VISION

To realize the full health potential of every human, everywhere.

MISSION

Reform the global health ecosystem through the power of information and technology.

About HIMSS

HIMSS (Healthcare Information and Management Systems Society) is a global advisor, thought leader and member-based society committed to reforming the global health ecosystem through the power of information and technology. As a mission-driven nonprofit, HIMSS offers a unique depth and breadth of expertise in health innovation, public policy, workforce development, research and digital health transformation to advise leaders, stakeholders and influencers across the global health ecosystem on best practices. With a community-centric approach, our innovation engine delivers key insights, education and engaging events to healthcare providers, payers, governments, startups, life sciences and other health services organizations, ensuring they have the right information at the point of decision.

HIMSS has served the global health community for more than 60 years, with focused operations across North America, Europe, the United Kingdom, the Middle East and Asia-Pacific.

Membership

HIMSS members include more than 110,000 individuals, 480 provider organizations, 470 nonprofit partners and 650 health services organizations. HIMSS offers a variety of membership types and ways to get involved.

CPDHTS Certification

Advance your digital health strategy career with Certified Professional in Digital Health Transformation Strategy (CPDHTS)SM certification from HIMSS. Demonstrate your knowledge, competence, credibility, and commitment to your career and continuing education.

With this professional certification, you will be able to:

- Demonstrate that you meet an international standard of professional knowledge and competence in digital health transformation strategy and health strategy
- Increase your credibility with your employer
- Show your commitment and command of the subject matter in pursuit of continuing professional development

Candidates who meet the eligibility requirements can apply to take the certification exam.

ELIGIBILITY REQUIREMENTS

To take the CPDHTS Exam and earn professional certification, you must either:

- Hold a baccalaureate degree from an accredited college or university and
- Have five years of information and management systems* experience, with three of those years in a healthcare setting**

OR

- Hold a graduate degree or higher from an accredited college or university and
- Have three years of information and management systems* experience, with two of those years in a healthcare setting**

OR

- Have at least 10 years of information and management systems* experience, with eight of those years in a healthcare setting**

For detailed information on eligibility requirements, see the CPDHTS Candidate Handbook. Download Here.

Preparing for the Exam
Start by reviewing the CPDHTS Candidate Handbook, which provides a detailed outline explaining the content and structure of the exam. It will help you identify your strengths and weaknesses and focus your preparation. HIMSS also offers materials to help you prepare, including webinars, review courses and books.

Application Process
All candidates must apply and receive an eligibility ID number before making a reservation to test. Applications will be reviewed for eligibility, and candidates will be contacted with instructions on how to make their reservations.

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HIMSS

Digital Health Transformation Course

Help lead the digital health transformation by deepening your knowledge of the strategic path towards sustainable healthcare delivery for global populations. Interactive self-paced modules in this course allow you to explore in detail the concepts that facilitate digital health transformation.

Building on the HIMSS global network and a well-established suite of maturity models, you will learn about strategic pathways to advance digital health, including the person-enabled digital health ecosystem; digital infrastructure and interoperability; analytics; governance, leadership and policy; and workforce capacity-building.

Accelerating Digital Health Transformation Globally: A Comprehensive and Systematic Overview was developed by internationally recognized thought leader Anne Snowdon, PhD., FAAN, RN, Professor of Strategy and Entrepreneurship, Academic Chair of the World Health Innovation Network (WIN) and HIMSS Executive Director of Clinical Research. The series of ten learning modules build knowledge and leadership competency required to advance and accelerate digital health transformation globally.

Hosted on the HIMSS learning management system, the course offers clinical continuing education hours for physicians or nurses (ABPM, CME or CNE) as well as non-clinical continuing education hours (CAHIMS or CPHIMS). Learners have six months from the date of purchase to complete all course requirements. The approximate seat time is ten (10) hours. Participants receive a certificate of completion for each module completed and a final certificate of completion for completing all ten modules.

COMPETENCY AREAS

Digital Health Ecosystem
- Digital Health Information Systems and Technologies
- Privacy and Security
- Emerging Technologies
- Applied Artificial Intelligence and Machine Learning
- Digital Infrastructure and Interoperability
- Digital Maturity Assessment

Person-Enabled Health
- Population Health
- Citizen Driven Informatics
- Virtual Healthcare Delivery Models
- Patient-Generated Data and Consumer Perception

Measurement and Improvement
- Data Science, Clinical and Business Intelligence, and Analytics
- Clinical Outcomes
- Stakeholder Satisfaction
- Compliance and Adherence
- Economic Assessment
- Program Planning and Evaluation
- Sustainability

Strategy, Governance, and Organizational Management
- Operational Management (including Workforce)
- Policy, Regulations, Legislation and Ethics
- Leadership
- Strategy
- Health Equity and Inclusion

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SECTION II

DIALOG BY DOCNDOC

UNDERSTANDING AI IN HEALTHCARE

CONTINUE READING →

The COVID-19 pandemic accelerated and justified many AI/ML innovations for healthcare, including radiology and pathology image diagnosis, patient triage and prognosis, population health modelling and projection, and post/long-COVID patient care. Some of these tools were one-off research efforts, some were applied to daily patient care, and at least a few are making their way into sustainable products. The pandemic is not gone, global ageing and chronic diseases are still increasing, and the available clinical workforce is not expected to come close to meeting current and future patient care needs. AI and ML tools hold the promise of workforce multiplication, empowering clinicians and the patients themselves to make faster, more effective, and more efficient decisions. AI/ML is not a panacea, but although the tools are still evolving, they are showing promising results. The following section is presented to support policymakers, administrators, clinicians, and technologists with a baseline understanding of the relevant terms and tools, and to highlight some common limitations and challenges.

ELLIOT SLOANE PHD
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Curator

PROJECT VISION

The Realities of Emerging AI/Machine Learning Healthcare Products

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The term Artificial Intelligence (AI) is a broad category that covers many computing methods intended to mimic or reproduce human learning and decision-making. The goals of AI programs for healthcare are multifold for clinicians and/or patients, including enhancing clinical decision-making, reducing medical errors, reinforcing quality and safety practices, and optimizing healthcare processes to reduce waste and increase satisfaction by all stakeholders. The need and pressure for designing and deploying AI tools to augment and improve patient care, safety, and satisfaction is growing rapidly because ageing populations and constrained clinician labour pools threaten to overwhelm many hospitals, clinics, and practices.

This article is divided into three parts: 1) Overview of terminology; 2) Successful healthcare AI examples; 3) Realities, Limitations, and Challenges. Readers with prior AI knowledge may choose to skip Part 1, but may refer back to it when clarification is desired.

PART 1A:

There are two broad AI categories deployed in healthcare: rule-based (RB) and machine learning (ML). RB systems are typically the simplest because they are based on relatively structured known clinical and scientific facts. e.g., if a patient's blood pressure is greater than 130/70 mmHg, according to the American Heart Association's 2017 rubric treatment for high blood pressure (hypertension) could be indicated. RB AI runs into complications, though, when patients have multiple diseases (multi-morbidities), because, for example, drug-drug (or drug-treatment or treatment-treatment) interactions, disease-drug interactions, and patient-specific undesirable drug side effects and risks are interdependent.

For example, the same 130/70 mmHg finding may have a different interpretation and treatment pathway for an otherwise young, fit active adult compared to an obese senior with diabetes and shortness of breath. In such cases, a category of fuzzy-logic programs may be used to supplement RB AI systems. Fuzzy logic may also be deployed in RB systems for radiology, pathology, or similar image analysis, assisting detection of difficult-to-discern tumours or other anatomic irregularities or injuries. Fuzzy logic calculations move past binary yes-no or true-false decision branching using statistical estimates to help move "maybe" cases into yes or no paths.

PART 1B:

The second broad class of AI, Machine Learning (ML), is characterized by programs that “learn,” typically using prior or current data to diagnose, prescribe, or predict healthcare situations. e.g., determining if a chest CT image suggests COVID-19, flu, or pneumonia, deciding which drug prescription regimen would offer the best risk/benefit tradeoff, or triaging incoming COVID-19 patients to predict and identify those who are at the highest risk of serious fatal complications. One may encounter numerous ML methodological terms and applications, including Artificial Neural Networks (ANN), Natural Language Processing (NLP), Bayesian Systems, and Ensemble methods. ANNs use programs to simulate the human nerve process of summing multiple sensory inputs – i.e., digitized human data -- over time to trigger a response.

NLP may use a combination of ANN, filters, RB libraries, and context clues to translate spoken words into correct phrases or codes. Bayesian-based programs may use an iterative process of error detection and success seeking. Ensemble methods may combine multiple RB and ML tools in parallel to identify the most accurate tool for a situation. A further ML categorical split exists between trained ML and self-learning ML tools.

In trained ML, the program’s learning is derived from human experts Part 1b: The second broad class of AI, Machine Learning (ML), is characterized by programs that “learn,” typically using prior or current data to diagnose, prescribe, or predict healthcare situations. e.g., determining if a chest CT image suggests COVID-19, flu, or pneumonia, deciding which drug prescription regimen would offer the best risk/benefit tradeoff, or triaging incoming COVID-19 patients to predict and identify those who are at the highest risk of serious fatal complications. One may encounter numerous ML methodological terms and applications, including Artificial Neural Networks (ANN), Natural Language Processing (NLP), Bayesian Systems, and Ensemble methods. ANNs use programs to simulate the human nerve process of summing multiple sensory inputs – i.e., digitized human data -- over time to trigger a response.

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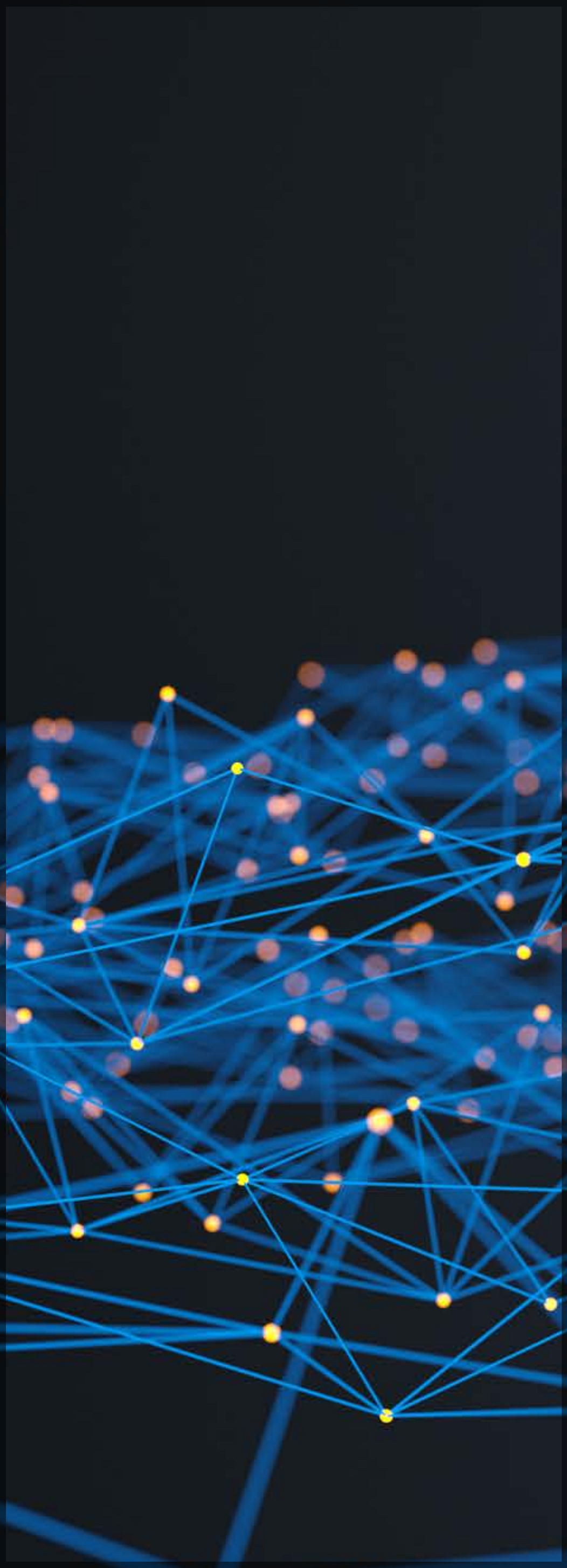
By contrast, self-learning ML programs evaluate each new piece of data against prior data patterns that, optimally, result in self-organizing clusters. Those clusters can then be assigned meaning by experts. e.g., one cluster may represent patients who have severe pulmonary long-COVID symptoms versus another cluster of patients with severe neurologic long-COVID symptoms.



PART 2:

Some examples of successful AI in healthcare can be derived from the COVID-pandemic literature. The UK Pulse Oximetry at Home and Virtual COVID Ward programs are examples of RB systems, and similar programs have emerged in the US and elsewhere. By contrast, many articles in the radiology and ultrasound imaging literature describe emerging and applied lung and organ imaging ML methods to identify, confirm, or disambiguate COVID-19 when other symptoms or lab diagnostics are inconclusive or contradictory. Another exploratory COVID-19 ML application with a mixed track record has been COVID case and hospitalization forecasting.

Other AI applications were already being developed and deployed in the decade before the pandemic. Examples include NLP for clinician dictation in discrete fields like radiology or pathology, Clinical Decision Support Systems (CDSS) that help match cancer treatments to individual genomic, proteomic, and genotypic data, radiologic and pathologic image tumour identification and second-opinion creation, and matching patient populations to clinical trial requirements and goals. Exploratory ML applications include attempts to identify early stages of tumours, sepsis, dementia, or patient fall risks.

PART 3:

Realities, Limitations, and Challenges of AI in Healthcare. One needs to acknowledge the successes that AI has had, as described in Part 2 above. Nonetheless, several significant limitations must be understood and accepted.

PART 3A:

First and foremost may be bearing in mind that AI is, at best, a simulation of human intelligence. There are no flesh-and-blood nerves, organs, emotions, or values in the programs – at least not yet. AI software perceives and analyzes a set, or many sets, of digitized patterns based upon prior imprinted data. A computational assessment of a patient's vital signs, for example, cannot discern critical telltale signs that a physician, nurse, or caregiver would perceive, such as poor pallor, sad demeanour, cognitive confusion, glazed eyes, wincing facial pain, or unsteady gait. A computer has no compassion or empathy engine, either, so recommending complex and risky treatments for a very elderly patient with well-advanced Alzheimer's disease may not seem unreasonable to the program.

PART 3B:

Verification, validation (V&V), and change management are significant challenges, too, because of the potential life, death, cost, and satisfaction consequence of errors. In most medical technologies, V&V requires a) verification the product does what was designed to do, and b) validation that it works properly for the intended application. So an AI program that shows high reliability for breast cancer detection in a population of North American women based on images collected from the latest generation of low-dose mammography devices may not produce valid results when examining a community of petite women with relatively small breasts using a 15-year old mammography device.

Further, since all software is eventually enhanced, updated, and repaired, defining and executing a reliable V&V process can be quite complex and may, in some cases, require some clinical trials. A senior colleague working in a very large global commercial healthcare AI endeavour described the unsatisfactory results they were having when attempting to apply carefully developed and validated AI systems that were curated from world-renowned speciality hospitals to world-class hospitals in diverse countries. Terminology, diagnosis, treatment practices, and available therapies were so radically different that satisfactory results could not be obtained and sustained.

PART 3C:

Because scientific and medical knowledge is constantly changing, re-training, and V&V of an AI system to incorporate significantly different new facts may be quite difficult. A human adopts new patterns (habits) by not only learning new facts and actions but also by suppressing or forgetting prior ones that are no longer believed to be correct. In the blood pressure/hypertension example in Part 1 above, when the American Heart Association reduced the hypertension threshold from 140 to 130mmHg, forcing an ML AI system to unlearn 140mmHg when it has already included data from 100,000 patient visits over 5 years may be considerably harder than simply changing a single rule in an RB AI system. ML systems are not typically designed with an “unlearn” or “forget” subsystem! An example from the COVID-19 pandemic may illustrate this challenge: at the onset of emergency cases in several cities in Italy and the US, the “best practice” for patients

with acute respiratory distress was ventilator care in an ICU. That led to a massive effort to locate, commission, invent, and approve large numbers of ventilators, train clinicians to operate those ventilators and repurpose hospital beds for ICU care wherever possible. Unfortunately, COVID patients' ventilator mortality rates were so astonishingly bad that by the end of the first wave, ventilators were no longer the care pathway of choice.

High-flow nasal oxygen cannulas, prone positioning, and even watchful waiting were found to have better survival rates. In such a crisis, with rapidly changing facts and discoveries, overriding an ML system or CDSS system would probably be far better than wasting time trying to re-train it!

PART 3D:

Transparency and interpretation of AI decision-making can erode clinician and patient trust. In the literature, "self-explaining" AI programs may sound preferable, but that may be a tall order for ML software. Even if the initial software was trained with a very well annotated expert data set, such software may not be able to identify and disclose the way many nuanced changes and updates that occurred over many months or years which were based on, perhaps, many tens of thousands of new patient cases.

PART 3E:

By extension of the above Part 3 issues, the legal liability of AI software and AI software vendors

is an emerging issue. If a patient is harmed, who is liable? Who is sued? Who has responsibility for the chain of events leading to harm? At one extreme, in the US, medical technologies are always presumed to be operated and under the control of a “learned intermediary,” e.g., the licensed physician, nurse, or allied health professional. However, if the intermediary’s decision-making was misinformed or misled by a software, sensor, or data deficiency, then interpreting and assigning culpability may be very complicated. Further, in the event of significant harm, incident and forensic investigation may require preservation and examination of many years of software changes, V&V, and training records to understand the root cause. (The Boeing 737 Max crash debacle might be an example of the complexity.)

PART 3F:

AI is primarily a methodology to optimize the “as-is” state of medicine. In other words, the data that is collected to develop RB or ML AI reflects the clinical care pathways and processes that exist today. e.g., at the beginning of the pandemic, ICU admission and ventilator care were the well-documented and expected standard of care. Extreme rates of patient mortality could only represent situational anomalies in an AI system. To generate future “to be” states requires different tools, among which Simulation and Modeling (SM) stand out. With SM, a model of the new process flows can be developed based, in part on existing data and simulations of planned new

pathways. e.g., some less acute patients might be routed to prone positioning beds, some relatively stable may be maintained in wait-and-see wards, and only those patients with high-survival-likely respiratory distress may be routed to ventilator care. If an existing AI system already is helping manage this latter group of ventilator patients, then the SM tool can help assess staff and facility requirements based on analyzing prior patient admission data. Estimates of the length of stay, staff ratios, equipment and supply needs, etc, can be modelled in the SM tool, helping to design an optimized sustainable model. As each new program begins to take and manage patients, new data can begin to accrue to help develop and validate new AI tools to support those care pathways. Thus, AI and SM can be seen as synergistic partners to support evolving patient care.

CONCLUSION:

There is little doubt that the ageing global population which often has multi-morbidities, combined with global clinical staff shortages all make the development and deployment of AI software tools very attractive. As in all medicine, there are complex risks and benefits. Clinicians and hospitals that wish to make use of AI technologies must carefully and prudently assess, deploy, and manage AI tools, always keeping a careful and vigilant eye on safety, efficiency, efficacy, and potential risks and limitations.

AI: Interplay among Humans, Organisations & Technology

FEATURE BY
HENNING BOJE ANDERSON
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Department of Management Engineering

I could just mention the basic features of the Danish health care system that is, its universal coverage, tax-based financing, free and equal access, high degree of digitalization and a lot of problems. But we try to learn from incidents. And more recently, we also tried to learn from excellence. So we have to strike a balance between learning from the negative and then learning from the positive.

AI in health care is improving diagnosis and clinical care, as they said in the report from W.H.O. At the same time, artificial intelligence may change the practice of medicine, increasing efficiency and accuracy of diagnosis, especially in specialities that rely on imaging such as radiology and pathology. But it's also noticed by several that algorithms can underperform when they leave their home hospital and the patient selection. And now the algorithms that I'm going to talk about are mainly exclusively classification algorithms. And here we have several examples that have come up in recent years and they have all been published in and most of them have been published in high-quality journals, actually, and then also in the trade press. So, for instance, Nature Medicine recently wrote about the diagnosis bias of artificial intelligence algorithms applied to chest radiographs in underserved patient populations, and the same groups, the World Economic Forum and Physics World also highlighted this.

Then there was this disturbing news about racists in the machine where it turned out that it was an issue with Google's labelling. Now, this is being addressed in many forums, for instance, also in the Forbes Forum.
And, when you look up fairness in machine learning on Google Scholar, you find a small score of papers - five, seven years ago. But now within the last two years, it's almost 2000. So it has the attention to it has risen. Here's a cartoon from the Danish Medical Daily "Dagens Medicin" where it is quite easy to spot the bias. Here is a pregnant woman and a husband sitting there and the doctor says, I'll just prescribe something for you. We don't know how it affects pregnancy, but it has been tested on 10,000 white males. So, therefore, rest assured, you can take it.

RACIAL BIASES FROM MESSY ALGORITHMS

And an example from 2009 is where "Nature" reports that millions of black people are affected by racial bias in health care algorithms. It turned out that the people who were black and white, define themselves as blacks because they were generally assigned lower risk scores than equally sick white people. And the reason why this happened was the data. They were quite representative, but they represented black people having fewer visits to hospitals simply because when they were ill, they didn't go to hospitals nearly as much as white people. So black patients spent $1,800 less per month in medical costs per year simply because of their circumstances. So this led to the algorithms. Computing incorrectly with the black patients must be healthier since they spend less on health care. This was, of course, a scandal and it was affecting everything that was used to allocate healthcare widely in U.S. hospitals.

Let's ask about what bias is on if we bias, of course, is a skewness. So it has been used this term and the concept to describe statistical skewness and also in navigation. But the more recent understanding of the use of the term cognitive bias came in the nineties, especially in an extremely influential book called "Judgment Under Uncertainty: Heuristics & Biases" which introduced a rich research program on the study of heuristics and biases that people use when we make decisions under limited information, limited resources, limited time. And the authors introduced several biases and described the categories - confirmation bias, hindsight bias, self-serving bias, anchoring bias, and availability bias. And several books have also described the biases in medical reasoning.

Ironically, prejudice and discrimination are inevitable byproducts of heuristics and biases, namely the efficiency of human cognition. Because if we had to calculate everything in detail, we wouldn't be able to be effective. It's interesting to see that this extremely influential book in cognitive psychology is "Thinking Fast and Slow" which came out about a decade ago and also has a lot of citations.

And on the other hand, biases are not only said innocent quality ones - but they are also socially conscious and unconscious.

A bias is an inclination or prejudice for or against one person or group, especially in a way considered unfair.

When we talk about biases and discrimination, it is nearly always concerning groups that are vulnerable or in some sense suffering from discrimination and the poor where it is, and I would say a touchy subject. So here we list the attributes that are often cited as requiring bias evaluation, gender, of course, necessity, religion, age, marital status, socio-economic circumstances, disability status, and ability status.

And then actually the European Union's chapter of fundamental rights extends the protected attributes by mentioning not only gender, race, colour, ethnic or social origin, genetic justice, but also language, religion, belief, political membership, national minorities, property, birth, disability, aIDS of sexual orientation.

ML PRINCIPLES FOR ACHIEVING FAIRNESS

1 INDEPENDENCE (DEMOGRAPHIC PARITY)

The proportion of each segment of a protected class (eg: gender, low income) should receive the positive outcomes at equal rates.
Limitations: This May result in discrimination against equally eligible/ treatment-needing individuals.

The first one is called independence or demographic parity. Some of the names also really mean that proportion - each segment of a protected class such as gender, low income, etc. To receive positive outcomes at an equal rate as non-protected ones. So the positive outcome is we have them allocated to the outcomes. The limitations, of course, are that they may result in discrimination against equally eligible treatment needing individuals.

2 SEPARATION

The true positive rate and the false positive rate must be equal (and therefore the false negativity rate and the true negative rate are equal) for every value of the sensitive attribute(s).
Limitations: May ignore pre-existing inequality

If we require that the true positive rate and the false positive rate must be equal. So, patients are assigned only after score - independent of gender, and age, and people with a higher survival rate are more likely to get assigned. So again, here we have a limitation that we may ignore preexisting inequalities

3 SUFFICIENCY

Both negative and positive parity has to be achieved (predictive rate parity)
Limitations: Ignore pre-existing inequality among the candidates

THE IMPOSSIBILITY THEOREM IN ML

No more than one of the three fairness metrics of demographic parity (independence), sufficiency (predictive parity), and separation (equalized odds) can hold at the same time for a well-calibrated classifier and a sensitive attribute capable of introducing machine bias.

We have the impossibility of having an idea, fair and formal principle of fairness. And now I go to reviewing some main ethical principles of fairness that can guide us when we try to regulate the development and deployment of algorithms for sorting patients. The variations of these.

ETHICAL PRINCIPLES OF FAIRNESS

Basic, but incompatible intuitions/principles about fairness:

- Treating "Like Cases" alike
- Ensuring Equal Opportunity
- Compensating for "brute unluck" of any adverse circumstances, seeking to establish a "level playing field"
- Fair distribution based on voluntary transactions

PRINCIPLES OF ETHICS UNDERLYING GOOD PRACTICES IN MEDICINE

TRADITIONAL BIOETHICS PRINCIPLES

- Beneficence
- Non-maleficence
- Autonomy
- Justice

A NEW ENABLING PRINCIPLE

- Explicability

The first one is treating like cases and this seems to be self-evident and harks back for thousands of years to the Greek philosopher Aristotle. Then there's another one, which is a more recent date, which is about ensuring equal opportunity.

The third one is a sharpening of rules. It is about ensuring, again, equal opportunity by compensating for the lack of any adverse circumstances. And yet the outcome seeks to establish a level playing field. And then finally there is this hard-nosed attitude, namely that health care benefits are fairly distributed if they're based on voluntary transactions.

So this first principle is about treating like cases alike. It's an example of what has been called a super-thin lenience principle. There can be no ethical ground for providing care to one person and not to another without there being some relevant empirical difference between them (physical or psychological).

Ethics say that you cannot say this act is good, the other act is not good without having some physical difference. There must be some observable empirical difference. You can't say that one is good and the other is not good. The same for aesthetic judgments. So if two persons are alike in all relevant attributes, then treating them different is simply

unfair and inconsistent. So there can be no difference in merit or design without some factual difference deserving of care. It's an ethical property that 'supervenes' empirical evidence or attributes.

The second principle that fairness is equal opportunity was published 50 years ago in a major work - Justice as fairness, which is about substantive equality of opportunity. As per this, there are two justice principles. The first one is liberty. Each person has an equal claim to the fully adequate scheme of equal basic rights and liberties, it says. The second one is equality. It suggests that we must have fair equality of opportunity.

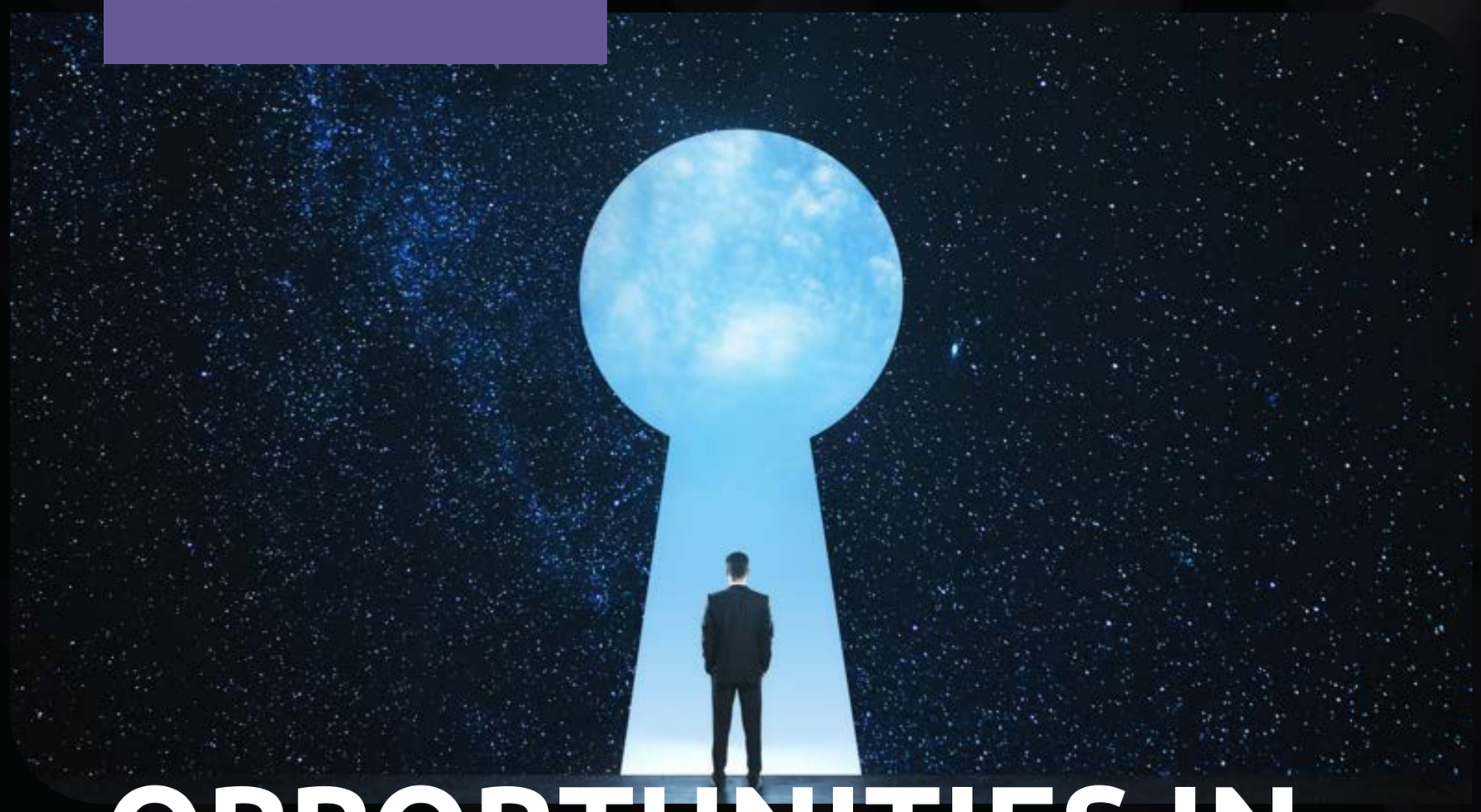
If we are perfectly allowed to have unequal treat treatment or distribution of goods, it's only if they benefit the least advantaged the most. So this is called the Maximin principle of maximizing the minimum.

Then we have a sharpening of this position, which is fairness as an equal opportunity where we compensate - we seek to compensate for any unluck or any adverse circumstances. This, also known as logical determinism, goes further than roles in seeking to compensate for differences in circumstances in which the individual does not influence at all.

Egalitarianism demands that people's benefits should be determined only by their choice and not by differences in the circumstances. They have no influence.

We cannot have any influence on these issues. Then why should our access to treatment and benefits be dependent on it? Then we have a stop opposite view, the ethical view, namely libertarianism, which holds that all goods, including health care benefits, are fairly distributed if they're based on voluntary transactions. So society must respect each citizen's unconditional ownership of themselves and their labour. They also claim that the distribution of goods and health care benefits occurs as a result of voluntary exchange among citizens. So there is little attention to the issues of public utility law to address balanced health care across the population. So this ethical stance puts an extreme weight on freedom - Liberty.

SECTION III



OPPORTUNITIES IN DIGITAL HEALTH

CONTINUE READING →

I witnessed India's successful innovation leadership in the disruptive creation of global Teleradiology in the mid-1990s. Since that time, India has also become one of the largest and most trusted information services providers on the planet. Indeed, very few international corporations do not lean heavily on India's robust information technology industry in virtually every market sector. My strong impression and belief are that if India leverages HIMSS' global digital health expertise in the coming decade, India could become the preeminent global hub for a huge portion of tomorrow's digital health marketplace!

ELLIOT SLOANE PHD
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Curator

PROJECT VISION

New Digital Health Opportunities for Personalized Healthcare

FEATURE BY

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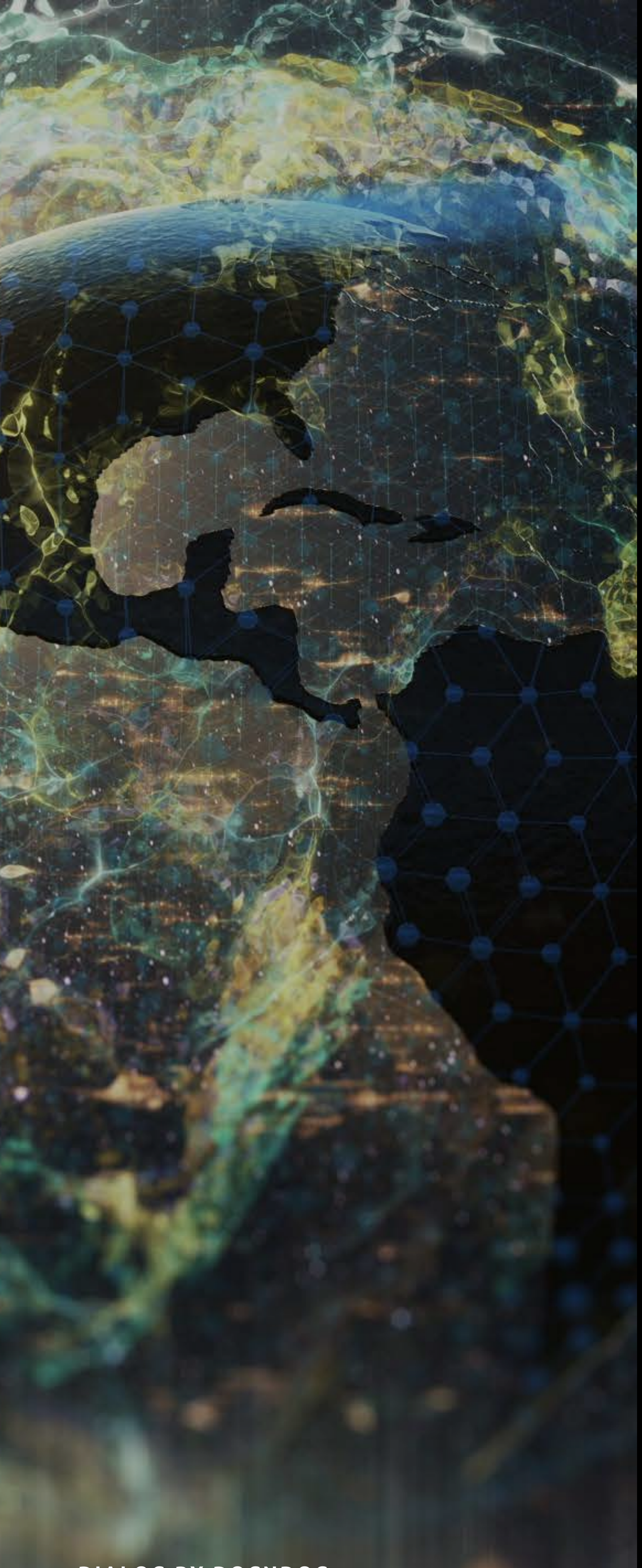
More than 75 years ago, WHO defined health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” In these 75 years, almost all major aspects of human society have been transformed, but healthcare remains the same as it used to be before the above definition – healthcare remains disease-care. Healthcare approaches adopted in different countries are varied, but they all suffer from several fundamental debilitating problems. A major problem in many so-called developed countries is the legacy problem: entrenched socio-technical systems and business models on the parts of healthcare providers (e.g., hospitals and physicians), the health technology and services industry, and even public health agencies, all combine to maintain their complex, expensive, inequitable, inefficient, and often mediocre health, wellness, and healthcare status quo. The push to implement national electronic health record systems in many countries has brought some improvements in care quality and efficiency; however, they remain rooted in disease care and not in improving and perpetuating true health and wellness.



There is a great opportunity today in several countries like India where healthcare approaches do not have this deep-rooted legacy problem as described above. A great example was seen at the beginning of this century when countries without extensive telephone landline infrastructure were able to leapfrog the technology gap and empower the masses through mobile communication technology. Interestingly, later many of these countries also developed new perspectives on internet technology and accordingly were able to similarly transform several aspects of their societies. We believe that such an opportunity is right here and now in empowering health to even the poorest people living in the remotest parts of the world. This era is even more conducive for the leapfrogging empowerment of health, wellness, and healthcare, transforming the lives not only of individuals but potentially of entire societies.

Progress in biology, multimodal sensors, mobile devices, computing, intelligent / knowledge-driven systems and related technologies are rapidly enabling the realization of the definition of health as proposed by the WHO. The fact that chronic diseases are the major cause of death and cost in modern society justifies the emerging idea that health is a perpetual personal data system rather than the current population-based episodic probabilistic approach that believes in suppressing diseases rather than curing and even preventing them. Old as well as modern health systems all know that *lifestyles* that support health and wellness are quite often more important for improving and maintaining health than medical care, contributing over 80% to a person's health state. In other words, maintaining good health and avoiding diseases is much more efficient – and satisfying – than trying to repair failing health after the damage has been done.

Visionary researchers like Dr Eric Topol are seeing a clear need for the creative *destruction* of traditional healthcare approaches and replacing them by developing what Prof. Bernd Blobel has described as a *personalized, preventive, predictive and participative precision* (P5) medicine approach for maximizing health and wellness. These approaches advance a data-driven digital health paradigm that considers each individual as a unique system. By building digital health models of a person, even a "digital twin", it is possible to predict and use a personalized and precise approach to guide individuals away from a disease or to control it effectively. Technology now allows us to perpetually measure lifestyle and key biomarkers and analyze them to build personalized models and estimate health states. P5 approaches such as the Personicle are designed to support optimization of health, living a healthier lifestyle (wellness) and better healthcare. Digital health apps and wearable sensors (also known as personal/consumer health devices) can enable personalized health navigation that is genuinely under the control of the individual and their caregivers (family, friends, community), and not solely the established healthcare system.

These emerging perspectives and technologies are proactive, rather than reactive; continuous rather than episodic, and use lifestyle and wellness rather than suppress diseases using chemicals that have unknown side effects. Social necessities and advances in technology have brought us to a tipping point:

SOCIETY IS READY FOR A NEW PERSPECTIVE TO BRING THE REQUIRED TRANSFORMATION IN HEALTH LEADING TO BETTER HEALTH FOR ALL INDIVIDUALS, AND HENCE FOR GLOBAL HEALTH.

ADVANCES AND DEVELOPMENTS IN E-HEALTH

FEATURE BY

DR ANINDA CHATTERJEE

Hospital Administration Expert

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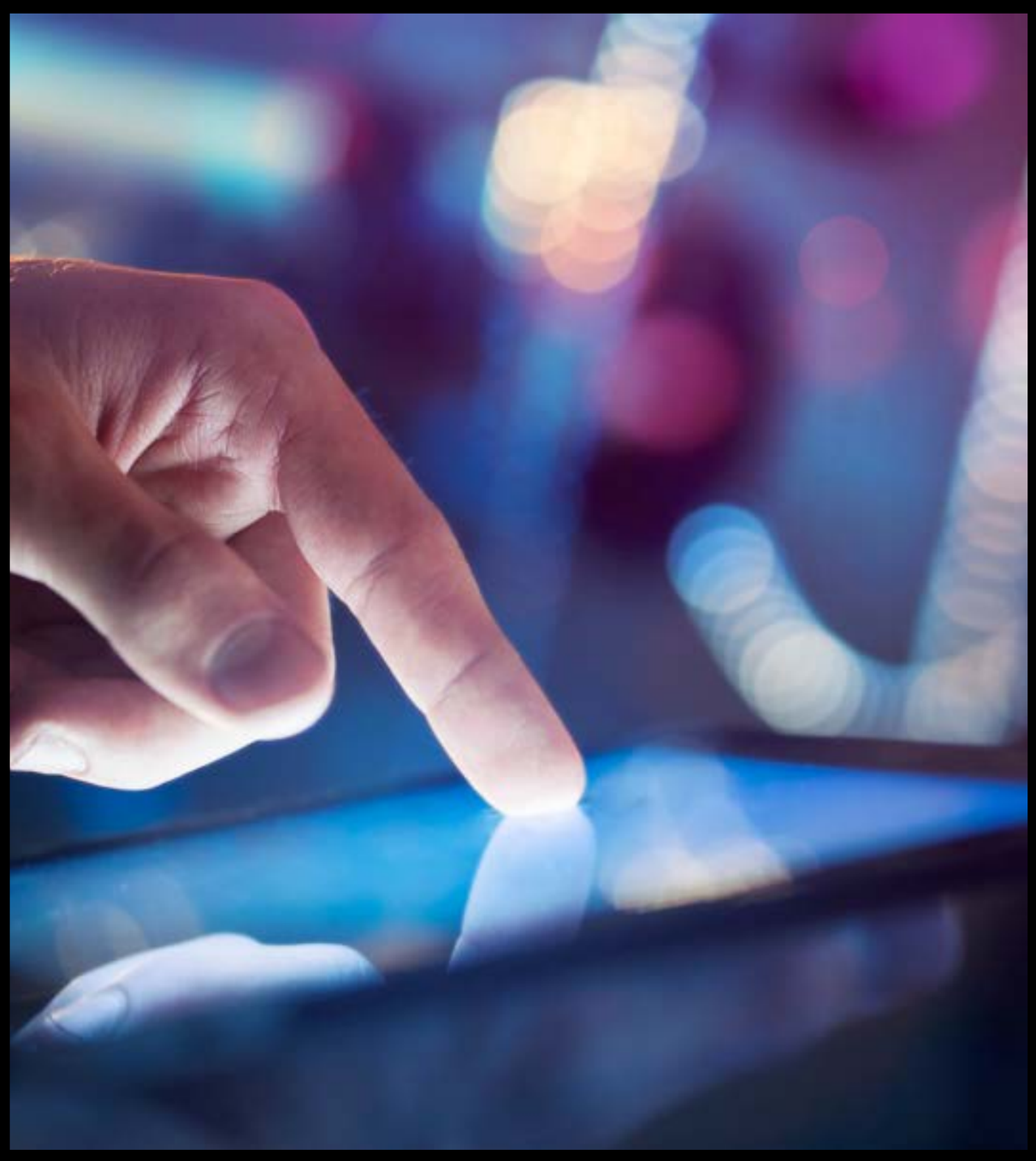

The future of the healthcare sector is soon to be realised through a dimensional transition from the traditional provider-centric approach to a smarter consumer-centric service led by the digital revolution in the healthcare ecosystem.

From banking to travelling, retail to education, a modern citizen is exposed to the digital world and acts as a decision maker in a consumer-friendly ecosystem. Person-enabled decision-making, based on data and analytic tools has not yet made its big headway in healthcare. Patients are looking forward to proactive, predictive smart health communication rather than appearing to a doctor when it is already high time!

Person-enabled health: Scheduling for a doc or taking hospital appointments has been and still is somewhat a cumbersome affair. The crucial medical expertise and services are to cross the hurdle of high rates of hospitalisation, increasing healthcare costs, huge crowds and inaccessibility of the experts many times. Health care has to be personalised, giving priority to one-to-one dialogue, individual health goals and complaints. A long-term continuous smart digitalised reciprocation is needed much like the corporate retail strategy. This reciprocation should involve digital health tracking; virtual health care visits with the click of a button. Predictive analysis with machine learning algorithms is showing significant responses in tracking and monitoring. Interoperability is taking a quantum leap with advanced analytics and commutable data information that can be interpreted as meaningful medical insights, available to both providers and consumers.

The fact is health data is often unique to each health care body and cannot be exchanged during patient care. To attain common data governance, the digital information should be complete, accurate and always accessible. Interoperability is essential to incorporate a vast gamut of health care smart gadgets; like smartwatches, bio patches etc. Smartwatches can monitor heart rate, oxygen saturation and overall physical health with pedometers. **PPG** (photoplethysmography) technology measures blood vitals. Bio patches, smart hearing aids along with all the E-health technologies can create a smart healthcare revolution. The vast data can come under a future EMR umbrella which should have a policy infrastructure, to combat privacy threats and offer unified health data. Data governance will be of immense importance soon time, addressing the issues like data ownership, transparency and seamless data accessibility in all the healthcare sectors.

As far as Indian medical management is concerned, all the hospitals are struggling to cope with the increasing number of patients having minimal resources persons. The budget, humongous framework of hospitals, and shortage of teams and expert assets can be dealt with with a proper vision of healthcare digitalisation!

The revolution of E-health networking can bring a paradigm shift to the diagnosis, prognosis, treatment and prevention care of a wide range of chronic and acute diseases. Advances in sensor devices for biomedical monitoring, patients diagnosis via e-health, visualisation solutions, decision support systems for 24x7, EMR storage and transmission, application of machine learning and AI along with using IoMT (Internet of medical things) are some of the future smart hospital solutions based on consumer-centric engagement towards a sustainable, prosperous and effective healthcare ecosystem.

Amongst the healthcare trends, Especially after Covid 19, **Artificial intelligence** (AI) has remarkably made a signature e.g. helping to analyse CT scans to detect pneumonia. Another example is **Microsoft's Project Inner Eye**, a radiotherapy AI tool, which has accelerated the process of 3D contouring.

Remote sensing and touch-less monitoring 24X7 through **BALLISTOGRAPHY** & AI, **Project Hangover** a Microsoft AI meant to catalogue biomedical research papers. AI can contribute to mental healthcare as well. **Deep learning** combined with AI audio processing, analyse human speech to catch the early symptoms of dementia. **Virtual Interventional Radiologist** (VIR) is another AI-dependent **chatbot** technology, that assists doctors and even helps patients with self-diagnosis.

Augmented reality (AR) and mixed reality are effective in handling an array of healthcare settings. The surgeries can be perfected by the surgeons probably with less expenditure. These technologies will assist in training purposes significantly.**AR** technology is going to be a healthcare marvel with many solutions; from remote-controlled critical operations to helping nurses find veins. There is scope for further exploration and research in Metaverse medical care; virtual reality. Right now it is being used in training and therapy for phobias, **PTSD** and memory regression therapy. For this digitalised E-healthcare communication, Facetime and Skype can be used but by complying with government regulations.

A recently created device by the Organ Care System by Transmedics is in vogue at the Ohio State University's Wexner Medical Center. This device can keep an organ, outside of the body for several hours. Other options in this end can be explored. **Bio-printing**; 3D-printed organs already made their way from fiction movies to clinical testing.

Since the beginning of the pandemic, Telehealth or remote healthcare is leading the curve and is expected to grow to $185.6 billion by 2026. But to convert it into a reality one important aspect is HIPAA compliance or GDPR (for international standards in European Union) which has to take into consideration by the healthcare providers. Healthcare technologies will continue to improve with the demand of the hour. With the anticipation of AI, machine learning and extended reality with the right software and futuristics, state-of-the-art endeavours can explore new horizons of smart, personalised healthcare.

SECTION VI

DIALOG BY DOCNDOC

DIGITAL HEALTH ADOPTION

CONTINUE READING ⟶

Digital health adoption follows a dynamic tangent, powered by advancements in technology and steered by the real-world forces of practicality.

This section looks at how digital health adoption has been powered by developments like remote monitoring, advanced data and machine learning algorithms and shaped by factors like production efficiency. The technology for remote monitoring has been long available, but the technology and its adoption received a boost with the necessity of the pandemic.

Similarly, communication and machine learning technology are already available, but lag behind due to the practical reality of only disorganized, non-standardized. or incomplete/biased information being available to be processed.

Data technology, when viewed as a productivity tool in healthcare/workforce management settings may ensure better adoption as the proposition is now aligned with the objectives of the decision-makers.

Staff Editor

PROJECT VISION

Digital Health: Adoption

FEATURE BY
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WHAT IS DIGITAL HEALTH?

By streamlining operations, enhancing patient outcomes, and lowering healthcare costs, digital health, which is the fusion of digital technologies with healthcare, has the potential to change the delivery of healthcare. Digital Health essentially comprises six key areas:

1. The use of patient-monitoring and patient-management mobile apps
2. The use of medical IoT devices to support patient care
3. Giving clinicians the ability to monitor patients remotely
4. Giving clinicians decision support at the point of care
5. Facilitating virtual care encounters between clinicians and patients via digital platforms
6. Enabling clinicians and patients to be educated via educational modules, apps, and other tools

Digital Health is a perfect example of P4 medicine in action, which stands for predictability, prevention, personalisation, and participation. All four are expected to have a significant impact on the healthcare sector by 2025.

Digital Health involves monitoring health status from outside the four walls of medical facilities and is thus commonly known as Remote Patient Monitoring (RPM)

RPM is made possible by the use of integrated measuring devices, patient applications, and a data processing platform that provides information to medical personnel. This combination ensures patient safety while also increasing comfort and reducing the load on medical facilities. Furthermore, services are more easily accessible, and healthcare costs are reduced. Patients are constantly under the care of specialists who have access to up-to-date health

information in real time. As a result, medical personnel can monitor many more patients concurrently and devote more time to patient communication and education, which is critical for the prevention and control of diseases.

WHO CAN USE REMOTE PATIENT MONITORING?

Beneficiaries of remote monitoring services are, among others:

- Seniors
- Chronically ill patients
- People with disabilities (requiring home care)
- People who live in areas with difficult access to healthcare
- People requiring regular check-ups (cancer survivors)
- Patients discharged from the hospital

These groups of patients must be monitored regularly:

Frequent visits to medical facilities can be time-consuming and inconvenient involving logistical challenges. Remote observations and trend analysis of physiological parameters, physician recommendations adherence, program compliance, and outcomes not only save the time of patients but provide comfort, help maintain greater independence and reduce the risk of complications.

Key features of RPM

- Enabling early detection of an emergency
- Providing immediate contact with medical personnel for faster response
- Reducing the number of ER visits
- Shortening hospital stays
- Enabling regular health check-ups

WHO CAN PROVIDE REMOTE PATIENT MONITORING SERVICES?

Remote patient monitoring services can be provided by, among others:

- Medical facilities (primary care providers and hospitals)
- Individual Medical Practices / Clinics
- Nursing homes
- Facilities lacking extensive specialist resources
- Dedicated monitoring centres

Remote monitoring can supplement traditional medical care by improving communication between patients and medical staff and providing complete diagnostic value.

Remote monitoring of patients who have left the ward reduces the risk of readmission for hospitals. Nursing homes can keep track of people who are waiting to be admitted or who require assistance after leaving the facility. For facilities that lack extensive specialist resources, RPM enables quick consultation with specialists, saving time and facilitating rapid, specific decision-making, allowing treatment to begin or be adjusted immediately. Monitoring centres are specialised units within health organisations such as regional telecare programmes or medical tourism departments that are solely responsible for the care of patients covered by remote monitoring. Clinics can track patients between OP visits continuously.

IS REMOTE PATIENT MONITORING GROWING?

Remote patient monitoring is becoming increasingly important and valuable as a result of rising demand. According to "Research and Markets," this field will be worth **$31.3 billion in 2023**. “Goldstein Research” predicts that the value will reach **$48.5 billion by 2024**.

HOW DOES RPM BENEFIT A MEDICAL UNIT AND PATIENTS?

Remote patient monitoring has a wide range of implementation options. It can be tailored to the needs of various patient groups as well as care providers. Simple changes such as changing or adding appropriate measuring devices or matching medical surveys allow the most valuable data to be collected.

Remote patient monitoring has become important as it is designed to keep patients’ current needs, as well as future requirements in mind. It is certain that, in the face of socioeconomic changes, it will become a more widely used supplement to traditional medical care. With fewer medical personnel and an increasing number of patients, the role of technology in providing adequate assistance will be critical.

ADVANTAGES OF REMOTE MONITORING

FOR THE MEDICAL UNIT

- Reducing the duration of inpatient treatment and lowering levels of bed occupancy
- Observation of patient’s health status and their adherence to medical recommendations
- Ability to intervene rapidly in the event of disturbing changes
- Increased patient involvement
- Close coordination of care
- Taking a load off the medical staff
- Increasing the effectiveness of treatment
- Up-to-date, comprehensive and convenient access to patient’s medical data
- Greater availability of services
- Improvement of an institution’s image and boost for its reputation

FOR THE PATIENT

- Full diagnostics of patients’ disorders
- Continuation of treatment at home
- Increased sense of safety through easier and faster contact with medical staff
- Shortened response time to life and health threats
- Comfort and convenience of medical examination
- Reduction in care costs
- Saving time for patients

WHAT ARE THE BARRIERS TO DIGITAL HEALTH ADOPTION?

While digital health technologies have the potential to improve care efficiency and health outcomes, there are still barriers that must be overcome. In this very short article, the top barriers and how to address them are outlined as under:

Barriers to the medical unit

- Data privacy and security
- Interoperability with HIS
- Perceived increased work and responsibilities by a doctor
- Impersonal care delivery
- Time-consuming
- Financial concerns
- Negative pressure from the department and/or hospitals
- Unreliable technologies

Barriers to the patient

- Fear of using technology
- Impersonal care delivery
- Older age
- Cognitive impairment
- Language barriers
- Financial concerns

RECOMMENDATIONS TO ADDRESS THESE BARRIERS

DATA PRIVACY & SECURITY	Digital health technologies must adhere to all data governance, privacy, and security regulations.
PERSONLIZED CARE	In-person care should be supplemented by digital health technology (blended model).
INTEGRATION	EMRs and existing health system processes should be integrated with digital health technologies.
COST & ACCESS	Digital health technologies should be reasonably priced for their intended users. Patients should be able to make insurance claims for digital health technologies. Subsidized smartphone plans, free Wi-Fi, and technology rental should be made available to those in need.
REGULATIONS	Digital health technologies, in general, should be regulated and certified.
DEPARTMENTS & INSTITUTIONS	To encourage the adoption of digital health, performance incentives and mandates should be implemented.
PATIENT SUPPORTS	Patients should be encouraged to join e-patient movements and advocate for themselves. Family members and informal caregivers should interact with patients using digital health. To overcome language barriers and disabilities, patients should have access to translating / enabling technology.
TRAINING	Patients should receive training. Medical students should be educated on digital health technology. Practising clinicians should complete digital health technology continuing education programmes or certification courses.
TECHNOLOGY SUPPORT	Both patients and clinicians should have access to technical support.

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Quality Tool: Data Collection

QUALITY CAPSULE +

This week I will keep my promise of introducing Data Collection, the most misunderstood quality tool….the hatchery for COPQ.

Context

How often has your boss instructed you: Go get the data?

You toil for 10 days and return with the data you believe your boss wanted.

The boss is enraged: This is not the data I wanted!

Your mind runs: What question were you seeking an answer to, boss? Can you trace the COPQ?

Data and Information

Quality Improvement is an information-intensive activity. We need clear, useful information about problems and their causes to make improvements.

In many cases, the absence of relevant information is the major reason why problems go unsolved. For long periods. Adding to the COPQ.

Most organizations have tons of data and facts about their operations. However, when quality improvement teams start working on a project, they often find that the information they need does not exist.

Let me explain the difference between data and information:

- Data = Facts
- Information = Answers to Questions
- Information includes Data
- Data does not necessarily include Information.

Quality improvement teams seek answers to questions:

- How often does the problem occur?
- What is causing the problem?

In other words, they are seeking information.

But, while good information is always based on data (facts), simply collecting some data does not ensure useful information.

How do we generate useful information?

Information generation begins and ends with questions. To generate information, we need to:

1. Formulate precisely the question we are trying to answer
2. Collect the data and facts relating to that question
3. Analyse the data with quality tools
4. Present the data in a way that communicates the answer to the question.

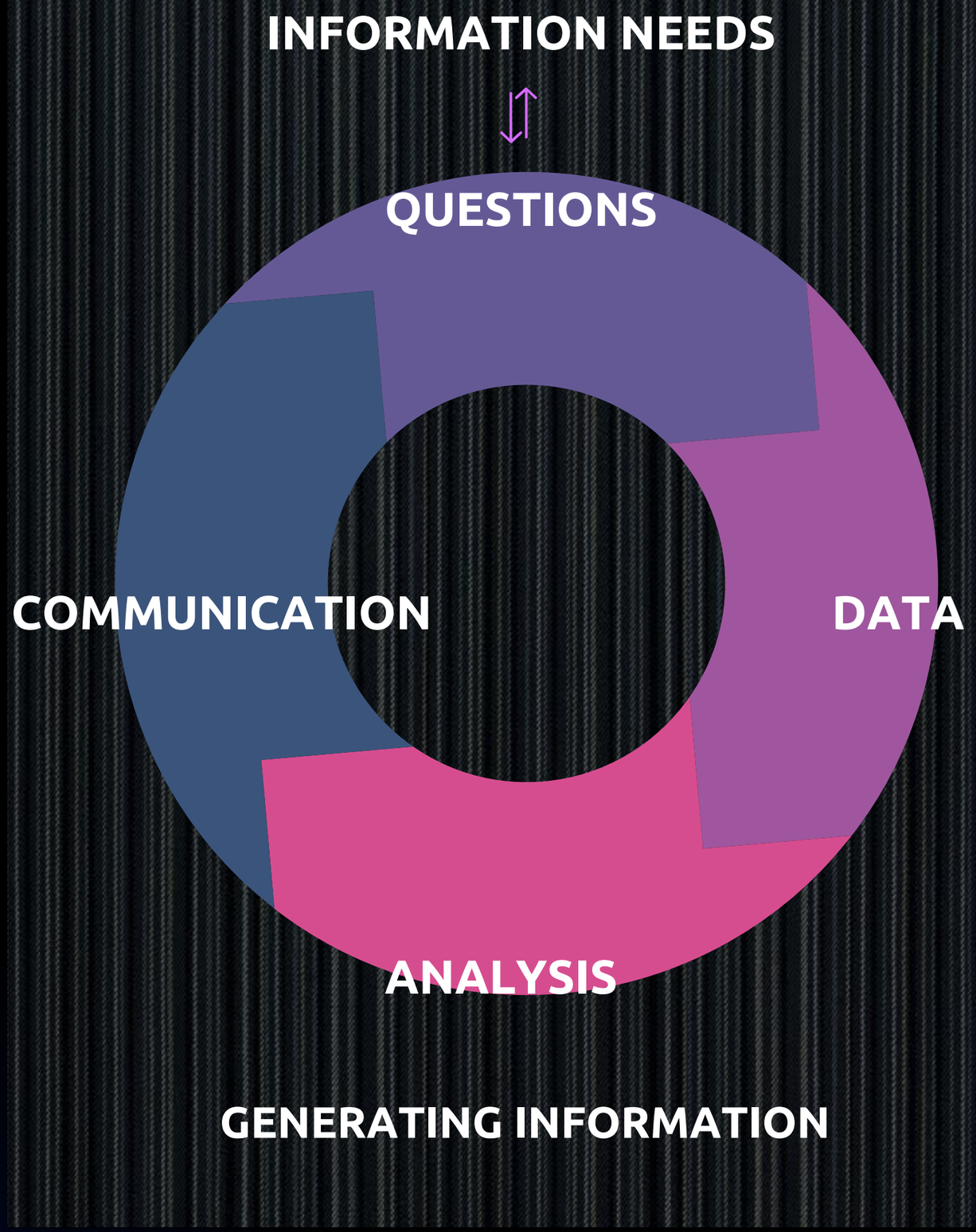
Key Skill

Learning to “ask the right questions” is the key skill for effective data collection.

Accurate and precise data collected through an elaborately designed statistical sampling plan is of no use if it does not address a question that someone needs an answer to.

Insight

The planning for the data collection process works backwards through the model in the figure.



GENERATING INFORMATION

COMMENTS BY

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The fundamental building block to an effective implementation of digital health is the framework of data. How efficiently we are able to collect it, organize it, make sense of it and use it in applications and process making, ultimately define how well a digital health transformation initiative will take root. We are not just referring to the data from the patients, but data about every stage of the processes we do today, where the inefficiencies lie and how this must be improved.

Shifting Healthcare Landscape: Age of Data Technology

FEATURE BY

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OUTLINE

Data technology applied to the realm of Clinical sciences has the potential for healthcare to progress further on the scale of objectivity, and help doctors to make informed decisions. During the COVID pandemic, technology turned saviour, when it facilitated remote delivery of healthcare through the use of information communication technology. Remote consultations, point of care monitoring, diagnostic devices, e-commerce delivery of drugs & devices, home ICUs, and complex procedures like dialysis and chemotherapy at home have enabled a paradigm shift in moving traditional care from within the walls of the hospital to virtually anywhere. The crisis transformed the mindset of patients, healthcare professionals and regulators alike.

The application of computational processing & big data in the field of medical sciences is supporting healthcare through improved insight and decision making. Following are some examples of data application in a healthcare environment,

- Driving improvement in clinical outcomes through early detection and alert e.g. Healthcare acquired infection surveillance
- Bring economic dividend through lower cost of care & minimal loss of productivity for the patient e.g. online antibiogram, robotic surgery
- Improve the quality of care through real-time insight generation e.g. Clinical decision support system (CDSS) for VTE prophylaxis in risk-stratified patients, diagnostic imaging to improve accuracy and reduce errors
- Individualized risk score for disease complication and progression, e.g. AMI readmission, Dengue length of stay
- Management for chronic disease patients, e.g. diabetes, take charge of their health through the use of smart devices, which combine real-time glucose monitoring, edge computing and therapeutic response. It also helps to modify their lifestyle choices and habits through the collection of individual information and personalized intervention
- Disease prevention and wellness promotion, to reduce morbidity & mortality e.g. predictive disease markers and risk scores
- Increase efficiency of service and hospital resource utilization by reducing the length of stay through CDSS, prediction models

HOW HEALTHCARE USES DATA TECHNOLOGY

It is well known that frequent unplanned readmissions degrade patient care and institutional performance, and it also adds to the cost of managing patients. Recent studies reveal that one out of five patients admitted with acute myocardial infarction (AMI) is readmitted within 0-30 days after discharge. In order to reduce the readmission rate in such cases, it is advisable to recognize high-risk patients during initial admission and take preventive actions at an early stage.

Based on the use case, an algorithm to predict the risk of 30-day readmission, and post-hospitalization from Acute Myocardial Infarction (AMI) is developed. The model-building process utilizes pattern discovery on a large dataset of anonymized AMI patients (including demographic and clinical profiles) using machine learning techniques. The model when integrated with the data systems, can provide a real-time feedback loop to the clinician on the risk of readmission at the point of discharge.

Hospital Acquired Infections (HAI) surveillance program for the four major hospital-acquired infections, viz. ***Central line-associated bloodstream infection (CLABSI), Catheter-associated urinary tract infection (CAUTI), Ventilator acquired pneumonia (VAP) and Surgical site infection (SSI)*** are other applications of data technology in healthcare. The surveillance algorithm is designed, based on a high suspicion of HAI in the hospitalized patient population.

A Venous - Thromboembolism (VTE) prophylaxis program runs as clinical decision support triggered workflow on the Electronic Health Record system, which makes it mandatory for every patient at risk to undergo a VTE risk assessment, during their hospital stay.

However, there are pitfalls to technology, viz. bias, lack of transparency and unexplainable decision-making process, currently inherent in the state of art AI models, which require caution. For healthcare professionals and society to align with rapid change, the educational curriculum needs to adapt. While hospitals invest in technology hardware and software, processes are re-designed around the new capabilities and patient expectations, innovation mindset will be a part of our professional life.

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SECTION IV

DIALOG BY DOCNDOC

HUMAN RESOURCES & TECHNOLOGY

CONTINUE READING

An oft-cited concept for healthcare technologies is patient-centricity, or keeping the patient's needs, safety, and expectations at the centre of all actions and decisions. As digital health technologies have exploded and pervaded the patient and clinician experience, unintended problems have emerged. Patient and clinician cognition erodes as stress and illness escalate, yet many programs and screens are growing more crowded and complex. This can lead to dangerous fatigue and error. Human-friendly and –usable designs will become more important as system and medical complexity continue to increase, which will require creative and innovative solutions. Patient-centricity must be matched with clinician-centricity, so the workload for patients AND clinicians can be reduced rather than increased. Further, as digital tools become embedded in everyday patient care, trust in the security, reliability, and integrity of these systems becomes paramount. Technology is a means to an end – patient care – not an end unto itself!

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PROJECT VISION

Workforce and the Digital Healthcare Enterprise

The global pandemic exposed inequities, vulnerabilities and lack of general preparedness, to meet the basic needs of a world in crisis. Healthcare today, mid- and post-pandemic, faces unprecedented challenges that include exponential growth in costs relative to GDP, aging populations with rising prevalence of chronic illnesses, lack of uniform access to basic and preventive health care, and concerns over quality, safety, and waste. Moreover, burnout rates in healthcare have compounded workforce challenges that were already the subject of headlines about insufficient numbers of healthcare practitioners including clinicians. Collectively these challenges exert strain on health systems already barely coping with demands for services.

As leaders of health systems in India and around the world look to address these challenges, digital health technology emerges as a core enabler to automate, improve efficiencies, and fundamentally re-imagine the future of health and care. Digital transformation is predicated on several critical catalysts for these changes: enabling standards and regulatory environment, favorable funding models, availability of safe, trusted, and reliable technology, well designed end-to-end integration and a workforce with skills to embark on and sustain every aspect of the digital transformation journey. In fact, incomplete integration, and poor digital health literacy in the workforce have been shown to be amongst the most common barriers to the successful digital transformation of health care.

Point-of-care practitioners, nurses, are often the largest part of the clinical workforce. They are a constant point of contact for patients, families, doctors and other staff, and play a crucial role in supporting health care environments. Today's nurses are in the process of acquiring and learning to properly use digital healthcare skills but will need assistance to position the health systems to successfully meet keep up with ongoing changes. Physicians are, of course, another very important group of stakeholders in successful digital transformation initiatives. Appropriate engagement and skills development for physicians is vitally important. Indeed, there are an increasing number of medical schools introducing digital health training into their curricula in anticipation of demand for a digitally literate physician workforce. Because digital health is evolving rapidly, continuing education for nurses, physicians, and all allied health professionals will be important for successful outcomes.

A high functioning, digitally literate clinical workforce is usually multidisciplinary in nature, and digital health technologies can enable each member across the enterprise to function at the "top of his/her license". The workforce challenges are not isolated solely to clinicians, however. Clinicians must draw on, collaborate with, and empower many non-clinical staff members, including clinical engineers, IT practitioners programmers, systems engineers, information and data architects, and many other specialists.

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Clinical engineers (CE) have become invaluable resources for successful digital transformation. CEs are, sometimes called biomedical engineers in hospitals, which is fine, members of but the CE profession is a distinct branch of engineering that focuses directly on solving point-of-care patient care challenges (see www.GlobalCEA.org and https://ced.ifmbe.org/ for details). During the pandemic, these global CE communities have worked closely with WHO, PAHO, and

international MoHs to solve patient- and clinician-facing technology challenges including digital health, such as in programs like the UK's Pulse Oximetry at Home, Paraguay's AI-based clinical decision support system, and new collaborations with Wings of Hope to develop "Digital runways" for LMIC's rural healthcare. These CE communities are also working closely with global interoperability and cybersecurity standards professionals, academia, WHO, NGOs, and many MoH's to accelerate the design, development, validation, and deployment of medical/personal devices, EHR system, IoT, and mHealth technology integration for improved clinical and patient care efficacy, efficiency, and safety.

All of these stakeholders must continually acquire and maintain up-to-date leading-edge digital health skills commensurate with their role. In addition, all stakeholders must actively be engaged collaboratively with each other to leverage digital health technology's potential. This will enable the stakeholders to use digital health technologies in ways that best address organizational goals around access, quality, safety, efficiency, user experience and cost. Organizations at the leading edge of transformation, often employ and invest in ongoing training of clinical and technology professionals who have a fundamental understanding of the "business of clinical care delivery," and are able and committed to bringing technical competency, communication skills, and innovative approaches to problem-solving in complex, multidisciplinary environments.

Vast amounts of health-related data now and in the future will increasingly exist in digital form. The Compound Annual Growth Rate (CAGR) for healthcare data is 36%, the highest of any industry(Reference for this?). It is thus imperative that health care workers can understand the purpose, basic structures, use, and privacy-compliant requirements for storage of electronic health records (EHRs) and electronic data. In addition, new forms of communication and care such as the explosive growth of telehealth and telemedicine make it vital for health care workers to be able to use various modalities efficiently and appropriately to relate information to patients, colleagues, stakeholders and collaborators. In addition, current and future potential benefits success of AI tools to supplement clinical workforce capacity rely heavily, among other factors, on high-quality digital health data. As digital health tools and technologies assume a more prominent role in patient care, teaching and research, the importance of workers' adherence to legal, regulatory, privacy and security policies and their requirements become paramount.

Leading organizations invest in ongoing competency development for both clinical staff- nurses, physicians, allied health professionals, clinical engineers, etc.- and non-clinical staff because all of them will increasingly require core skills in digital tools and technologies to maximize productivity and organizational outcomes, and to facilitate collaborative team and stakeholder communication and collaboration.

An important and often overlooked aspect of digital health workforce transformation is the patient! Digital health literacy for patients, such as understanding how to access medical records, maintain personal health data, interpret clinical reports and guidance, properly communicate problems and complications, and use patient-facing decision support tools for empowered patient self-care is not learned from reading a book in the classroom. Indeed, each patient's digital health skill needs may be highly focused on their specific health and disease processes. Patients and caregivers need adequate support and training so they can play their role as co-producers of their successful healthcare experiences.

Some of the key competencies for a digitally literate health workforce include:

- Informatics concepts and processes
- Health information and records management
- Data analytics, interpretation, and visualization
- Interpersonal and Professional Communication
- Ethics, legal, or regulations
- Privacy and security
- Technical knowledge and support
- Clinical care delivery processes and pathways
- Systems, Design, and Usability thinking

Many resources are readily available for organizations seeking to build digital health literacy amongst their workforce. Some of these include:

- Clinical Informatics board certification by the American Board of Preventive Medicine (https://www.theabpm.org/become-certified/subspecialties/clinical-informatics/)
- Various Informatics fellowships and master's level programs
- Health Information and Management Systems Society (HIMSS) Certifications including CPHIMS, CAHIMS, and CPDHTS (https://www.himss.org/resources-certification/overview)
- Certified Health Informatician (https://digitalhealth.org.au)
- Certified Clinical Engineer (https://accenet.org/CECertification/Pages/Default.aspx)
- Nursing Informatics Certification (https://www.ania.org/education/certification-resources)
- Certified Healthcare CIO (https://chimecentral.org/certification/chcio/)
- In addition. Many multi-industry professional training and certification programs for database, data analytics, telecommunication, and project management can be invaluable
- Note: Patient digital health literacy is currently underdeveloped, and typically relies on individual clinicians, clinics, or hospitals to resort to one-on-one training on a best-effort basis, which is inevitably inefficient.

Clinical Communication in Challenging Situations

FEATURE BY

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”Person-centred, registry-enabled learning health systems can successfully co-produce better health, value and science by leveraging conversations and data.”

Lisa Weiss and Jim Weinstein, co-founders of the Dartmouth Spine Center, in the year 1998 started a new system for providing comprehensive spine care with a new information environment that supported better conversations and better decisions.

A patient visiting is asked to complete a health assessment - that shows how they are doing and what their expectations of good care are. The summary information is shared with every patient - using them for better conversations to focus on outcomes achieved vs outcomes wanted. It is fed forward to the clinician and then it is used for a more sharp conversation about how the person is doing, choices and what to do next.

A dashboard is made from the health assessment. It takes about 20 minutes to summarise:

- Personal summary, work disability, health history, health habits, review of systems, history of present illness, red flags, clinical protocols, patient-reported health and wellbeing scores and indicating the present clinical status and tracking its progression in time.
- A tracker separately tracks the outcomes and compares them with the expectation.

Such data is further consolidated into various forms of analysis and assessments such as:

- Value Compass - to compare how the outcomes changed with various treatment models. This is usually compared on the parameters of clinical outcomes, functional outcomes, satisfaction and costs.

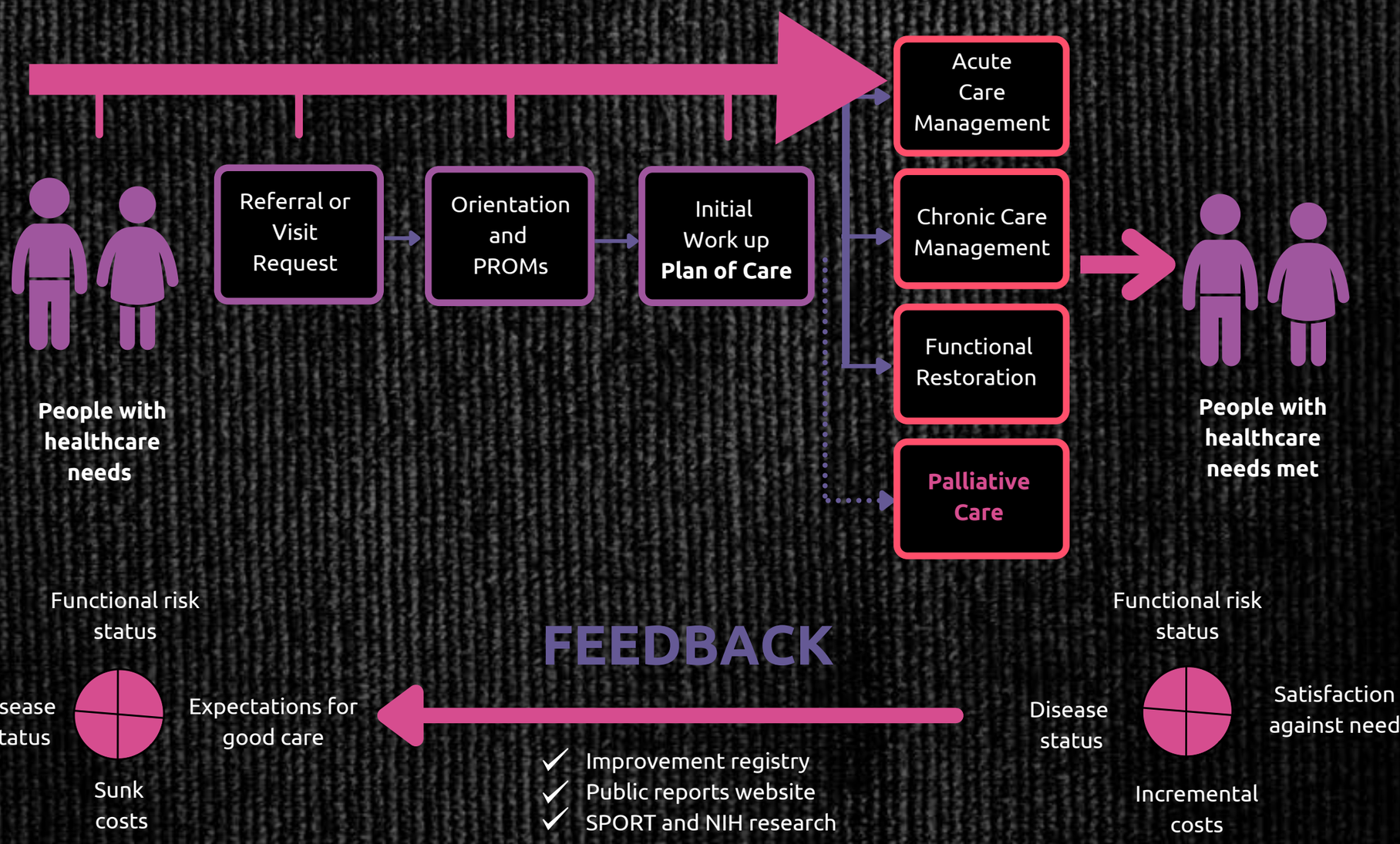
This information is fed back into the centres for real-time care. This allows for personalised risk calculators that allow me to take personalised informed decisions. This is the beginning of personalised predictive medicine – skating to where the puck is going to be. This system has resulted in over 100 publications and the work continues today.

In 2000, Steffan Lindblad was inspired by our work and he laid the foundations of the Swedish Rheumatology Quality Register. He summarised his view of our discussion as an equilateral triangle with patient, physician and partnership on the corners, all interconnected through communication. It is all about the partnership that is fuelled by communication.

This is presently implemented for rheumatology management across patients in Sweden. Every patient is given a health assessment, and they quickly learn how to read their dashboards. This shows the dates of visits tracked with patient-reported outcomes and clinical outcomes and is combined and highlighted and coloured and medications are also tracked.

In the diagram above, the patient had gone from borderline flare-ups to an all-out exacerbation of their arthritis from August to December. When their medication was changed at the end of November, the person returned to the resting disease state.

On a systemic level, this caused a cut in half of the disease activity rate of all the Rheumatoid Arthritis cases across Sweden in nine years. One of the counties (Gavle) that implemented the system considerably reduced its outcome variability and it immediately fell in line with and better than the national numbers.



CONCEPTS: DEVELOPING A CONCEPTUAL MODEL

In October 2013, we met 10 people from Sweden who were instrumental in the implementation of the model. We drew up a model to summarise our brainstorming and we came up with two key areas: Social System Innovations, including Patient/Family Networks and QI/Research Networks, and Technological Innovations, including registries, HIT-enabled networks and Feedforward Feedback Data Flows under the label, Patient-Centred Decision Support for the Co-Production of Good Care and Better Health Outcomes.

THE CORE OF THE MODEL:

- Co-assess: Co-assess the patient's health status and how the treatment plan has been working to improve the patient's health and well-being.
- Co-decide: Co-decide on what the next steps in the patient's treatment plan should be based on relevant evidence and past experiences to minimise the burden of disease.
- Co-design: Co-design the treatment plan for daily care and professional interventions to attempt to minimise the burden of treatment.
- Co-deliver: Co-deliver the treatment plan that usually involves daily self-management and adherence to the plan and occasional treatments by a professional clinician or clinical team.

"Person-centred, registry-enabled learning health systems can successfully co-produce better health, value and science by leveraging conversations and data."

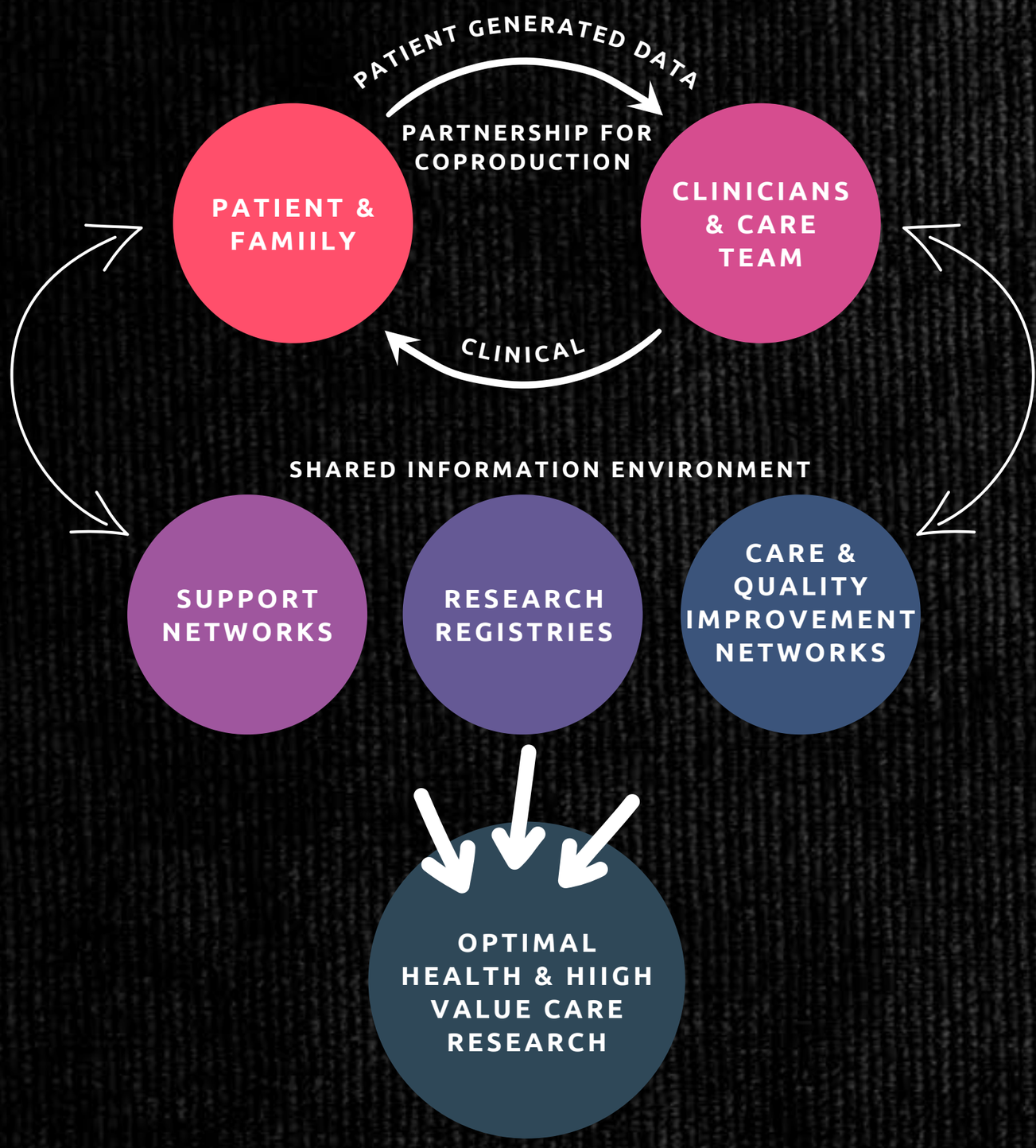
“The key to scoring goals is skating to where the puck is going to be”

In healthcare, we need the same principle, to think ahead of time, to be ready for the changes before they happen.

Wayne Douglas Gretzky played 20 seasons in the National Hockey League (NHL) for four teams from 1979 to 1999. Nicknamed "The Great One", he has been called the greatest hockey player ever by many sportswriters, players, the NHL itself, and by *The Hockey News*. Gretzky is the leading goal scorer, assist producer and point scorer in NHL history, and garnered more assists in his career than any other player scored total points. He is the only NHL player to total over 200 points in one season, a feat he accomplished four times. In addition, Gretzky tallied over 100 points in 16 professional seasons, 14 of them consecutive.

WAYNE GRETZKY

Former Professional Ice Hockey player



This model is currently being adopted in the treatment of various conditions, including:

- Cystic fibrosis
- Adult Crohn's Disease
- Peds and rheumatology
- Palliative care/serious illness
- Cancer
- Kidney disease
- Multiple sclerosis

CORE CONCEPTS

Coproduction Defined: The independent work of patients and professionals to design, deliver, assess and improve the relationships and actions that contribute to the health of individuals and populations through mutual respect and partnership that leverages each participant's unique assets, expertise and actions.

Learning Systems Defined (Senge): "Learning organisations are those organisations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together."

"Together, we bring the full power of our collective expertise to provide the best possible care to our patients, our people and our communities."

Real-world examples of the success of the concept:

- Cardiac Surgery - Northern New England Cardiovascular Study Group -- In eight years (1987-1995), the mortality was reduced from 4.5% to 3.5%. This continued until 2003, bringing the number to ~2%.
- Cystic Fibrosis - CFF Registry Enabled Learning Health System - Ten-year gain in life expectancy from 1990- to 2012 before breakthrough protein modulators were developed.
- Rheumatoid Arthritis - Swedish Rheumatology Quality Register - The mean inflammatory marker level has fallen from 12.6 to 3.12 between the years 2002 and 2017.

SERIOUS ILLNESS CONVERSATION

The Serious Conversation Guide by Ariadne Labs is a framework to make conversations about seriously ill patients' priorities more efficient, higher quality and more meaningful. It includes the following phases:

- Setup and introduction
- Assessment of the patient's understanding
- Sharing the information about uncertainties, time, function and best and worst-case scenarios.
- Exploring the patient's objectives and thought process
- Emphasising the most relevant points

The SIC Model of Care aims to systematically increase conversations between oncology teams and seriously ill patients to understand their goals before complications arise while making conversations more efficient, higher quality and more rewarding.

Integrating it with the MR makes it accessible at every successive stage. Having the conversation early allows the patient to process it better. Including perspectives of multiple experts from varying fields from practitioners to social workers and relatives of patients allowed for the development of a system that takes into account all considerations, allowing it to be much more readily accepted.

We included everyone in the training and developed one-to-one training for key personnel as a feedback mechanism for the work that they had just completed, allowing them to gain confidence and learn through practice.

We co-designed our eligibility criteria, and identified our barriers, our key drivers, our workflows and changed ideas.

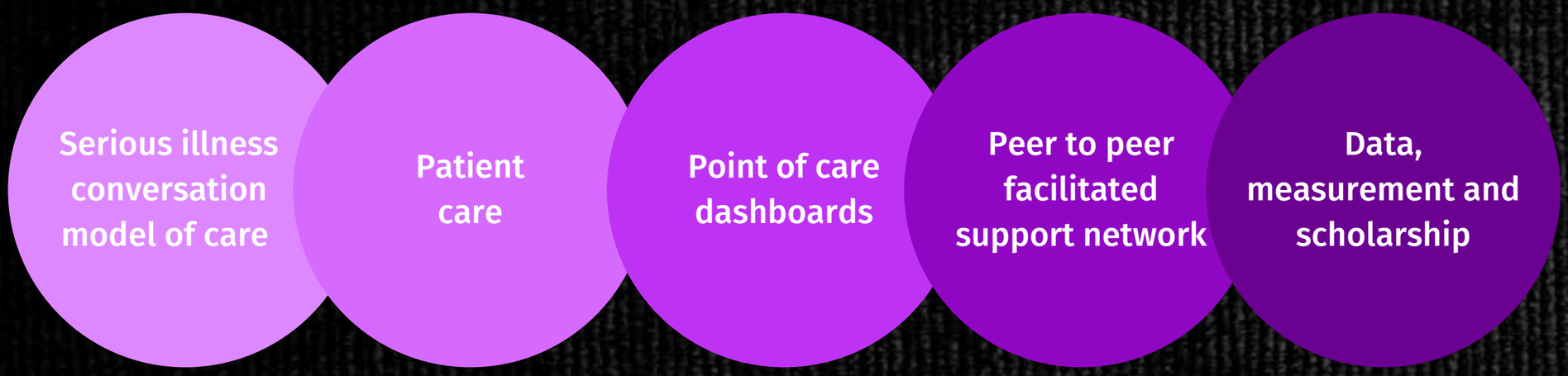
Use of the SICG in oncology and high-risk primary care settings led to:

- Earlier discussions before EOL
- Increased EOL discussions before death
- Higher quality discussions followed best practices
- Documentation highly visible in MR

89% of clinicians using a guide elicited patients' goals and values as against only 44% of the control group. (Paladino J, JAMA Oncol. 2019;5:801-809)

Dartmouth's Learning Health System in Oncology

Designing for Better Outcomes, Experience, Value and Science



Collaborative Learning Network

Learning, Measuring, Sharing and Improving Together

Patient anxiety was lower while following the process and the benefits lasted over 24 weeks. (Bernacki R, JAMA Intern Med. 2019;179(6);751-759)

The median time for the conversation was also reduced, increasing clinician efficiency with the nurses requiring about 26 minutes and physicians requiring about 22 minutes. 19% of conversations were completed by nurses and 37% were completed by physicians. (Lakin JR, Health Aff, 2017)

Implementation stages we went through:

- Development (five months): SIC Team formed, weekly huddles initiated, patient eligibility defined, provider training defined, workflow mapping
- completed.
- Kickoff (two months): Initiated SIC coaching and data sharing with the team
- Standard work (two months): Patient report out defined, scheduling script introduced based on VOC.
- Resources (two months): SIC completion, timing defined, expanded workforce capacity
- Expansion

Introducing a scheduling script, incorporating the feedback of the patients in scheduling and other steps elevated our median percentage of eligible patients given the procedural conversation significantly. A pre-visit menu allowed patients to set their agendas and this makes the patients very confident in knowing what to ask and they can do that at a time that is suitable for them.

BENEFITS

1. The PFA reduced clinicians' barriers to initiating conversation.

2. Early conversations improved clinicians' experience of delivering care

3. The LHS reframed clinicians' perspective on their role in providing care
4. The LHS created team equity, a growth mindset and engagement

CONCLUSIONS

1. Co-production learning health systems can improve health, healthcare value and science.

2. A key to their success is better conversations that forge better patient/physician relationships that focus on the patient's goals and on treatment plans that have the best chance of achieving the outcomes that matter most to patients.

SECTION IX

DIALOG BY DOCNDOC

DIGITAL PAYMENTS INFRASTRUCTURE

CONTINUE READING

India has been the pioneer in UPI payments. UPI opened up a wide array of possibilities for commerce and led to both better ease of transactions and an increase in the number of transactions for the entire market - ranging from small roadside food stalls to large manufacturers and even healthcare organizations.

UPI got everything right. The convenience, the speed, the security and the accessibility ended up doing a far better job for the common man than the gamut of payment solutions used globally.

In India, healthcare insurance is on the rise. Insurance is not just a convenience, but a necessity and a part of the policy to ensure universal healthcare access. The expansion of the number of patients who are insured complicates payments and cashflows for healthcare providers as well as parallel service providers. In this section, we explore a potentially groundbreaking innovation to provide a uniform, streamlined, and consolidated payment experience.

Staff Editor

PROJECT VISION

A Digital Backbone for Healthcare Payments is Coming

FEATURE BY
ABHISHEK JAIN
CPTO
Swasth Alliance

AND
DR AJAY NAIR
CEO
Swasth Alliance

Every over 60 million Indians are pushed into medical poverty, and countless others are not able to access care. There are many reasons for this, a major factor is the fact that India's public expenditure on health as a proportion of our GDP is woefully under what countries at a similar stage of development spend and orders of magnitude lower than the expenditure in high-income countries. All of this leads to families paying for care out of pocket for a majority of their healthcare needs. The Sustainable Development Goals that India has signed up to achieve envisages Universal Health Coverage (SDG 3) of which access to financial risk protection is a key aspect.

Given our mixed health system, this will likely be achieved by a combination of public and private healthcare providers serving the country's growing needs as well as public (Ayushman Bharat) and private (Health Insurance, Employers etc.) payors helping avoid catastrophic medical expenditure by creating various pooling mechanisms. However, to achieve this for every Indian, our current payment system needs an overhaul.

The Ayushman Bharat network doesn't currently have enough providers, especially in rural areas. Cashless facilities are not uniformly available at all providers, while reimbursements require lengthy paperwork and have long wait times. Processing claims themselves are a cumbersome process, leading to delays in the patient getting discharged from hospitals as well as very long receivables cycles for hospitals. This also means that a lot of the costs incurred by the patient, for example, outpatient visits, drugs and diagnostics are not covered.

All of these ultimately lead to a poor experience for patients, healthcare providers as well as payors. These problems have been solved in other industries with digitisation and healthcare is ripe for such a change.

All these ultimately result in poor patient/provider experience and lack of trust in the health benefits offerings, thereby reducing the availing/facilitation of such benefits. This calls for rebooking the way the health financing is processed and looking for better alternatives that allow for smooth patient experience, and seamless and standardised information exchange between stakeholders.

IMAGINING A HEALTH BENEFITS NETWORK FACILITATED BY HEALTH CLAIMS EXCHANGES (HCX)

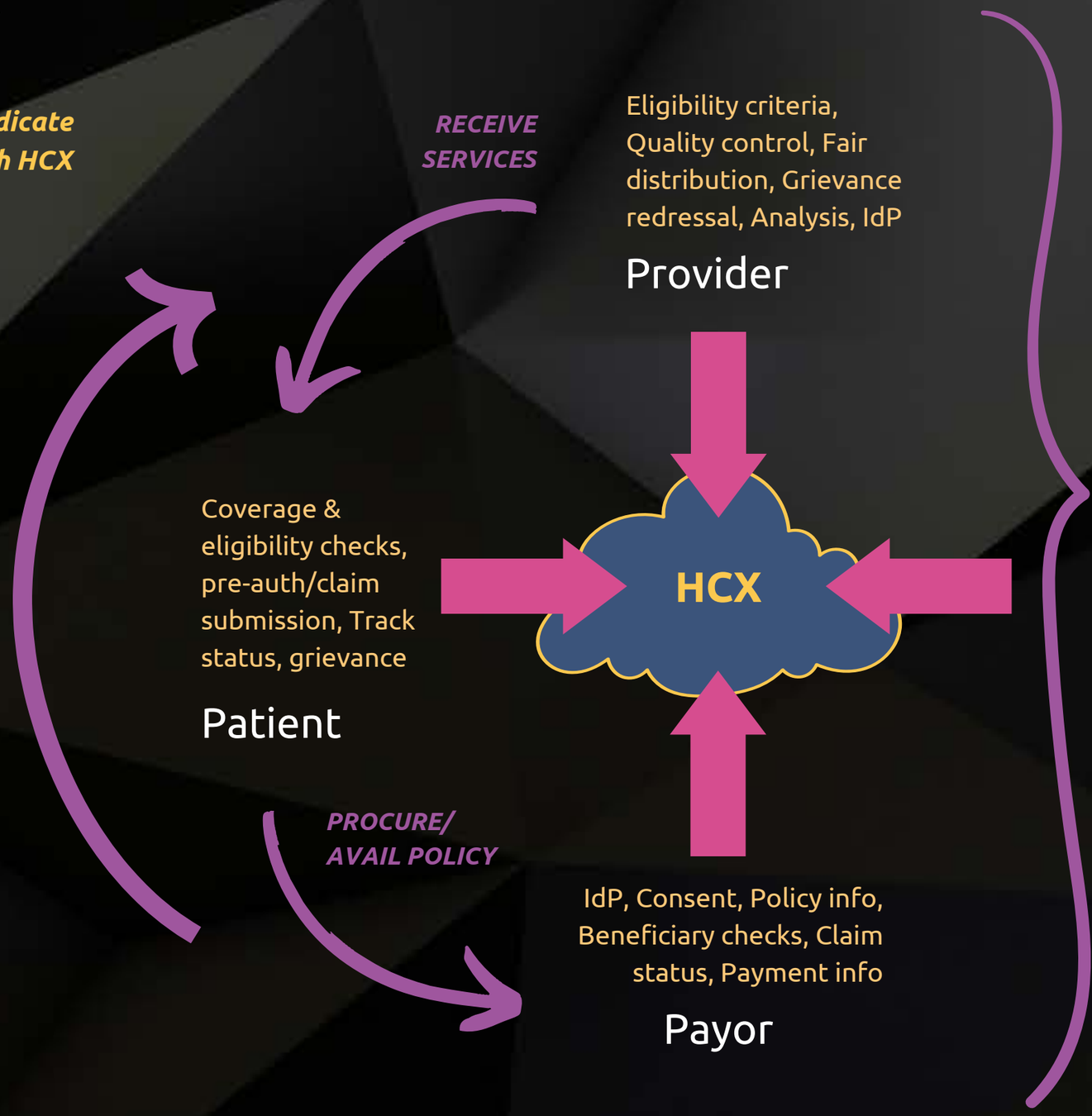
In 2019, a Joint Working Group of NHA and IRDAI (2019), proposed the concept of Health Claims Exchange (earlier named Platform) to address these critical issues by aiming to pave the way to build a digital health benefits network. In 2020, the Hon'ble Prime Minister of India announced the launch of the Ayushman Bharat Digital Health Mission, which also included a health claims platform/exchange as a key component.

Such a network would provide a seamless way for all stakeholders to interact and create a win-win for all by providing the following key benefits to each of the key stakeholders.

HCX - STAKEHOLDER INTERACTIONS

Purple arrows & Purple Text indicate Meta interactions

Pink arrows & yellow text indicate capabilities achieved through HCX



HCX - STAKEHOLDER BENEFITS

Patients

- Faster discharge, lower wait times
- Visibility and transparency in the claim process
- Newer services can be covered eg. OPD, diagnostics, pharmacy etc.
- Health outcomes will become an important
- metric in payments

Providers

- Get paid faster
- Better patient experience due to faster discharge
- Connect to ALL payors in the country with one connection
- Offer cashless facilities to more patient
- Better ability to track problematic claims
- The larger covered base of patients to service
- More services covered

Payors

- Seamless connection to any healthcare providers and other ecosystem actors (regulators, processors, TPAs etc.)
- Innovation in adjudication and fraud management due to standardised data sets
- Quick ability to introduce new products seamlessly to the ecosystem
- Analytics-friendly data to improve health benefits /plan offerings

Policymakers / Regulators

- Enhanced ecosystem observability to monitor and regulate the ecosystem - almost real-time Improved analytics for policymaking
- Possibility to create data access policies that can encourage research
- Better policyholder protection with data and data-driven grievance redressal mechanisms

WHERE WE ARE AND THE PATH AHEAD

At Swasth, we have been lucky to work with volunteers from a large number of organisations across the country to build the standards for such an exchange (the HCX Protocol) through an open and collaborative process. We are also working on a proof of concept/pilot connecting payor software with hospital software through this switch. This will help demonstrate the workings of the exchange and allow us to fine-tune the protocol as well as the software.

The HCX protocol is not static and the working groups coordinated by the Swasth Alliance hold regular cadences to add new features to the exchange and evolve the protocols. Current efforts include expanding provision beyond cashless claims to reimbursement use cases, enabling coverage of outpatient use cases, enabling auto-adjudication etc.

We believe that the HCX is a significant step in building the nation's capacity to deliver Universal Health Coverage and would love to partner with all ecosystem stakeholders on this journey. For more information please write to us at hcx@swasthalliance.org

SECTION VII

DIALOG BY DOCNDOC

CASE STUDIES: THE INDIAN CONTEXT

CONTINUE READING

PROJECT VISION

With the recent government push for digital health initiatives India, a global supplier of healthcare and technology professionals, is primed to advance its ambitions. The following case studies illustrate successful digital health technology initiatives by pioneers in India. Beginning with the first triple HIMSS EMRAM Stage 6 Apollo Hospital, the case study illustrates how HIMSS Maturity Models can support and align with the growth and success of India's hospitals. Other creative digital health innovations in India, showcasing digital health progress in robotic surgery, follow.

MANISH KOHLI MD
MD, MPH, MBA, FHIMSS, FAAFP
Curator

dozee

LEVERAGING CONNECTED HEALTHCARE FOR ENHANCING PATIENT SAFETY AND IMPROVING CLINICAL OUTCOMES IN NON-ICU SETUPS

Across the world, we follow a reactive approach to healthcare and fail to take proactive measures to care for our health. In today's day and age, it is heartbreaking to know that globally ~29.7 lakhs of people die within 30 days of surgery due to postoperative complications resulting from lack of continuous monitoring. This is much higher than global deaths related to causes like HIV, malaria, and tuberculosis combined.

In more than 75 years of independence, India has built its healthcare ecosystem ground up. One of the key highlights of the ecosystem is its hard-working and highly talented doctors and healthcare professionals(HCPs). We've seen Indian doctors and surgeons shining at the global level. However, we have our fair share of problems. Inadequate and crumbling infrastructure combined with a high patient load has resulted in unaffordable and inaccessible healthcare. In a country of over a billion people, we have just over 1.25 lakh ICU beds. For over 55 million cardiac patients we have just over 5000 cardiologists. Against a recommended nurse-to-patient ratio of 1:4 for step-down ICUs, ours range from 1:10 to 1:40! While we expedite the development of healthcare infrastructure such as hospital beds and clinics, consistent growth in the number of HCPs to meet the WHO standards will continue to be a challenge. The gap has been and will keep increasing unless we change something fundamental. This is where the role of technology to bridge this gap becomes vital.

India is on a path of digital transformation of the Healthcare System to deliver access to quality care for 1.38 billion Indians. Technology has played a vital role in India's digital transformation journey, across sectors, over the past two decades, including manufacturing and fintech, among others. This has made it imperative for the healthcare sector to embrace technology in order to make healthcare delivery more efficient, accessible, and affordable.

Having launched in 2019, Dozee is India's first contactless health monitoring solution that is steadily and systematically pioneering remote patient monitoring in hospitals and at home. In the hospital, Dozee automates vitals monitoring in non-ICU beds like HDUs, Step-down ICUs, VIP Rooms and Infection Wards.

The idea was to significantly change the healthcare system with contactless patient monitoring and AI-based Early Warning Systems (EWS). We believe that if timely actions can be taken when health deteriorates, we can save millions of lives thereby creating a significant positive impact on society.

An independent impact assessment study* conducted by Sattva consulting found that Dozee saves 80% of the time taken by nurses to track patient vitals and also decreases the ALOS in ICUs by 1.3 days. The report also observed that for every 100 Connected Beds, Dozee saves 144 lives by generating timely alerts and can unlock annual savings of up to Rs. 2.7 Cr for the hospital.

Co-founded by Mudit Dandwate (IIT Mumbai) and Gaurav Parchani (IIT Indore) in 2015, Dozee makes use of AI-powered ballistocardiography (BCG) to capture vibrations from the human body and translate them into insightful vital biomarkers. This enables contactless monitoring of vital parameters such as Heart Rate (HR), Respiration Rate (RR), Blood Pressure, Heart Rate Variability, Sleep and Sleep Apnea; with medical grade accuracy.

Dozee converts any non-ICU Bed to a Connected Bed with contactless continuous monitoring of vitals, an early warning system and patient triaging, thereby, enabling early intervention, efficient nursing, reduction in human error, cost savings and improving overall patient experience.

Dozee has upgraded over 7500 beds across 300+ hospitals across India monitoring 125K+ patients and saving 200K+ nursing hours and following global standards in patient safety, data privacy and cloud security with relevant certifications.

The advancement of medicine and technology has ushered in a new era of remote patient care. Remote Patient Monitoring enables healthcare providers to remotely monitor their patients' wellbeing using a centralized patient monitor, allowing hundreds of patients to be observed at once via a web interface and a mobile application.

Dozee Connected Beds in a non-ICU ward can create a huge impact on improving the utilization of existing ICU beds and lead to a significant reduction in ICU operational costs and prudent utilization of hospital budgets.

Connected Beds can help India to address the shortage of ICU beds, Nurses and Doctors and the adoption of AI-powered Early Warning Systems (EWS) for patient monitoring in non-ICU wards can lead to significant enhancement in patient safety and improved clinical outcomes.

Large-scale adoption of Connected Beds powered with new age sensors combined with cloud-enabled Artificial Intelligence (AI) will create a strong backbone for the transformational Connected Health Ecosystem in India.

- **7500+ Dozee Beds**
- **300+ Hospitals**
- **1,25,000 Patients Monitored**
- **2,00,000 Nursing Hours Saved**

Dozee is on a mission to transform the healthcare infrastructure one bed at a time, eventually, achieving the vision of Connected Health in Every Bed !!

To know more about Dozee visit www.dozee.health

*To know more about the impact report please write to **impact@dozee.io**

CASE STUDY I

DIGITAL MATURITY- A JOURNEY NOT A DESTINATION: APOLLO HOSPITAL

CASE STUDY BY

SHANKAR KRISHNA, AAZATHRAJ, NATISH CHAUHAN, & NUTAN MOHANTY

The need to have Healthcare at quality levels that never slip from the best is a basic expectation of every individual aspiring to consume healthcare. This necessitates the need to ensure that the golden triangle of quality, accessibility, and cost are maintained in effective harmony so that a health system not just thrives but also is consistently motivated and encouraged to deliver clinical outcomes, operational excellence, service delight, and financial prudence that consistently break the barriers of the best and demonstrate the highest degree of sustainability. While it is indeed an aspiration to achieve all this making it the DNA of a healthcare delivery enterprise is the core need. This automatically underscores the need to build health systems and health care delivery models on an effective backbone of technology. Transforming health care with Technology today is a necessity and the most logical ally to solve the humongous expectations and challenges that health care delivery constantly encounters. The population segment we are dealing with is far too large compared to the capacity they can deal with. Therefore, the ecosystem of digital health technology will be excessively leveraged and it must live up to the expectation in terms of size, scalability, support, consistency, and quality.

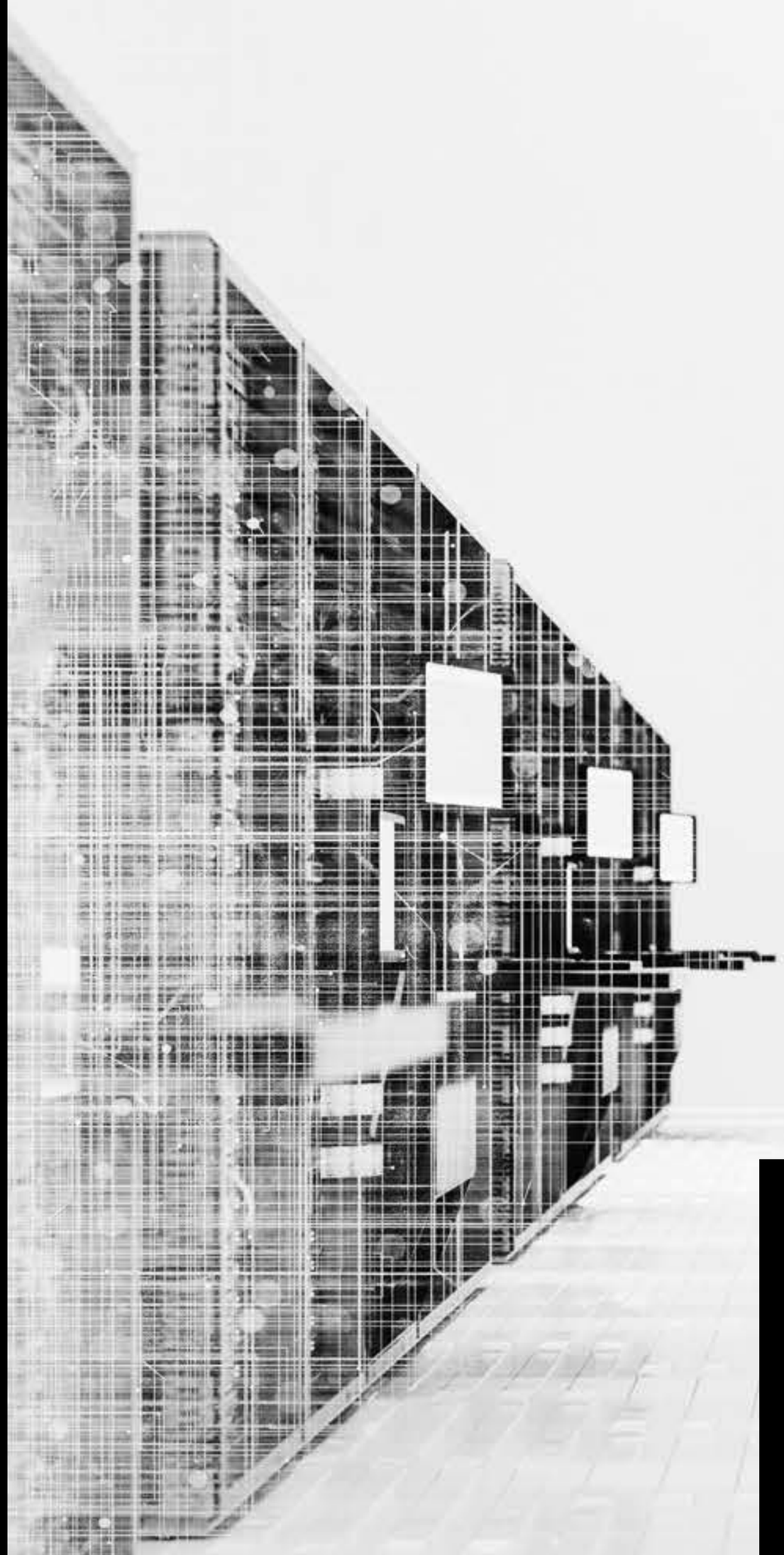
We at Apollo Hospitals are excited and extremely happy at our achievement of Stage 6 for O-EMRAM, DIAM, and INFRAM. It is deeply gratifying to see that the fundamental backbone of Apollo's Digital backbone is compliant with the best-in-class standards in the world. Our consistent efforts to ensure that we embrace and further industry-standard benchmarks give us the confidence that our Healthcare delivery is the best in class. We see this as our commitment to our patients, our clinical fraternity, and our organization colleagues. This is a testament to Apollo's commitment to delivering world-class excellence to all its patients.

Right from our mission statement of "Bringing the best healthcare to India", it is our commitment to ensure that our Healthcare delivery is pristine in terms of quality, consistency, and sustainability. The world has a severe shortage of healthcare delivery infrastructure. This demand-supply gap can only be

mitigated by transforming healthcare delivery through effective Technology. This becomes vitally important to ensure that the digital backbone is best in class and guided by the combined best practices from across the world.

The HiMMS maturity models provide such a framework and we decided to ensure that our solution stack is compliant with these. Furthermore, this is not just about the maturity of the digital backbone but also the model of effective adoption of the solutions and thereby demonstrating that an organization can be effectively managed and sustained by consistent and well-coordinated consumption of the digital solutions. We are seeing good results in the direction of our quest towards operational, clinical, service, and financial excellence. We strongly believe that the effective deployment of technology in healthcare delivery is a force multiplier to boost our capabilities. We are striving to ensure that we can provide personalized care to every individual guided by technology that ensures that we are operationally effective, sharply focused on quality of service, and non-compromising on achieving the highest standards of clinical outcomes bundled with the hallmark of Apollo's Tender loving care. We have made significant strides of progress in deploying cognitive algorithms into our care protocol and pathways, we have made significant progress in deploying AR/VR into our patient communication and clinical upskilling, and we have made huge progress on deploying cutting-edge medical technology coupled with powerful information technology to achieve the highest level of clinical outcomes and all-round financial prudence.

The core of the IT systems at Apollo hospitals have been homegrown. The IT systems of Apollo hospitals ensure that all system-wide work processes are interconnected such that the transfer of information leads to the effectiveness and efficiency of work processes. The fundamental ethos during the creation of the design backbone of the IT system was to ensure that the organization has the culture to manage based on insights derived from data that is contextual to the point of care and thereby bring in the knowledge and the experience of our transactions at scale to our work process. The IT systems ensure the optimal amalgamation between clinical present, revenue cycle, supply chain human resources, and financial systems such that data flow presents the right context of



information to the user at the point of service. Our systems employ standardized coding nomenclature for all transaction types end we have made a deliberate effort to ensure that there are internationally used standard guidelines in coding transactions (such as FHIR, SNOMED, LOINC, CCD care continuing transactions, and DICOM).

The IT systems by design have ISO 27001 data security and privacy standards embedded along with best practices of security and privacy from across the world. The entire IT ecosystem solution ensures that patient and patient privacy is at the heart of our healthcare delivery system ensuring that a single patient can have a sustainable and longitudinal record for their entire journey in the healthcare system spanning years of episodes that include various care settings.

CASE STUDY II

TRANSFORMING HEALTHCARE WITH TECHNOLOGY

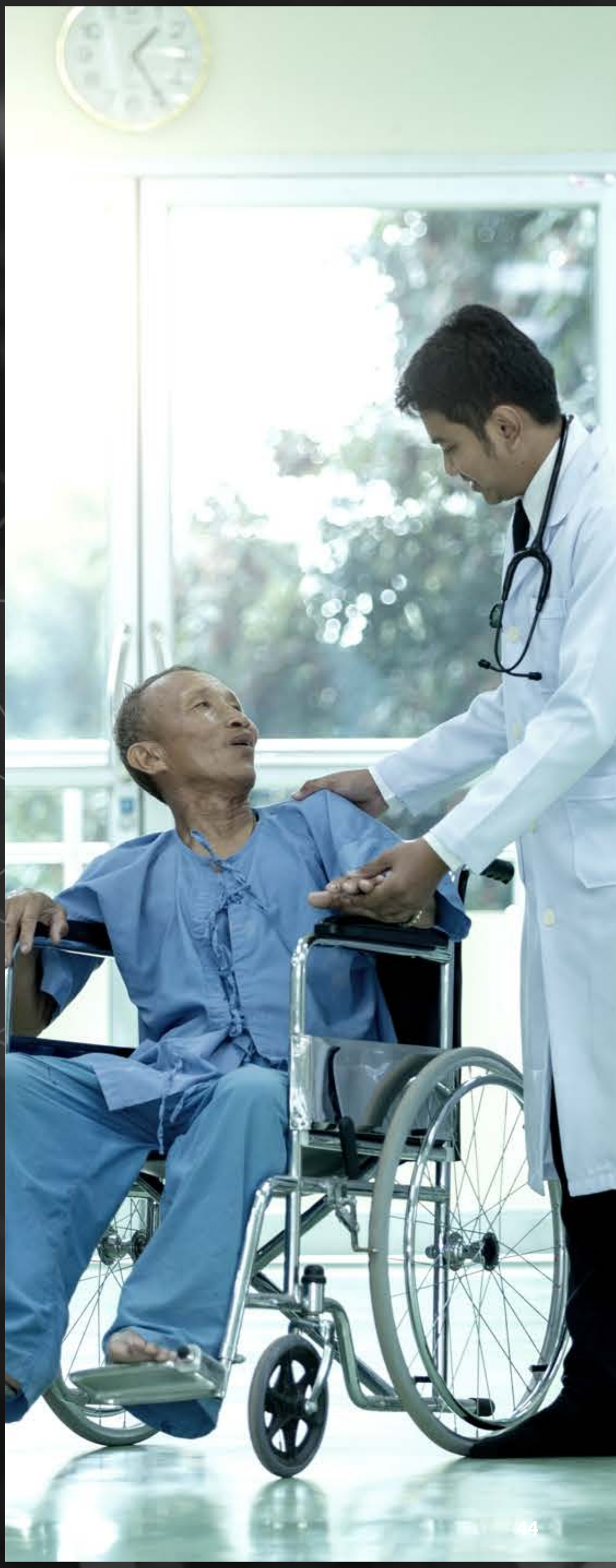
CASE STUDY BY

ARVIND SIVARAMAKRISHNAN CHCIO,
RANGANATHAN G PMP

Today, digital transformation is becoming a base necessity, and though healthcare is a little late to the game because of its aversion to risk-taking, it is catching up at a pace faster than other industries. Digital transformation is a necessity to ensure that we are always 100% quality-focused, aligned towards customer expectations, and with a high degree of efficiency internally and externally. Healthcare delivery is a very human-resource intensive industry, and any slackness is unacceptable because we are dealing with the lives of people. Therefore, we must drive towards 100% perfection and ensure replicability of service. The challenge is in the size, the scale, and the sustainability – it must be made the DNA across the country. The convergence of the Social, the Mobile, Analytics, and the Cloud (SMAC) along with IoT will play a transformational role in the future of healthcare. Together, they will be able to deliver a confluence of quality clinical outcomes that are measurable, automated clinical practice guidelines, and care pathways that emulate best practices that are not dependent on individual pockets of excellence. Within monitoring, a focus on preventive healthcare and connected health outcomes will define the future of healthcare.

As an effective employee benefit and as a responsible employer, most employers today provide employees with healthcare benefits and insurance, which is prevalent in both the public sector and the private sector. However, increasingly organizations are adopting a proactive approach to the health and wellbeing of their employees, rather than a reactive approach. The major objective is to ensure a healthy workforce with adequate levels of productivity. This focus on health and wellbeing often extends to the family members of the employees. They intend to keep their employees away from secondary and tertiary healthcare challenges which are avoidable with a high preventive wellness focus. Effective proactive health management on a large scale can help prevent non-communicable diseases with health and lifestyle changes, diet, exercise, good advice, and. The intent is to prevent them with early intervention and avoid advanced medical care, hospitalization, or secondary or tertiary care. Such interventions require scale which is heavily possible in the digital world. Technology can enable aligning the chronic care management program or non-communicable diseases care management program to ensure that people are monitored and kept healthy by a combination of healthcare interventions like health and lifestyle counselling, mental health counselling, etc. This requires bringing together SMAC and IOT to administer these services, monitor these services, work at scale, keep the levels of quality and clinical outcomes, etc. A key focus area for digital interventions in the future of healthcare will revolve around leveraging technology for augmenting efficiency, and effectiveness and ensuring sustainability by removing wasteful practices, which tend to have huge financial repercussions. This will involve turning to electronic health records, automation, and effective integration, at all levels, right from small-scale providers to very large healthcare systems. The digital interventions will add to efficiency not only from financial aspects but also reduce administrative overheads to augment operational efficiency. Therefore, when it comes to better outcomes for the healthcare sector, digital interventions will impact both the core (clinical outcomes) and the periphery (operations).

Another key focus area at the intersection of technology and healthcare is privacy and security. With an increase in consumerism, there is a rise in awareness around areas of patient privacy and security. This requires the right tools and techniques to monitor, and the corresponding education to facilitate security and privacy by leveraging technology. Healthcare organizations will take an active interest in augmenting their cybersecurity practices to ensure strict monitoring, especially when it comes to handling patient information. Furthermore, the importance of technology and healthcare revolves around education and building skills. Starting right from medical school and allied health school, there needs to be a focus on continuous learning using digital tools like augmented reality and virtual reality for effective training techniques and add-on training at a higher level of maturity. It is important to focus on digital health education and skilling not just at the high-end but also at the entry-level segment to logically minimize the burden of lack of resources in the healthcare industry. The use of technology in learning, development, education, and skilling, is therefore another area where we see technology helping the healthcare industry. There is a strong focus on business process engineering, which is an aspect of process maturity and workflow maturity. It ensures that you can do the right thing in the right place to get the right outcomes. In healthcare, when processes are well managed, whether, in terms of operational efficiency or clinical efficiency, they lead to desirable clinical outcomes.



As the industry is realizing the power of data, be it healthcare or non-healthcare, the topmost trend is the incorporation of cognitive learning into enterprise-class applications. Cognitive learning is a combination of analytics, AI/ ML, prescriptive algorithms, and predictive algorithms. It gives these applications the ability to achieve a higher degree of excellence, compliance, and operational and clinical efficiency.

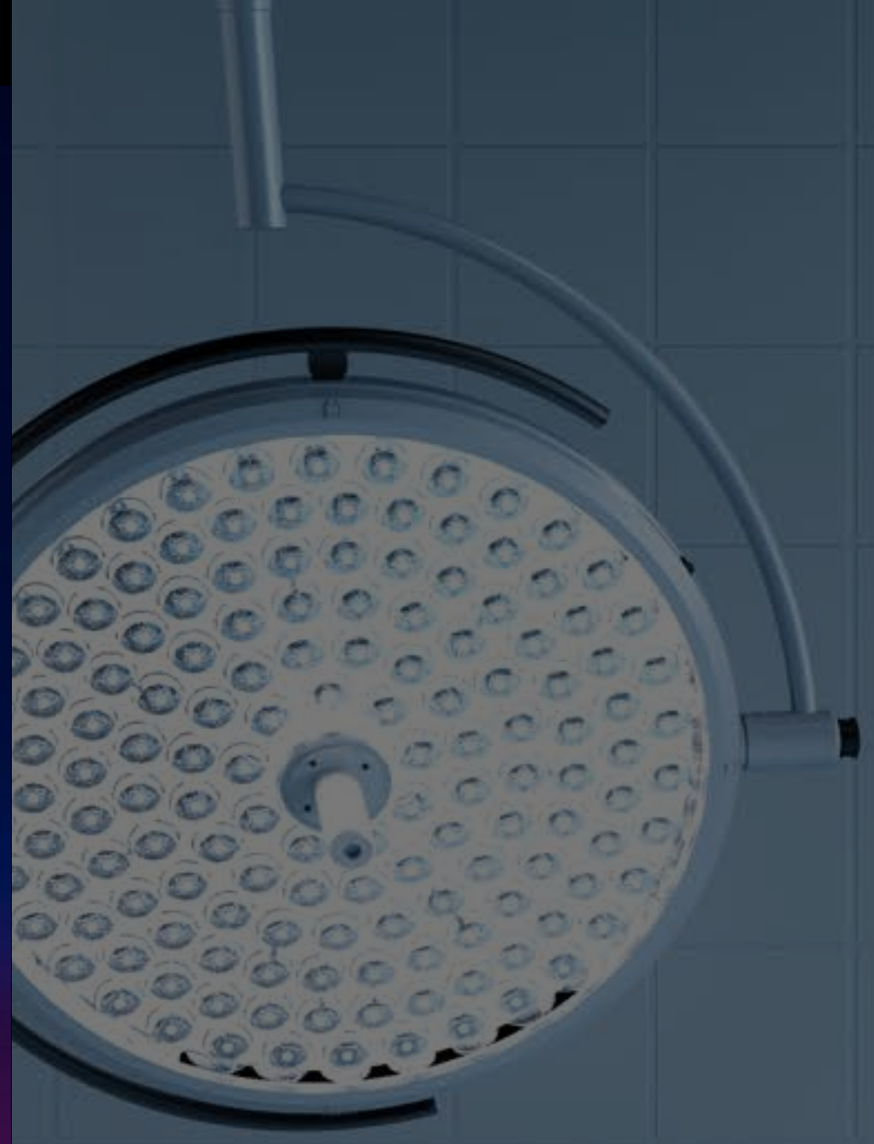
The excellence thus achieved can be service-oriented as well. The second trend is to develop a more intuitive, robust, and easy-to-learn user experience (UX), given that people are increasingly adopting electronic systems, primarily mobile technology. So being mobile-enabled, that is, being available in app format makes it easy to use such light devices at various points of care. At the same time, certain processes need to be undertaken on larger screens such as those on traditional desktops. Even for these, the user interface/UX is very important, coming before the activity itself. The third trend is migration to the cloud. This is very important from the standpoints of manageability, the total cost of ownership, disaster recovery, business continuity, and better technical talent to manage infrastructure.

Maintaining electronic information technology systems sometimes becomes a challenge in service organizations such as those in the healthcare industry.

CASE STUDY III

ROBOTIC SURGERY IN INDIA: AN UPGRADE

FEATURE BY
DR RAJ PALANIAPPAN
Director & Lead Surgeon, Bariatric & Robotic Surgery, Apollo Hospitals, Chennai



THE RISE:

A man is only as good as his tools. If at all there is a true representation of the proverb in healthcare, it is Robotic Surgery. Long after the US FDA approval of the da Vinci system by Intuitive surgical in 2000, India got its first robotic installation in 2006 and robotic urology surgery was performed (1). The following decade saw unprecedented growth in robotic surgery in India. There are currently 119 robotic installations as on July 2022, with more than 600 trained robotic surgeons in our country. There have been around 16500 surgeries to date with around 2500 surgeries in the last year alone largely thanks to DaVinci Surgical Robot (2).

The trend suggests that the rise of robotic surgery in India has been, and is, going to be a rapid and huge one. With the introduction of two new Robotic systems, CMR Surgical Versius in 2019 and Medtronic HugoRAS system in 2021, opened up the market which is only proving to be beneficial to the institutions and ultimately patient outcomes (3). With the “Made In India” robotic platform SSI Mantra having its first installation in July 2022 with one-third the installation cost and half the recurring cost promised by the promoters, will serve the price-conscious nation through its affordability and widespread use for the Indian population (4). This is touted to revolutionise the economic viability of the platform not just in India, but across the globe.

With around 110 odd robots available across various specialities, and the recent introduction of robotic platforms for Orthopedics, Neuro and spine surgeries, the war has only begun and it soon is going to become inevitable for surgeons and hospitals to embrace the technology.

THE SHINE:

It is particularly beneficial in a country like India where the demand for surgeons is ever-increasing. Similar to the global trend, the highest robotic application is seen in urology followed by gynaecology. However, the trend is changing with more surgeons from other specialities getting trained due to an increase in surgical indications. At present, the reach has been to multiple specialities including Urology, Gynaecology, Surgical Gastroenterology, Thoracic surgery, Otorhinolaryngology, Head & Neck surgery, Cardiac surgery, Neurosurgery, Spine and Orthopedic surgery, Ophthalmology, etc (5).

The alarmingly rising population in India resulted in a very large number of patients being treated by a single surgeon. This is leading to a shorter learning curve for most robotic surgeons. As laparoscopy is well established in India, surgeons with excellent laparoscopic skills have an edge with a shorter learning curve. Hence, the transition from a laparoscopic surgeon to a robotic surgeon is smooth, which ensures a faster dissipation (1). With fellowships in robotic surgery available, the training process has been streamlined with increased opportunities for upcoming young surgeons. Third-party and corporate insurance approval by IRDA in 2018 is expected to cover over 10 crore public by health insurance along with 'Ayushman Bharat' National Health Protection Scheme 2018-19 which will effectively cover additional 10 crore poor and vulnerable families for Robotic surgery(6).

THE PROS:

Robotic technology has increased the technical capabilities of surgeons through its improved ergonomics, motion scaling, and tremor filtration (7). This has made life easier for surgeons in technically demanding spaces like the pelvis and the fundus where access was a challenge even in laparoscopic surgery which eluded the surgical community of better outcomes in complex surgeries like prostatectomy, pelvic exenteration, low rectal resection, esophagectomy, and navigation surgeries like a spine to avoid cord injuries (8).

3D imaging with 10 x magnification has proved to be of ultimate use in tissue differentiation which helps for better tumour clearance in oncology, nerve preserving surgeries like prostate, pelvic floor surgeries, and tissue sparing like in ultra-low anterior resection (9).

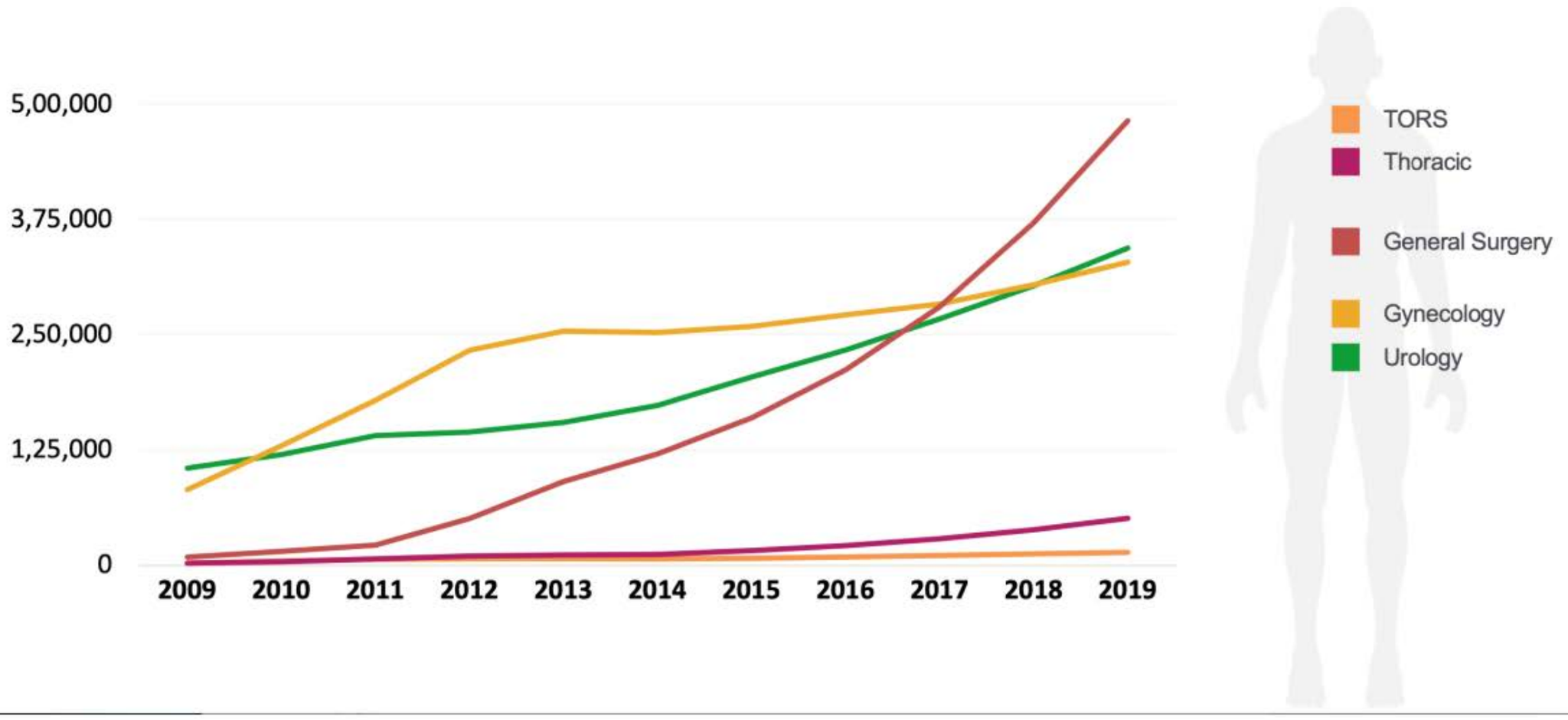
Superior tissue approximation techniques with suturing and stapling significantly reduce post-operative complications of anastomotic disruption and leak. Suturing using the robotic platform due to the availability of seven degrees of movement of needle driver like a human hand has largely reduced the postoperative leak leading to reduced morbidity and mortality (10). Robotic staplers are proved to be more precise and have significantly better outcomes in robotic surgery than any other available laparoscopic/conventional staplers with intelligent technologies to assist in safer stapling (11).

With the addition of superior technologies like augmented reality, real-time warning, telesurgery and flexible systems are revolutionising the surgical world with the added advantage of reducing errors, and improving precision further, especially in cancer surgeries (12).

THE CONS:

Systematic reviews/meta-analyses comparing robotic surgery to conventional surgery have failed to show the superiority of robotic surgery for basic and simple procedures, thus questioning its true benefit (1). A robot, being a machine, is prone to breakdowns and malfunctions. FDA data on robotic surgery found that there were 14.4% adverse events with significant negative patient impacts, including injuries and device malfunctions. Performing a true robotic surgery where there is no requirement for an assist port or a second experienced surgeon, needs expensive hand instruments like energy devices, and staplers which is more concerning due to the high recurring cost of the instruments (13). There are studies which reported higher contamination of robotic instruments with proteins and residue as compared with other instruments due to the use of complex pulleys and wires. This necessitates the establishment of new standards of cleaning and novel classification (14).

Several procedure-wise cost-effectiveness studies also have shown that open/ laparoscopic surgeries are much more cost-effective than robotic surgeries. The robot platform currently costs between 5-15 crores as an initial investment depending on the speciality with a yearly maintenance cost of 25-75 lakhs. Besides the cost of the machine, the expenditure incurred in setting up a facility dedicated to robotic surgery is also huge. The spending on robotics in turn will increase the load of health sector expenditure (15). The threat of irrational demand by the patient due to the increased popularity of Robotic Surgery is mounting undue pressure upon the surgeon and the hospitals. This is especially true in India where the literacy rates and awareness about health are poor and belief systems are more prevalent. This pushes hospitals to buy robots for commercial publicity pushing surgeons to recruit patients for surgery (16).



THE WAY:

India being the world’s 3rd largest by purchasing power parity, and being the fastest growing economy, its healthcare market has jumped threefold this year. The rapidly expanding healthcare sector has resulted in the decentralization of institutions and is expected to bring in more hospitals offering robotic surgeries, resulting in a decline in the cost of the treatment (17).

The availability of excellent surgeons, coupled with low cost, and short waiting time, makes India a sought-after destination for patients all over the world. Currently, medical tourism in India is a 2 billion USD industry. The availability of robotic platforms would attract more foreign patients who may be requiring robotic procedures(18). With 40 of the 110 total robotic installations happening in the last 3 years, and new affordable and multispeciality units getting launched, the numbers are only going to grow exponentially. Taking various facts, logistics, and economic aspects, the spread of robotic surgery in India is possible with its judicious use and standardized reporting of outcomes (1).

Mobile Teladoc Health Robots at Meenakshi Mission Hospital

In India, despite several advancements made in the medical field, the benefits are still available to the privileged who are residing mainly in urban areas. It is a known fact that 75 per cent of the qualified doctors practice in urban centres, whereas the vast majority of India's population lives in rural areas. To address the issue, Meenakshi Mission Hospital and Research Centre in Madurai extend its support by establishing Telecare centres in remote rural areas. So far it is established 15 centres in and around southern Tamilnadu with the support of public undertaking sectors & corporate.

To bridge the health and technology intensively, MMHRC went for the next phase and establish India's first telehealth robots.

First of its kind in India, Meenakshi Mission Hospital and Research Centre have deployed 16 mobile Teladoc (USA) health robots. The primary objective of the Teladoc robot is to argue the diagnostic abilities and efficiency of health care delivery of patients irrespective of their physical location.

Teladoc telemedicine robots have the capabilities to carry out the basic clinical examination (such as checking blood pressure and heart rate) on their own, as instructed by the doctors. As 10T devices, they can be used to control other advanced diagnostic equipment such as CT and MRI scan machines. These robots can collect and process data from other diagnostic equipment and present it to doctors to help them make precise clinical questions with the help of Teladoc, doctors from different disciplines, from all parts of the world can come together to treat and monitor patients all the time.

At Meenakshi Mission, these robots have empowered our doctors to treat patients anywhere and anytime. Our ambulances will also be equipped with Teladoc robots. By doing this, the patient can immediately get in touch with the emergency and ICU specialists along with the other specialists of all departments. This means that specialists like neurologists and cardiologists can begin vital treatment even as critically all patients are on their way to the hospital.

We are all set to explore ways to use this novel technology to provide an expert diagnosis from Madurai to patients in other parts of the country and put world-class health care within every one reach.

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Patients For Patient Safety Initiative, India

Patients For Patient Safety, India (P4PSI) is a CAHO initiative to address the key input gap in identifying preventable harm incidents – patients.

Patients (including their families) have great insights from their symptoms, responses and outcomes which are valuable, but mostly not captured. Hence, the objective is to partner and engage with patients to get their perspectives, and experiences and have them participate more actively in the care process to ensure better outcomes.

This partnership between patients, healthcare providers, the healthcare ecosystem and policymakers would help to focus on preventable patient safety incidents and improve healthcare for everyone making a step toward's India's Universal Healthcare Goals.

P4PSI was inaugurated on the 3rd of April, 2022 at Kochi, Kerala.

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