AUSTRALIA INDIA INSTITUTE

VIRTUAL HEALTHCARE:
TOWARDS AN INCLUSIVE FUTURE OF HEALTHCARE

Summary report of the research collaboration workshop held on 13 September 2022 prepared by the Australia India Institute

OUR PARTNERS

Thanks to our partners

CONTENTS

FOREWORD

Inclusive digital healthcare would once have been thought of as out of reach in both India and Australia. Today, thanks to the research and commitment of a dedicated few it is becoming a reality. This is an example of how the bilateral relationship between India and Australia goes beyond the expansion of pure economics, to the important social element of ensuring no one is left behind. But it also highlights the economic benefits of investing in people with disability in both countries, and how transformative that can be. The opportunities between our two nations in the field of digital healthcare are growing and I am excited to be leading an Institute at the fore of this work.

Making the most of this opportunity means bringing together Indian and Australian experts, academics, young people, businesses, and government with the goal to make the most of our combined strengths. As we bring the best and brightest from our nations together and build our research collaboration, the healthcare and disability sector, through the use of technology, really standout as an area of mutual benefit where both Australia and India can work together to improve the lives of people with disability for the benefit of our societies as a whole.

India is known to offer some of the world's best private healthcare, alongside being a world leader in generic pharmaceutical production and with now over 100 unicorns and many more start-ups. Similarly, Australia's National Disability Insurance Scheme (NDIS) is a pioneering world's first insurance program, marking a historic moment for Australian society. Of course, there are many challenges that underly the healthcare sector in both of our nations. Chief among them is equity of access. And with the COVID pandemic further exacerbating the challenges faced by people with disabilities, the progress made in virtual health care emerges as an opportunity to increase inclusion.

Thank you to the VirtuCare partners and sponsors for this insightful report, including the Australian Government Department of Education. Particular thanks to Professor Nathan Grills whose passion and insight of virtual healthcare is unparalleled. Through the work outlined in this important report, I look forward to the VirtueCare project growing into its next phase as we work to ensure that these innovative solutions can truly create inclusive societies for all and where Australia and India, though research collaboration, can really have a positive impact on the lives of people with disability.

The Hon. Lisa Singh,
Chief Executive Officer, Australia India Institute

Virtual health care is no longer a pipedream. It is a reality! But we must prioritise work and research to ensure that we leave no one behind. To this end the VirtuCare project draws in some key players in the field of inclusive digital health care to maximise the potential of virtual care to benefit those with disability in India.

Key collaborators from India include the Indian Institute of Public Health Hyderabad (The Public Health Foundation of India), E-Sanjeevani Telemedicine Service (Centre for Development of Advanced Computing Mohali, India), Emmanuel Hospital Association and the George Institute. This team is capably supported by the Australia India Council, Infosys, University of Melbourne, University of Adelaide and Monash University.

However, to understand how to make virtual health care more accessible, we need to consult more widely. This report summaries the initial steps and findings when we more than 150 experts came together for a National Symposium on Disability Inclusion in Virtual Care, under the future of healthcare workshop supported by the Australian Government Department of Education. The report on this event outlines existing approaches to promoting inclusion and outlines conceptual ways forward.

More importantly the report is a means to an end as it informs the next stages of the project. We will draw on the initial finding, and continue to include the experts that we engaged, to progress 3 areas of work:

- Literature review to explore what approaches have been used to make virtual healthcare more disability accessible. This report will be released via mainstream channels and no submitted for peer review publication.

- Evaluations of experiences of people with disability and key stakeholders will be undertaken to better understand what could be done to better make virtual healthcare more accessible. Key stakeholders include Universities, Health colleges, NGOs, tech partners, Infosys and other key informants.

- Codesign digital interventions to support Community Based Inclusive Development Workers (CBID workers). These workers are trained through a program designed by the Government of India and Uni of Melbourne and require ongoing support to undertake community-based disability care. A Codesign process will inform the design of interventions such as an online community of practise and App based supports.

I want to thank all the experts who given their important inputs. I also want to thank the VirtuCare partners and funders who make this important project possible. Together we can ensure Virtual Healthcare improves the health and wellbeing of people with disability in India.

Professor Nathan Grills,
VirtuCare Project Lead,
Melbourne School of Population and Global Health,
University of Melbourne

EXECUTIVE SUMMARY

On 13 September 2022, the Australia India Institute, with the support of the Australian Department of Education and the University of Melbourne, partnered with the VirtuCare Network and the Indian Institute of Public Health to convene and deliver a hybrid workshop on the future of inclusive digital health in Australia and India. Held in Hyderabad, the workshop saw expert stakeholders attend and present on the role of inclusive digital healthcare and technology in both countries. These presentations focused on how digital healthcare can consider and meet the challenges faced by people with disabilities.

During the workshop, Indian and Australian presenters and panellists highlighted the opportunities and challenges within the inclusive digital healthcare and technology sector. Critical opportunities in virtual healthcare tackle the ability to create more effective, efficient, inclusive, affordable, and accessible healthcare, especially for people with disabilities. However, making the most of these opportunities means addressing challenges that persist in the digital healthcare sectors in Australia and India. These challenges include a lack of access to quality and organised datasets, the lack of connectivity to the internet and accessible health resources for people with disabilities as well as people living in rural and remote communities, the challenge of maintaining user privacy, and the ongoing exclusion of people with disabilities from decision-making processes.

Maximising the opportunities and confronting the challenges to create inclusive digital healthcare can start with a collaborative and coordinated approach. Through this workshop, priority areas for bilateral research collaboration between Australian and Indian researchers, experts, and professionals were identified. These priority areas strive to make the most of the opportunities and meet the challenges of creating a more inclusive future through digital healthcare.

PRIORITY AREAS FOR BILATERAL RESEARCH COLLABORATION

- Formulate inclusive guidelines for private and public provision of virtual healthcare, which enable people with disabilities to have access to digital healthcare interventions.

- Enhance the applicability of current telehealth institutions to the needs of people with disabilities and other marginalised groups.

- Understand perceptions of digital healthcare interventions by people with disabilities (and carers of people with disabilities) and community-based practitioners.

- Evaluate the lessons from the usage of telehealth and digital healthcare solutions that were utilised during COVID-19.

- Convene multidisciplinary teams involving partners in both India and Australia.

- Conduct rigorous testing and prototyping of digital healthcare solutions.

- Facilitate and enable co-design principles to ensure digital healthcare initiatives are inclusive and meet the needs of people with disabilities in Australian and Indian contexts.

- Develop best practices in digital health care services for people with limited access to technology, internet, hardware, and IT literacy.

- Overcome weaknesses in healthcare systems data production and generating 'better' data, structured data, disaggregated data, secure data, and inclusive data.

- Design effective systems of evaluation for digital health care interventions.

- Build networks and knowledge-sharing systems to facilitate collaboration in India and Australia across varied stakeholders.

INTRODUCTION

During the fifth Australia-India Education Council (AEIC) meeting in 2019, both Indian and Australian education ministers agreed to deepen research collaboration on areas of mutual benefit. The challenges of the COVID-19 pandemic have necessarily accelerated the importance of digital healthcare and technology globally. The future of healthcare and how digital health and technology can lead to a more inclusive and accessible healthcare system, particularly for people with disabilities, emerged as an agreed upon theme for increased bilateral research collaboration between the Indian and Australian governments.

With support from the Australia India Council, the Australian Department of Education, and the University of Melbourne, the Australia India Institute partnered with the VirtuCare Network and the Indian Institute of Public Health in Hyderabad, India, to convene and deliver a hybrid workshop on the future of inclusive digital health in Australia and India. The workshop was held to exchange knowledge and experiences in inclusive digital health and technology and identify the potential for further research and technical collaboration between Australian and Indian researchers and experts.

The workshop brought together Australian and Indian health researchers, practitioners and professionals from universities, research agencies and technology companies for networking and collaboration in inclusive digital health and technology. Participants sought to identify themes in inclusive digital health and technology with significant potential for research and technical collaboration between Australia and India. The workshop also emphasised promotion of research and collaboration alongside people with disabilities focusing on the intersections of co-design and inclusive digital health.

The workshop saw expert speakers and panellists discuss virtual healthcare and digital technology solutions as a tool for improving health, inclusivity, and accessibility outcomes, particularly for people with disabilities in Australia and India. Speakers and panellists presented case studies, co-design methods, and research to demonstrate the opportunities and challenges facing inclusive digital healthcare and technology initiatives. These opportunities and challenges give guidance and scope to the priority areas for bilateral research collaboration that exist in the inclusive digital health and technology sector.

WORKSHOP PARTNERS

The workshop was funded by the Australian Government Department of Education and jointly hosted by the **Australia-India Institute**, the **VirtuCare** network supported by the **Australia India Council**, and the **Indian Institute of Public Health, Hyderabad (The Public Health Foundation of India).** The VirtuCare network is supported by the Australia India Council and includes **Infosys**, **E-Sanjeevani (Indian Ministry of Health and Family Welfare)**, **The University of Melbourne**, **University of Adelaide**, **Public Health Foundation of India**, **Emmanuel Hospital Association**, **The George India**, **Monash University**, **CBM Trust India** and **Enablement.**

FORMAT AND NETWORKING

The four-hour workshop included eight presentations and two panel sessions. A networking lunch was hosted for participants at the end of the workshop in Hyderabad. An online networking session was hosted for virtual participants.

A second 3.5-hour session focused on the VirtuCare initiative, was held after lunch and was also live-streamed to the virtual audience.

SPEAKERS

Professor Michael Wesley
Deputy Vice-Chancellor,
University of Melbourne

Professor B.R. Shamanna
School of Medical Sciences,
University of Hyderabad, India

Professor Mike McGuckin
Deputy Dean,
Faculty of Medicine, Dentistry and Health Sciences,
University of Melbourne, Australia

Professor GVS Murthy
Director, Indian Institute of Public Health,
Hyderabad, and Vice-President (South),
Public Health Foundation of India, India

Dr Sanjay Sood
Project Director of e-Sanjeevani and Associate Director
and Head (Health Informatics), Centre for Development
of Advanced Computing (C-DAC) Mohali, India

Dr Rajasekhar Vijjeswarapu
Deputy Coordinator, Cell for the Disabled,
English and Foreign Languages University,
Hyderabad, India

Professor Nathan Grills
VirtuCare Project Lead,
Melbourne School of Population and Global Health,
University of Melbourne, Australia

Mr, Manjunatha Gurulingaiah Kukkuru
Associate Vice President and Principal Research Analyst,
Infosys Centre for Emerging Technology Solutions,
Bengaluru, India

Dr Deepthi N Shanbhag
Department of Community Medicine,
St John's National Academy of Health Science,
Bengaluru, India

Dr Anthony Vipin Das
Consultant Ophthalmologist
LV Prasad Eye Institute, Bengaluru, India

Mr. Arun Zechariah
Director of Education Technology Unit,
CMC Vellore, India

Dr Sara Varughese
Managing Trustee, CBM India, Delhi,
Bengaluru, India

Dr Emma George
Senior Lecturer, School of Allied Health Science and
Practice, Faculty of Health and Medical Sciences,
University of Adelaide, Australia

Dr Shrutika Murthy
Research Assistant,
The George Institute for Global Health,
New Delhi, India

Dr Delvin Varughese
Lecturer, Department of Human Centred Learning,
Action Lab, Monash University, Melbourne, Australia

Due to technical difficulties, part of the panel session on
the role of community-based inclusive development was
unable to be recorded and included in this report.

Workshop Video and presentations
available at aii.unimelb.edu.au/virtual-
healthcare-towards-an-inclusive-future/

SUMMARY OF PRESENTATIONS

PRESENTATION 1: THE DIGITAL FUTURE OF HEALTHCARE: REFLECTIONS FROM THE UNIVERSITY OF MELBOURNE

SPEAKER:

Professor Mike McGuckin
Deputy Dean, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Australia
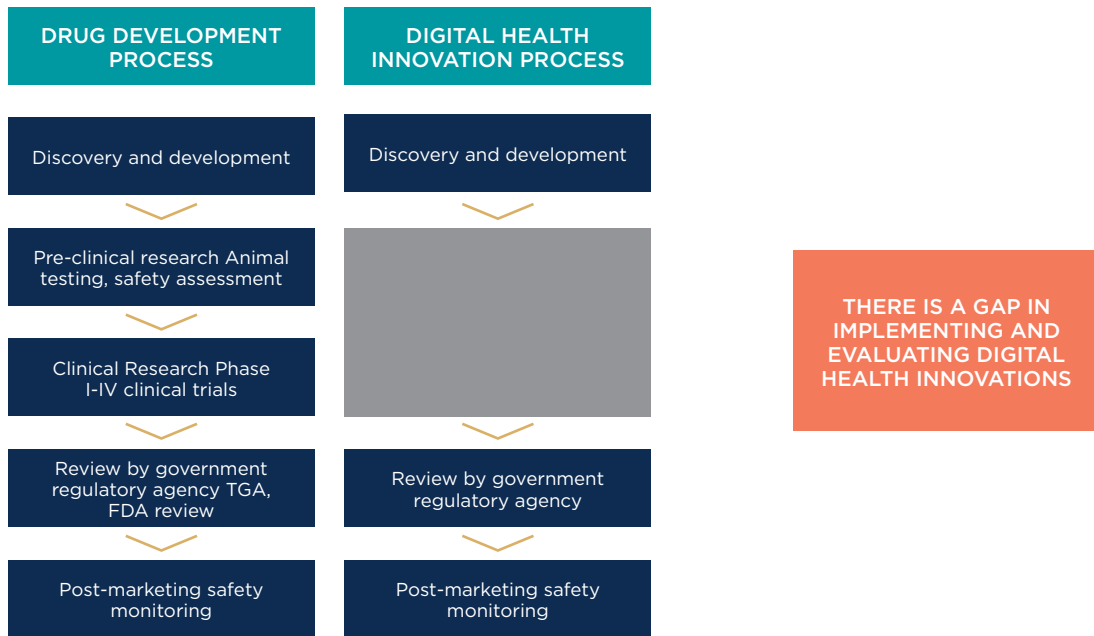
SUMMARY:

Professor McGuckin detailed the contributions of institutions such as the Centre for Digital Transformation of Health at the University of Melbourne for addressing the challenges that emerge in developing, testing, implementing, and funding digital healthcare solutions (DHCS). DHCS are often poorly developed and not subjected to rigorous testing, leading to failure and ineffective implementation. DHCS implementation can be difficult due to data sharing complexities in healthcare systems, privacy issues underlying digital interventions, clinician uptake issues, and difficulties in ensuring community awareness of DHCS and programs.

Professor McGuckin discussed three key aspects of DCHS implementation – multidisciplinary engagement, cross sectoral collaboration, and public value. Multidisciplinary teams are essential for effective DHC interventions through the stages of research and development to implementation. Second, it is necessary to work across conventional sectors. As an example, MOST (Moderated Online Social Therapy) is an online clinical support and evidence-based therapy tool which has been rolled out by state governments across eastern Australia. The development and rollout required the team to expand from a handful to over 100 researchers. An example of public value and commercialisation of DHCS is Seer Medical, which provides at-home monitoring of epilepsy patients. This DHC solution has saved the hospital system approximately AUD$50 million and reduced waiting times in hospitals for epilepsy assessment from 6 -18 months to 6-8 weeks.

Institutions such as the Centre for Digital Transformation of Health aim to address the challenges and take advantage of the opportunities DHCS can yield. This is achieved through providing technical support in development phases, organising appropriate multidisciplinary teams, providing clinical trial design support to ensure rigorous testing, and navigating pathways to implementation through engaging potential partners and funding bodies.

KEY TAKEAWAYS:

- Digital healthcare solutions (DHCS) in Australia and internationally need rigorous testing procedures to ensure effective and efficient delivery.

- DHCS require multidisciplinary and cross-sectoral collaboration for effectiveness through the development, testing, implementation, and management phases.

- The Centre for Digital Transformation of Health at the University of Melbourne seeks to improve the effectiveness of DHC by providing "hands on skills in clinical informatics and digital health" and equipping healthcare professionals to be digital health leaders.

DRUG DEVELOPMENT PROCESS	DIGITAL HEALTH INNOVATION PROCESS	
Discovery and development	Discovery and development	
Pre-clinical research Animal testing, safety assessment		THERE IS A GAP IN IMPLEMENTING AND EVALUATING DIGITAL HEALTH INNOVATIONS
Clinical Research Phase I-IV clinical trials		
Review by government regulatory agency TGA, FDA review	Review by government regulatory agency	
Post-marketing safety monitoring	Post-marketing safety monitoring	

WHAT CAN INSTITUTIONS DO TO FACILITATE SUCCESSFUL DIGITAL HEALTH TECHNOLOGIES?

- Provide high quality technical support in the development phase/help organize appropriate multidisciplinary teams

- Provide support for appropriate rigorous trial design including health economic evaluation

- Provide support to navigate implementation pathway – health system/insurer support, commercialization/industry partnership if appropriate, consumer engagement

SUMMARY OF PRESENTATIONS

PRESENTATION 2: EXPERIENCES OF INCLUSION IN DIGITAL HEALTH DURING THE PANDEMIC

SPEAKER:

Professor GVS Murthy
Director, Indian Institute of Public Health
(Public Health Foundation of India), Hyderabad, India

SUMMARY:

Professor Murthy outlined the great potential of digital technologies for the inclusion of people with disabilities. He detailed how the COVID-19 epidemic in India exacerbated the difficulties face by people with disabilities. A situation analysis of people with disabilities across 14 states in India during and immediately after the first lockdown revealed 82% of respondents reported moderate to severe stress levels, and 58% reported difficulties in accessing routine health services. Other studies also highlighted the difficulties people with vision and hearing impairment faced in obtaining accessible and accurate COVID-19 information. This analysis highlighted the potential of inclusive digital health interventions in addressing these challenges through virtual programs such as teleconsultation/rehabilitation, online mental health counselling and presenting information in accessible formats.

Professor Murthy presented several examples of digital interventions that the Indian Institute of Public Health, Hyderabad, India, has performed. One includes Diabetic retinopathy screening of children and newborns at primary health centres using teleophthalmology. Nurses in special newborn care units use high-resolution cameras which capture images of the eye to be sent to a central base hospital. Here they are examined, and those in need of laser eye treatment can be provided so immediately, avoiding retinopathy of prematurity. Other examples included smartphone-enabled care for stroke and ophthalmology. Many of the mobile-based interventions, however, also presented potential barriers to inclusion because of their built-in assumptions regarding literacy, vision, hearing capabilities and access to internet and support services.

Professor Murthy noted that the synergistic balance of digital healthcare opportunities with in-person healthcare can lead to a healthcare system with far better outcomes, inclusion, and accessibility for people with disabilities. The slow trajectory of digital health care in India and lack of disaggregated stratified analysis of disability need to be overcome to ensure all people with disability are included in DHC interventions. He identified ten broad elements of "where (and how) digital health can actually make a difference in relation to inclusion for persons with disability." These included:

- Using data to Identify populations in need
- Patient monitoring
- Patient screening
- Patient surveillance
- Consultation treatment advice
- Patient rehabilitation
- Health system capacity building
- Counselling services
- Follow-up patient advice
- Information, education and communication

KEY TAKEAWAYS:

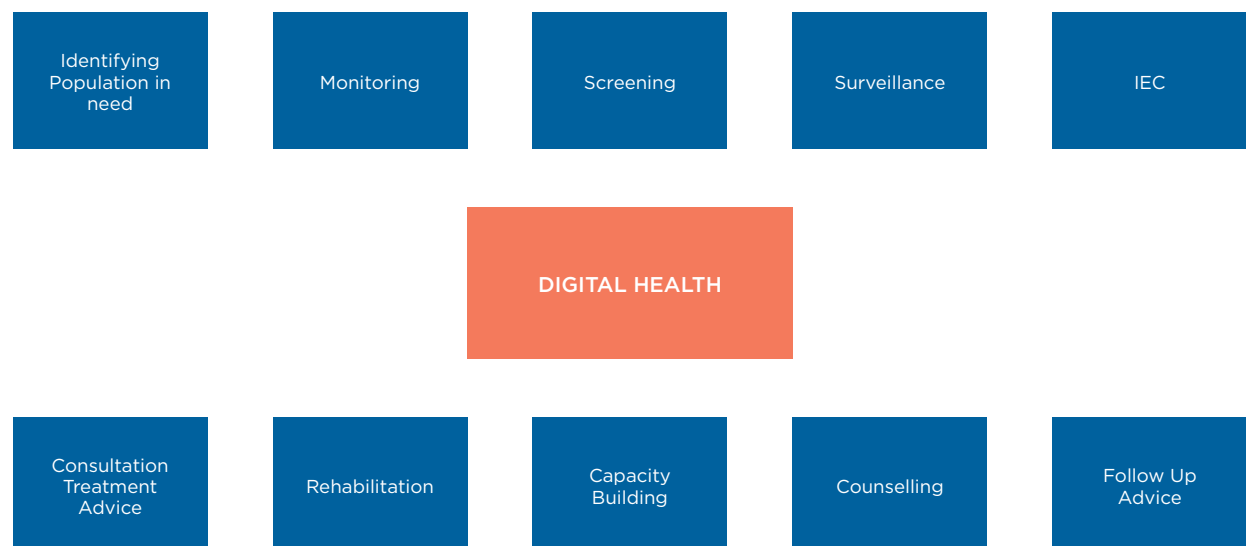- Synergistic balance of digital technology-enabled and in-person healthcare can potentially deliver a more comprehensive and inclusive healthcare system for people with disabilities in both India and Australia.

- Disaggregated stratified data by disability type is necessary for ensuring that digital health and technology interventions are inclusive and better equipped for effective coverage of people with disabilities.

IMPACT OF COVID ON PERSONS OF DISABILITY

- 403 persons with disability included from 14 States

- Data was collected from all in Round 1 and on 25% sub sample 6 weeks after lockdown lifted

- 82% reported moderate to severe stress levels

- 59% of those needing rehabilitation services couldn't access

- Physiotherapy services were maximally impacted

- 58% reported difficulty in accessing routine health services

Tetali S et al. IJERPH 2022; 19: 11373

HOW DIGITAL HEALTH HELPS

Identifying Population in need	Monitoring	Screening	Surveillance	IEC

DIGITAL HEALTH

Consultation Treatment Advice	Rehabilitation	Capacity Building	Counselling	Follow Up Advice

SUMMARY OF PRESENTATIONS

PRESENTATION 3: E-SANJEEVANI: OPPORTUNITIES TO PROMOTE INCLUSIVE HEALTHCARE

SPEAKERS:

Dr Sanjay Sood
Project Director of e- Sanjeevani and Associate Director and Head (Health Informatics), Centre for Development of Advanced Computing (C-DAC) Mohali, India

Dr Rajasekhar Vijjeswarapu
Deputy Coordinator, Cell for the Disabled, English and Foreign Languages University, Hyderabad, India

SUMMARY:

Dr Sood introduced the E-Sanjeevani platform, which initially began as a digital health service for doctor-to-doctor telemedicine consultation in India (E-Sanjeevani AB-HWC). Owing to the COVID-19 pandemic, the Indian Ministry of Health and Family Welfare requested E-Sanjeevani be transformed into a patient-to-doctor connectivity platform. This saw E-Sanjeevani transformed into a national citizen-centric platform that attempted to mirror traditional outpatient departments (OPDs). Rolled out in April 2020, E-SanjeevaniOPD was adopted by most states across India, and by the end of 2020, 800 online OPDs had been established, offering general and specialised healthcare to citizens. E-Sanjeevani in both its variants (AB-HWC and OPD) has now resulted in participants saving about INR 2000 (AUD$36) per appointment, and average journey of 18 km to an outpatient clinic.

E-Sanjeevani utilises a hub and spoke model for providing telehealth consultations, in which 102,000 rural centres or spokes are connected to 12,000 hubs where healthcare providers are situated. Additionally, E-Sanjeevani works with community health officers who are equipped with mobile tablets to extend health services to people in rural and remote areas with limited IT access or literacy. This model has been very successful, with an explosion in uptake well beyond the pandemic. Around 85% of the 250,000 daily consultations on the E-Sanjeevani platform continue to occur in rural areas.

Coordination and collaboration between healthcare professionals, patients and stakeholders has been a key focus of the E-Sanjeevani initiative. This is maintained through consistently training community health officers, practitioners, and state officers regarding updates and usage of new E-Sanjeevani services. Clear feedback pathways between hubs and spokes and institutions overseeing them have allowed for swift communication of the challenges or difficulties faced by users and healthcare providers. Fieldwork has been critical for assessing the impact of E-Sanjeevani on communities in rural and isolated communities. This has enabled the E-Sanjeevani platform developers to focus on improving internet services and access to specialist healthcare.

Dr Sood noted that the 2.0 rollout of E-Sanjeevani, with support from stakeholders such as the Australia India Council funded VirtuCare network and the WHO, aims to be more inclusive of people with disability. It will bring the two variants of E-Sanjeevani (OPD and AB-HWC) onto a single platform. He pointed out the need to see community health workers as stakeholders and collaborators with significant expertise in working with and facilitating accessibility for people with disabilities.

Dr Rajasekhar Vijjeswarapu, a visually impaired university lecturer, followed on by reflecting on the importance of digital technology and teleconsultation platforms such as E-Sanjeevani. He stressed the importance of conceptualising how to be inclusive of people with disabilities at the outset of developing digital healthcare solutions, not only as a moral imperative but also as a cost-effective measure.

KEY TAKEAWAYS:

- DHCS such as E-Sanjeevani have led to greater access to healthcare services for people in rural and isolated communities in India and demonstrate the potential scale at which digital healthcare can operate.

- Collaboration between Australian and Indian experts and networks such as VirtuCare can create a more inclusive E-Sanjeevani in its 2.0 rollout for people with disabilities and in rural and remote areas.

TWO TELECONSULTATION MODELS

eSanjeevaniOPD

Integrated Model Adopted by Uttar Pradesh
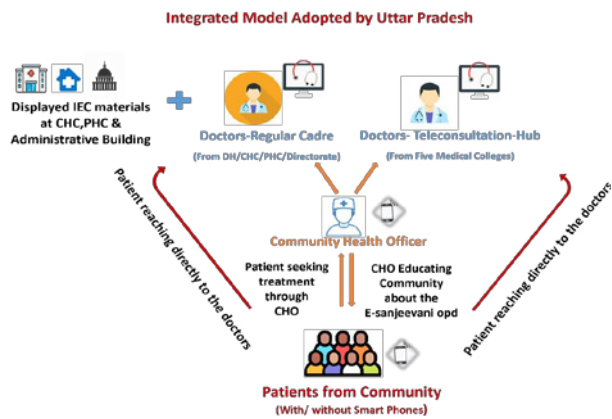
- Patient can download the application and directly avail consultation.

- Alternatively, the CHO facilitates conduction of teleconsultation services for the patient and at the same time educates community for the use of e- sanjeevaniopd application

eSanjeevaniAB-HWC
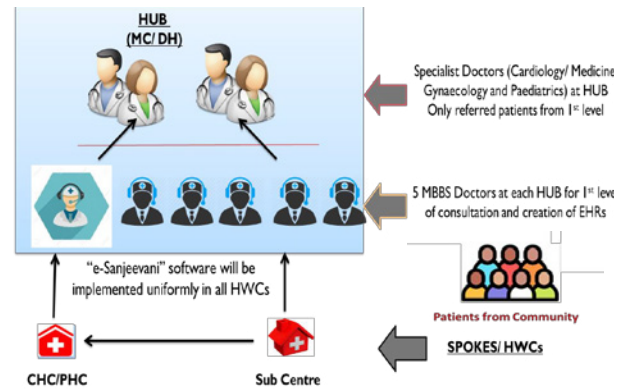
- In this model community can only access teleconsultation services with the help of CHO/MO at Spoke facility

- This model provides linkages between primary care facilities to secondary and tertiary care facilities

- Only browser based application for hub and spoke both

SUMMARY OF PRESENTATIONS

PRESENTATION 4: INFOSYS: OPPORTUNITIES IN DIGITAL HEALTHCARE

SPEAKER:

Mr Manjunatha Gurulingaiah Kukkuru,
Assoc VP & Principal Research Analyst, Infosys, Bengaluru, India

SUMMARY:

Infosys is one of India's largest global digital services and IT consulting companies which is developing innovative and emerging technology solutions in digital healthcare. Mr Kukkuru presented the emerging trends in digital healthcare and outlined the company's involvement in some current digital healthcare programs. He presented the opportunities represented by these technological interventions and highlighted the challenges such as privacy, accessibility, and poor data quality which can impede DHC delivery.

Infosys sees five emerging trends in the digital healthcare and technology sector, each with its own set of opportunities, challenges, and solutions. These include: a renewed focus on value-based care, new consumer experiences, digital front door or primary care access, digitisation/automation, and telehealth. Mr Kukkuru provided examples of how digital health care interventions can potentially combine broad trend parameters, for example, by providing more affordable care solutions (value-based care), real time monitoring for patients in their residences (new customer experiences) and using AI for virtual and diagnostic assistance (digitisation and primary care access).

Mr Kukkuru offered examples of interventions that involve both high and low levels of technological access and complexity. For example, utilising high levels of technology access may involve using 5G network capabilities for haptic feedback, HD image streaming and high throughput communication as tools for remote patient monitoring and care solutions. This contrasts with low level technological innovation that may be better for individuals in rural and remote areas or with patients who lack technological literacy, where the use of television remotes as a tool to assist digital healthcare interactions can be utilised.

Other technological innovations include the use of AI as a diagnostic and support tool for healthcare providers, or as a method of producing 'synthetic data' which can predict patient behaviours and conditions. Similarly, Mr Kukkuru detailed the opportunities virtual reality may have in training patients and users in the use of medical devices such as an insulin pen. This served the purpose of identifying the broad scope to which digital interventions can be used to better patient outcomes.

Access to quality data, user accessibility and user privacy are the key challenges facing innovative digital health and technology. For example, access to quality real-time data is key to healthcare interventions that utilise AI. The challenge is to develop integrated data stacks with the ability to communicate across multiple data sources, which can be presented in accessible formats to healthcare professionals and users. This feeds into challenges of both privacy and accessibility. The need to protect privacy is integral to the success of digital healthcare solutions. Similarly, accessibility and developing solutions that are equitable and inclusive is a challenge confronting both India and Australia.

KEY TAKEAWAYS:

• The wide scope of opportunities for digital healthcare interventions utilising emergent and innovative technologies can impact and disrupt current healthcare norms and patient outcomes.

• Ensuring access to quality data, maintaining user accessibility and inclusivity, and maintenance of user privacy is integral to building effective and ethical digital healthcare and technology interventions in both countries.

TECHNOLOGY AND INNOVATIONS

TELEMEDICINE
On Demand Access
Surgical/Medical Support
Mobile Health

X-REALITY
Immersive Learning
Digital Twins
Digital Transition

BLOCKCHAIN
Electronic Health Records
Data Provenance and
Interoperability Secure data on
Devices & Providers

CYBER SECURITY
Patient Data Security
Ransomware Defence
Secure Medical Devices

INTERNET OF MEDICAL THINGS
Remote Monitoring
Connected Devices
Assisted Living

REGTECH
Administrating compliance
Documenting CoP adherence
Billing/coverage verification processes

AI & AUTOMATION
Virtual Assistant
Diagnostic Support
Digital Supply Chain

DIGITAL COMMAND CENTER
Asset Management
Real-time Alerts
Resource Planning

5G
Realtime monitoring
Remote Procedures/Operations
Web of Connected things

SUMMARY OF PRESENTATIONS

PRESENTATION 5: CASE STUDY: REACHING PERSONS WITH DISABILITY IN RURAL KARNATAKA – PROJECT HOPE

SPEAKER:

Dr Deepthi N Shanbhag
Department of Community Medicine, St John's National Academy of Health Science, Karnataka, India

SUMMARY:

Dr Shanghag presented two virtual healthcare interventions developed by St John's Medical College, Bengaluru, Karnataka, India, E-Punarchethana and the Unit of Hope application (app). These were developed to address the problem of continuum in patient care due to difficulties with collecting accurate and uniform data and coordinating it between community and rural health care centres. A team at the Community Health and Training Centre (CHTC), 28km from St. John's Medical College, Bangalore, developed E-Punarchethana for digitising and standardising both clinic-based and community-based data. Community-based data would be collected by community health officers who would travel to rural areas around the CHTC with a tablet and survey households to gain better quality, disaggregated data on the demographics of the catchment area. This survey captured a population of 27,446. The synergised data collection software enable healthcare analysts to effectively extract data and make better decisions on both individual rehabilitation plans and at a service provision level.

The Unit of Hope is a multidisciplinary team offering a wide range of services, from medical treatment to counselling, and education for children with disabilities at St. John's Medical College. The need to continually connect and approach children with disabilities became urgent during the COVID-19 pandemic. The Unit of Hope app aimed to improve access to services for children with disabilities during the COVID-19 pandemic as well as develop standard guidelines for telerehabilitation for children with disabilities. The team identified 12 individual services and processes that needed to be included to launch the app.

These included patient consent, counselling services and speech, occupational and physical therapy. The application was developed through an iterative and consultative process between software developers and the Unit of Hope team.

The Unit of Hope app was launched in February 2021. It utilised three models of telerehabilitation to better improve access for children with disabilities. These involved giving beneficiaries/caregivers access to Unit of Hope application services directly, through a community health worker, or through medical personnel at health clinics. The Unit of Hope app helped facilitate 3927 interactions with children with disabilities and generate a set of guidelines that dictated the appropriate practices when using the application for telerehabilitation services for children with disabilities. The Unit of Hope applications continues to be available for download on Google and Apple stores.

KEY TAKEAWAYS:

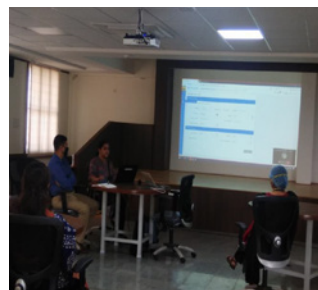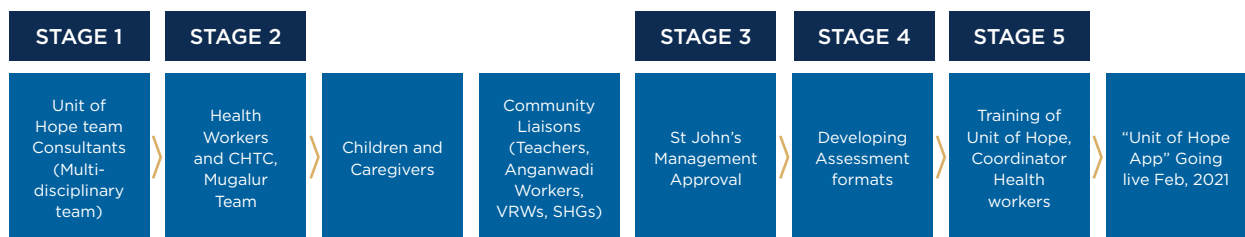- E-Punarchethana allowed for higher quality, disaggregated data on local demographics to be extracted, assisting healthcare professionals in generating better healthcare outcomes at an individual and community level.

- The Unit of Hope app placed importance on consultation, scope, procedure, and access as a tool to improve children with disabilities access to healthcare during the COVID-19 pandemic.

WHY E- PUNARCHETHANA?

- Lack of continuum of patient care

- Lack of care coordination between community and Rural Health Centre

- Lack of standardization of data

- Difficulties of using paper-storage problem

- Difficult to analyze data collected by grass root level health workers

- To aid in self appraisal and to be used as an effective monitoring tool

CONSULTATIVE MEETINGS WITH STAKE HOLDERS

STAGE 1	STAGE 2			STAGE 3	STAGE 4	STAGE 5	
Unit of Hope team Consultants (Multi-disciplinary team)	Health Workers and CHTC, Mugalur Team	Children and Caregivers	Community Liaisons (Teachers, Anganwadi Workers, VRWs, SHGs)	St John's Management Approval	Developing Assessment formats	Training of Unit of Hope, Coordinator Health workers	"Unit of Hope App" Going live Feb, 2021

SUMMARY OF PRESENTATIONS

PRESENTATION 6: THE EYESMART DATABASE: PORTABILITY OF DATA ACROSS THE HEALTH SYSTEM

SPEAKER:

Dr Anthony Vipin Das
Consultant Ophthalmologist,
LV Prasad Eye Institute, Bengaluru, India

SUMMARY:

The eyeSmart electronic medical record (EMR) database was conceived by the LV Prasad Eye Institute (LVPEI) 12 years ago. The LVPEI had 263 centres and 5.1 million patients across India and the key focus was portability of quality, structured data. Dr Vipin Das presented on the nature and journey of a data point in the LVPEI and how this data generates value. Data has value in clinical, media, financial and operational contexts, but there are several challenges that inhibit their value potential. These include the need for good quality accurate data, continuum data, the time dependent nature of data, and issues of standardisation of data.

The LVPEI sought to overcome these data challenges. It acquired data from rural community guardians in vision centres and made these data portable directly through its EMR system to the top of the LVPEI structure (the tertiary care centres and the Centre of Excellence in Hyderabad). In doing so, the LVPEI produced foundational work using its eyeSmart EMR database which details the presentation of ocular disorders within the Indian cohort. The work published from this data is called the AEye project. This data has been utilised in descriptive studies published on the nature of ocular disorders, including risk factors for Dry Eye Disease and the geographic distribution of Pterygium across India.

The AEye project pipeline dictates how LVPEI approaches its goal of producing foundational work on ocular disorders in India. This pipeline emphasises the importance of digitising data through and building fit-for-purpose, accessible EMRs. This is followed by developing and integrating machine learning algorithms that align with EMRs and extrapolating and presenting data that has a quantifiable usage and validation in a clinical setting.
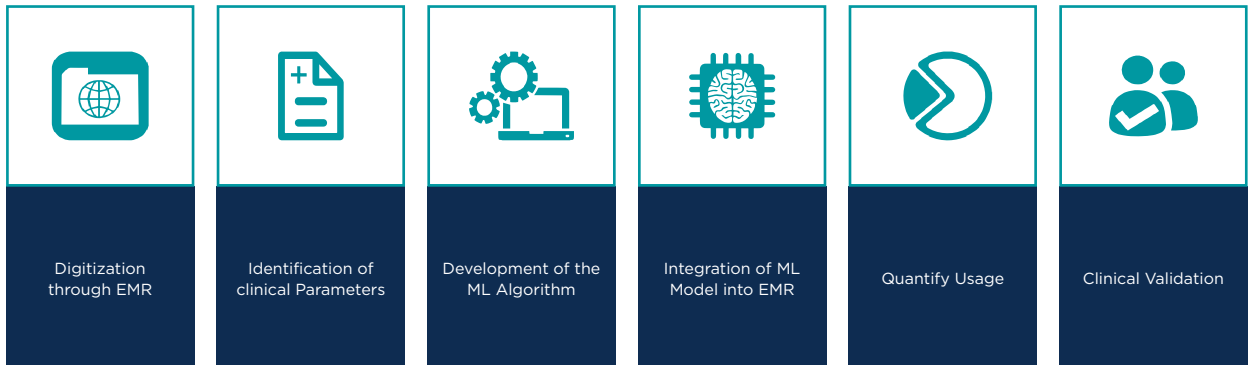
This ensures data captured by the LVPEI networks and centres has the most use and impact for practitioners and patients of the LVPEI. For example, it has had use in identifying priority populations and producing data-informed guidelines regarding demographics in need of reimbursement and assistance to access health insurance.

Dr Vipin Das also discussed the impact of COVID-19 on the work of LVPEI and the challenges it represented for understanding and identifying vulnerable populations being left out due to the COVID-19 pandemic. To allow their patients access to care during COVID-19, LVPEI developed two telehealth apps. ConnectCare, for urban populations, and Homecare, for those unable to visit hospitals or in rural areas around some of India. The LVPEI's dedicated Homecare team travelled to those in need of treatment and as well as transmitted data to the central eyeSmart EMR database. These data allowed LVPEI to conduct research and publish the findings as quickly as possible so that these insights could be expeditiously applied in the field during the pandemic. The findings revealed the effect of COVID-19 on patient presentation, teleconsultations, cataract surgeries, infectious keratitis, and strabismus. The learnings and applications would not have been possible without the heavily structured datasets the LVPEI has created through the eyeSmart EMR database and AEye Project systems.

KEY TAKEAWAYS:

- Quality, structured data contained in the eyeSmart EMR database, a key focus of the LVPEI, has provided a basis for primary research (covering diabetic retinopathy, endophthalmitis, infective keratitis, keratoplasty) as to the presentation of ocular diseases in India, particularly during the COVID-19 pandemic.

- Machine learning algorithms used to analyse and present data need to have clinical validation that speaks to healthcare practitioners, or else "Why will a doctor basically use an insight that is being told by a machine as opposed to decades of experience."

THE AEYE PIPELINE

| Digitization through EMR | Identification of clinical Parameters | Development of the ML Algorithm | Integration of ML Model into EMR | Quantify Usage | Clinical Validation |

Verkicharla PK, Das AV. Technology and myopia. Community Eye Health. 2019;32(105):S9-S10.

SUMMARY OF PRESENTATIONS

PRESENTATION 7: LEARNINGS FROM COVID-19: NEW AND INCLUSIVE VIRTUAL HEALTH EDUCATION AT CMC VELLORE

SPEAKER:

Mr Arun Zechariah
Director of Education Technology Unit,
CMC Vellore, Vellore, India

SUMMARY:

Christian Medical College, Vellore, in Tamil Nadu, India, is a tertiary care that also provides healthcare education services. Using technology, the healthcare education institution at CMC Vellore was able to deliver five COVID-19 related training programs that were accessed by thousands of medical and non-medical personnel. Mr Zechariah described the learnings from their experience and how CMC Vellore's team used technology to create and implement training programs rapidly in response to challenges of COVID-19 and other barriers such as limited or poor availability of computers, internet access, and language accessibility.

Utilising a multidisciplinary team of academics, and software technicians, the team at CMC Vellore took advantage of industry standard learning software, cloud services, and open-source platforms to create training programs in response to the rapid need to upskill medical and non-medical personnel on COVID-19 specific procedures and information. Taking a blended learning approach that combined self-directed and virtual classes, the course included subtitled video content, discussion forums, short answer response, multiple choice, LMS platforms and built-in assessment capabilities to create programs that were informative and engaging.

Overcoming issues of computer and internet access, the training programs were adapted to a mobile app and were able to be downloaded onto a device and explored without access to the internet. The learning content was presented in multiple languages, including Hindi, Tamil, Marathi, and English, for maximum participant uptake, comfortability, and inclusion. Mr Zechariah also noted the importance placed on data collection as a means of addressing gaps in participants' knowledge.

Collection of data through the online learning software allowed for the identification of stages in the course where participant engagement dropped significantly and produced learnings on how to maximise participant learning outcomes and the geographic spread of course participants throughout India. Consultative practices with academics and medical professionals were repeatedly used to ensure translations, course contents and outcomes, and formatting was appropriate.

CMC Vellore's education unit also developed the UDHAVI COVID helpline during wave two of COVID-19 in India to assist the community in and around Vellore. With an automated phone line that allowed users to choose their preferred language between Tamil and English, users were connected to either a medical professional or social worker. This helpline had a significant impact on the community, allowing the community to request medical care, food, and counselling without the need for a smartphone.

KEY TAKEAWAYS:

- Digital technology powered the education and upskilling necessary to tackle the consequences of the COVID-19 pandemic.

- It demonstrated the opportunities of online education technology in building capacity for medical and non-medical personnel.

- The range of innovative solutions for creating accessible digital education tools demonstrates the scope of opportunity digital technology can have in driving inclusive health education.

ONLINE TRAINING PROGRAMMES & HELPLINE SUPPORT DURING COVID -19

COVID-19 PREPAREDNESS – CRITICAL CARE COURSE	COVID-19 INTEGRATED SHORT COURSE	COVID SURAKSHA COURSE
THE CLINICAL MANAGEMENT OF COVID-19 – A SKILL UPGRADATION MODULE	NON-INVASIVE VENTILATION (NIV) IN COVID CARE	UDHAVI – CMC HELPLINE SUPPORT

SUMMARY OF PRESENTATIONS

PRESENTATION 8: PANEL DISCUSSION: DIGITAL HEALTH IN THE FUTURE OF INCLUSIVE HEALTHCARE

MODERATOR:

Professor Nathan Grills
Melbourne School of Population and Global Health, University of Melbourne, Australia

PANELLISTS:

Professor Rajasekhar Vijjeswarapu
Deputy Coordinator, Cell for the Disabled, English and Foreign Languages University, Hyderabad, India

Professor GVS Murthy
Director, Indian Institute of Public Health, Hyderabad, and Vice-President (South), Public Health Foundation of India, India

Dr Sanjay Sood
Project Director of E-Sanjeevani and Associate Director and Head (Health Informatics), Centre for Development of Advanced Computing (C-DAC) Mohali, India

Professor Mike McGuckin
Deputy Dean, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Australia

Dr Sara Varughese
Managing Trustee of CBM (Formerly Christian Blind Mission), Delhi, India

SUMMARY:

Panellists explored opportunities for research collaboration between Australia and India in digital healthcare, alongside how to scale up and utilise the potential of digital healthcare solutions to create a more inclusive healthcare landscape. On opportunities for further research collaboration between Australia and India, panellists discussed the need for effective systems of evaluation of digital healthcare programs. This would allow for the identification and ensuring of standards of care for people with disabilities, alongside identifying processes that work and do not work in digital healthcare interventions. A focus on consulting with and applying the experiences of people with disabilities to policy and digital health was highlighted as a key research opportunity.

Multiple panellists identified the need for quality data as an opportunity for research collaboration between Australia and India. The need for coordinated accessible and standardised datasets was seen as critical to the success of existing and future digital healthcare solutions. Similarly, research that collected qualitative and quantitative data from people with disabilities was also discussed by panellists as an opportune area for research collaboration between Australia and India. Panellists also flagged the need for an increasingly collaborative approach between networks in Australia encompassing government, NGOs, academia, the private sector, people with disabilities and their representative organisations. This collaboration would see the strengths of both Australia and India's digital healthcare sector capitalised upon.

Sharing their perspective on meeting the challenges of scalability and realising the potential of DHCS, panellists noted the need to acknowledge and delineate their limitations especially for people with disabilities, to ensure inclusion and better health outcomes. Having a balanced approach utilising in-person and digital telerehabilitation solutions remains a priority for ensuring accessible and inclusive healthcare. Panellists saw this as an opportunity for research collaborations to develop frameworks that would assist with operationalising this balance. Private sector representatives flagged the need for more reliable revenue streams for feasible scaling up of digital healthcare interventions.

Finally, panellists identified two other opportunities for research collaboration in inclusive digital health between Australia and India. First, the need for primary care providers, particularly in India, to be further educated in assisting people with disabilities was identified as a space where digital solutions and collaboration between nations could prove useful. Secondly, India and Australia share the challenge of providing better standards of care to people living in rural and remote areas with limited connectivity and accessibility. Bilateral research should explore frameworks and methods to better reach those with accessibility limitations.

SUMMARY OF PRESENTATIONS

PRESENTATION 9: VIRTUCARE: CO-DESIGNING A SYSTEM FOR INCLUSIVE VIRTUAL HEALTHCARE AND REHABILITATION IN INDIA

SPEAKER:

Professor Nathan Grills
Melbourne School of Population and Global Health, University of Melbourne, Australia

SUMMARY:

The VirtuCare project, funded by the Australian Government through the Australia-India Council and led by the Nossal Institute for Global Health at the University of Melbourne, aims to capitalise on the growth in digital healthcare in the wake of the COVID-19 pandemic. Crossing national divides, VirtuCare works alongside partners and networks in both India and Australia to create more inclusive digital healthcare solutions for people with disabilities. Professor Grills' presentation detailed the purpose and strategy of the VirtuCare project. VirtuCare places importance on working with and valuing the experience of people with disability to co-design policy whilst also working with digital health care experts, users, and project leaders in the virtual health care space in India (E-Sanjeevani, LV Prasad Eye Institute, Infosys, Public Health Foundation of India) to create a more inclusive digital health landscape in India and Australia.

The VirtuCare project is built on the understanding that "technology has unprecedented potential to improve both equity and access" for those with disability. A literature review is currently underway, aiming to document and apply learnings from telehealth and rehabilitation usage during COVID-19. This knowledge base will be utilised alongside a process of co-design, prototyping and evaluation of inclusive virtual healthcare and disability services, involving in-depth collaboration with end-users, people with disabilities as well as community-based inclusive disability (CBID) workers, and industry partners to formulate the VirtuCare model and digital health tool.

VirtuCare utilises the twin-track approach to bring about change for people with disabilities. This involves adapting and informing policy advice to ensure developing and existing virtual health care programs are inclusive of those with disabilities. The second track involves developing disability-specific telerehabilitation services and platforms, virtually equipping CBID workers to deliver disability-specific, inclusive services. Professor Grills detailed the applicability and opportunities of this approach. For example, in maximising inclusive virtual healthcare, VirtuCare is working alongside E-Sanjeevani to ensure the inclusivity of their virtual healthcare interventions, which service 170,000 patients a day, and that "India's emergence as a technology powerhouse" is capitalised upon.

Opportunity is rife to improve community telerehabilitation and disability-specific support services. Together the Rehabilitation Council of India and the University of Melbourne aim to train and equip 1000 cadre CBID workers with models informed by co-design informed policy and models.

KEY TAKEAWAYS:

- Co-designing and centring the experience of people with disabilities, and those who support them, is central to the VirtuCare project and developing models and digital health tools which create a more inclusive digital health landscape.

- Taking lessons, collaborating, and forming networks across Australia and India, ensure knowledge and experience from both nations are capitalised upon to maximise inclusivity in virtual healthcare.
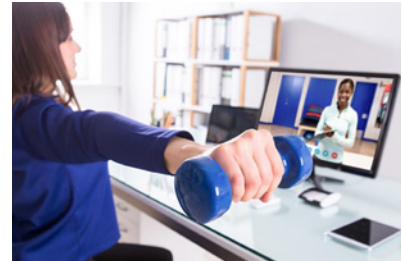
VIRTUCARE: CAPITALISING ON GROWTH IN DIGITAL HEALTH

Document and apply learnings from the usage of telehealth during the Covid 19 pandemic

Co-design, pilot and evaluate inclusive virtual healthcare and rehabilitation services

TWIN TRACK APPROACH:

Develop disability specific telerehabilitation support services and digital platforms to equip (virtually) Community Based Disability (CBID) workers to deliver disability services

Adapt/policy advice to ensure developing/existing virtual health programs include those with disability

VirtuCare designs future virtual platforms and policies to include the health and rehabilitation needs of people with disability

SUMMARY OF PRESENTATIONS

PRESENTATION 10: SUMMARY OR SCOPING REVIEW RESULTS

SPEAKERS:

Dr Emma George
Senior Lecturer, School of Allied Health Science and Practice, University of Adelaide, Australia

Dr Shrutika Murthy
Research Assistant, The George Institute for Global Health, New Delhi, India

SUMMARY:

"What is the experience and effectiveness of telehealth as a strategy for achieving health equity?" This broad question has guided the scoping review of academic literature undertaken by Dr George and Dr Murthy, and their counterparts in the VirtuCare project. The review identifies how telehealth has been best utilised to drive equity, accessibility, and inclusiveness in health systems in India and Australia for people with disabilities. Discussing the nature of their methodology, Dr Murthy described the convergence of four parameters as shaping the research and literature under examination. These parameters include post-2010 publications in English covering telehealth interventions through the lens of equity focused on people with disabilities. The scoping review is still in the initial stages, with further refinement needed to identify the literature to be considered.

Dr Murthy described the methodology and strategy of the review, explaining how each piece of literature was assessed according to the context in which interventions were implemented. This approach considered the mechanisms and outcomes of the intervention, the actors involved in the interventions, and the extent to which people with disabilities were consulted during the intervention. The review aims to generate insights on future research projects and interventions at the intersection of telehealth, disability, and equity.

Dr George provided details of three case studies considered in a pilot study for the scoping review and highlighted the key findings. For example, challenges faced during a telerehabilitation programme focusing on 305 individuals with low vision (42% of which were children) included internet connectivity, technology literacy and familiarity, scheduling difficulties and a lack of parental motivation to enrol in the telerehabilitation program. Similar issues were found in a study examining speech therapist telehealth interventions during the COVID-19 pandemic in India which had persistent scheduling difficulties and low levels of technological/health literacy amongst participants and carers. In addition, there were challenges such as visual fatigue, privacy, and specific speech therapy-related issues such as the position of the participant.

The concluding insight by Dr George addressed the intersection of equity and digital healthcare interventions. In the two examples given above, low-cost technological interventions such as Zoom and WhatsApp were used to help people with disabilities. She contrasted these examples against a case involving high-cost, complex telemedicine interventions for critical care which encompassed round-the-clock monitoring at the patient's home using cameras, computers, and monitoring systems for consultants and specialist observations. Although the high-cost telemedicine case highlights the success and potential of DHCS, it also raises questions about how this level of intervention could be performed equitably and take into consideration issues of privacy and accessibility.

KEY TAKEAWAYS:

- A scoping review of telehealth interventions is necessary for identifying patterns of equity and accessibility for people with disability and factors that undermine their effectiveness.

- "The literature can only tell us so much," and it is necessary to integrate the lived experience of people with disabilities into telerehabilitation interventions through co-design practices.

CONTEXT, INTERVENTIONS (MECHANISMS), OUTCOMES, ACTORS, DEFINITIONS

English, 2010 onward

Telehealth

ELIGIBLE STUDIES

Individuals with disability

Equity
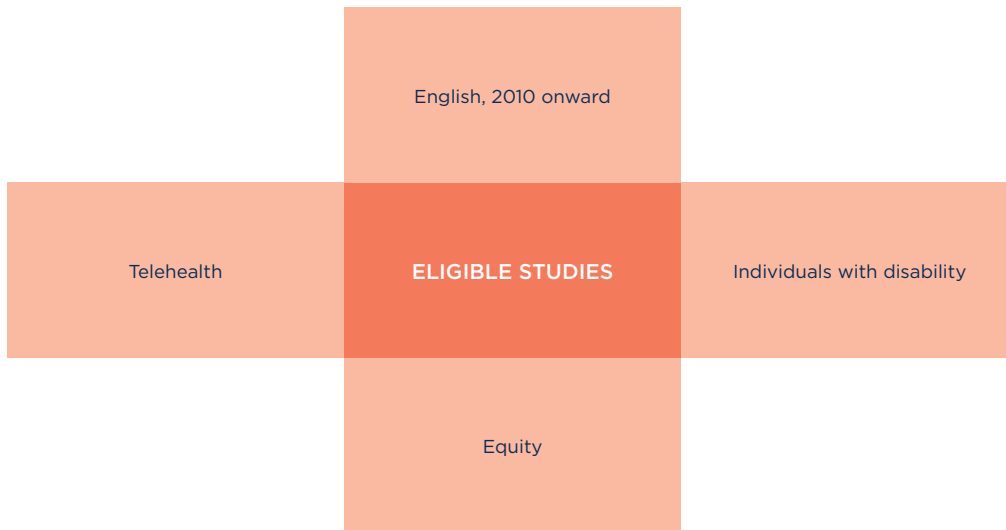
SUMMARY OF PRESENTATIONS

PRESENTATION 11: EXPLORING CO-DESIGN FOR INCLUSIVE DIGITAL HEALTH

SPEAKER:

Dr Delvin Varughese
Lecturer, Department of Human Centred Learning, Action Lab, Monash University, Melbourne, Australia

SUMMARY:

Representing Action Lab, a human-centred design and computing research group at Monash University. Dr Varghese gave insights into the theory and practices of co-design and participatory design and their utility in designing solutions for people with disability, particularly through digital technology. The discussion covered how the methodology of co-design can lead to solutions and possibilities which "are more than just an app" and work to operationalise the slogan 'nothing about us without us'.

Presenting some initial case studies, Mr Varghese introduced three initiatives that introduce potential intersections of digital technology and co-design. FeedFinder, WhatFutures, and Paroli are three programs that sought end-user engagement through digital technology. For example, WhatFutures, an initiative with the International Federation of Red Cross (IFRC), engaged 6000 young people through an accessible WhatsApp based game to have input on their 2030 youth engagement strategy.

Dr Varghese presented the Double Diamond as a foundational co-design theory and methodology. Involving two stages or 'diamonds' of divergence and convergence, the first diamond is the 'problem' phase focused on 'designing the right thing'. This phase involves processes such as literature review, stakeholder engagement, collection of end-user data from people with lived experience (such as people with disabilities), and sensemaking to generate a design brief that is informed by research and end-users. The second diamond is the 'solution' phase aimed to 'design the thing right'. This involves a process of ideation, prototyping and evaluation alongside end-user engagement to design solutions. Each aspect of divergence and convergence in the double diamond involves different extents to which end-users can be integrated into the policy design. This is important in considering the extent to which solutions have involved end-users.

Discussing the 'solution' phase and nature of project/

policy planning methodology, Dr Varghese highlighted how agile approaches allow for multiple iterations of solutions to be developed and prototyped. Agile approaches allow for increased focus on the barriers and problems identified and faced by end-users, alongside acknowledging the cumulative outcomes a policy can generate and the potential for many solutions to be utilised to address a particular problem.

Finally, addressing the dynamics of how policy practitioners frame design problems. Dr Varghese detailed how considerations can impact how a problem and policy are framed. For example, policy practitioners may consider technology and the potential resource constraints that can impact a solution. This may include whether a solution will utilise low-end, everyday technology or more high-end, bespoke technology. This consideration can also cover topics such as capability, collaboration, and identity and are important in thinking about what co-design solutions look like in practice.

KEY TAKEAWAYS:

- The Double Diamond demonstrates the opportunities for co-design with 'end-users' that exist across the problem identification and definition alongside to solution and prototyping phases.

- Agile and iterative approaches that integrate end-user input in designing policy solutions can lead to more cumulative outcomes for end users.

OPPORTUNITIES AND CHALLENGES IN INCLUSIVE DIGITAL HEALTH AND TECHNOLOGY

The opportunities and challenges speakers and panellists discussed from their lived experience working with digital health and technology and its intersection with the disability sector illuminated potential priority areas for bilateral research collaboration between Australia and India.

Inclusively-minded digital health and technological interventions can generate positive outcomes for stakeholders across the health value-chain, "improving efficiency and effectiveness of healthcare, and importantly addressing health inequities, by improving access for people with disabilities (McGuckin, 2022)."

1. OPPORTUNITIES IN INCLUSIVE DIGITAL HEALTH AND TECHNOLOGY:

1.1 INCREASE EFFICIENCY IN HEALTHCARE SYSTEMS

At the core, digital health and technology interventions can provide the ability to develop more efficient and effective healthcare systems. Digital healthcare solutions can reduce the burden of costs, wait times and resources on healthcare systems and potentially improve the effectiveness of healthcare delivery for its recipients.

"Seer Medical, which does at-home monitoring of patients with epilepsy... [has] helped over 10,000 people through this. They've shortened the waiting time in hospital for this assessment from six to 18 months to six to eight weeks. And if you just take 2020 as an example, they deliver 25,000 home monitoring days and estimate that that saved the hospital system AUD$50 million." **- Prof McGuckin.**

1.2 PROVIDE MORE ACCESSIBLE AND INCLUSIVE HEALTHCARE

All presenters emphasised the potential of creating more inclusive and accessible healthcare systems which generate better outcomes, particularly for people with disabilities. The ability of digital solutions to help the most vulnerable people within communities in Australia and India is a driver for research collaboration between nations.

"The health system in India is normally overloaded. There's a high caseload, so the horse can't take the load. There's limited access, affordability issues. And when there is limited access and affordability, the people who suffer the most are persons with disability. Therefore, to have a more level playing field, having in-person care, synergistically balanced with digital healthcare may bring about the inclusion of persons with disability, with outcomes which are far better than what we have today." **- Prof GVS Murthy**

1.3 BROAD APPLICABILITY OF BENEFITS OF DIGITAL HEALTH INTERVENTIONS IN HEALTHCARE SYSTEMS

There is a plethora of applications where digital health is currently and can continue to generate better outcomes for individuals, including people with disabilities, creating a more inclusive and accessible healthcare system.

"I looked at ten different aspects where digital health can make a difference in relation to inclusion for persons with disability. Starting with the identification of the population that is in need of these services to monitor whether they have received services. Screening for complications to prevent further adverse outcomes, surveillance, information, education, and communication to bring about a behavioural change counsel treatment advice, rehab capacity building, especially for parents and those who are primary caregivers of persons with disability, providing counselling support and follow up (advice)." **- Prof GVS Murthy**

1.4 PROVIDE ACCESS TO HEALTHCARE FOR PEOPLE WITH DISABILITIES IN RURAL/REMOTE AREAS

Accessibility issues for people with disabilities including access to the internet, specialist medical treatment, mobility, and health literacy were a recurring theme in speaker presentations. However, all agreed that digital health and technology interventions balanced with in-person consultation generate better outcomes for people with disabilities, particularly those living in rural and remote areas. The challenge of improving inclusivity and access for people in rural and remote areas is important to both the Indian and Australian contexts, with significant vulnerable populations living outside of metropolitan areas.

> *"So, these states came up with an idea of having a provision made in E-Sanjeevani... where the community health officers or the health workers could also be provided a login there within E-SanjeevaniOPD. And while they go from door to door, they could extend the service through their tablets, which they were carrying with them. So, this was another innovation which increased the inclusiveness of the population or the section of the populace, which was not otherwise having access to IT or internet services."* **- Dr Sanjay Sood.**

> *"And since then, we have seen that this particular variant (E-SanjeevaniAB-HWC) has suddenly increased the uptake of telemedicine because this is the variant which has actually led to the inclusion or rather enabled access of rural population or isolated people living in isolated communities to specialised healthcare services."* **- Dr Sanjay Sood.**

On the success of E-SanjeevaniAB-HWC hub and spoke model:

> *"The first challenge that E-Sanjeevani was trying to address is the accessibility to health services for just about anyone in the populace and that to a significant extent has already been addressed."* **- Dr Sanjay Sood**

> *"How do we look at remote patients who are not very well conversant with technology and be able to still engage with doctors and supports and caregivers? So, we are looking at how we can actually use a television instead of a phone and use the television remote as the interaction device to interact with patients who are, let us say, a little oldish. They don't have the ability to use phones and so on. So, you can still use the television, which is pretty much omnipresent and use the remote, which they're typically comfortable with because they've been watching TV, to assist them in healthcare interactions."* **- Mr Manjunatha Gurulingaiah Kukkuru.**

1.5 COMMERCIALISATION OPPORTUNITIES FOR DIGITAL HEALTH

Presenters touched on the potential of private industry to commercialise digital healthcare interventions to generate revenue and promote entrepreneurship. However, they noted the need to have guidelines and rigorous testing to ensure these interventions are appropriate and will generate better health outcomes for people with disabilities.

> *"The last example I want to talk about comes from Professor Mark Cook, who's an epilepsy researcher and neurologist. And he's developed a couple of technologies, which are improving the management of patients with epilepsy, and he's commercialised those."* **- Prof McGuckin.**

1.6 DESIGNING INCLUSIVE INTERVENTIONS REDUCES FUTURE COSTS

Designing and developing inclusive healthcare interventions with the needs of people with disabilities in mind was identified as not only a moral imperative but also critical to reducing costs for all stakeholders in the healthcare systems. The associated cost of revising digital health and technology interventions can be avoided by adding inclusivity measures at the outset of an intervention's design.

"And the cost factor will only come into picture when you ignore it. And when we start thinking about it at the end of it, that's where the cost becomes more expensive and so difficult." **- Prof Rajasekhar Vijjeswarapu**

1.7 INNOVATIVE DIGITAL HEALTH AND TECHNOLOGY SOLUTIONS TO IMPROVE INCLUSIVITY

Stakeholder presentations demonstrated the broad spectrum of digital health and technology solutions aimed at improving access to healthcare for people living with disabilities. These innovative solutions included utilising the most cutting-edge technology, such as AI to generate missing data sets and augmented reality to train individuals on using an insulin pen. Innovative uses of household technology such as landlines and television remotes, to allow rural/remote communities, people with disabilities, or people with limited healthcare accessibility to interact with digital healthcare solutions were also discussed.

"We did a helpline during wave two, and this really had a tremendous impact on the local community. We had an automated phone line where they could choose Tamil or English, and it would direct them either to a medical professional or to a social worker if they had a particular need... Anecdotally, we captured so much information that we can't even leave the house."
– Mr Arun Zechariah

1.8 CREATING FOUNDATIONAL DATABASES IN INDIA

Using digital health and technology interventions to generate data was a key theme of stakeholder discussions. Having better quality, digitised, structured, and disaggregated health datasets driven by technology was regarded as an opportunity to create foundation models for understanding disabilities and other health problems in India.

On the potential of data in India: "It is growing as we speak, but our whole goal is for the country (is), can you actually lay down foundational work of understanding? What is the presentation of ocular disorders in an Indian cohort, right? You all read the textbooks, the west has this, Europe has this, India big question mark." - Dr Vipin Das.

1.9 EDUCATING MEDICAL AND NON-MEDICAL PERSONNEL ON INCLUSIVITY.

Using technology to assist in the training of medical and non-medical personnel as a means of educating and improving health literacy surrounding disability and inclusion. The COVID-19 pandemic created the opportunity for driving the shift toward digital education.

"And with the help of technology, we were able to within like two and a half weeks, of course, we have really strong faculty on campus and educators. And we were able to create multiple courses not only for medical practitioners but also for non-medical people, and with the support of data trust and the Azim Premji Foundation, we are able to actually train thousands of doctors and nonmedical professionals around the country in a very short time." **- Arun Zechariah**

2. CHALLENGES IN INCLUSIVE DIGITAL HEALTH AND TECHNOLOGY

2.1 FACILITATING ACCESS FOR PEOPLE WITH DISABILITIES

2.1.1 Rural and remote areas

Speakers continually raised the challenge of providing healthcare access to individuals, particularly people with disabilities living in rural and remote areas. Examples that were given of using digital health and technology to meet this challenge varied, from using community-based health workers with relevant devices (cameras, handheld devices) reaching out to people living rurally or remotely and facilitating digital health interventions, to using telephone landlines to provide information and consultation. The variety of methods speaks to the challenge and scope of research opportunities in using digital health and technology to better the health outcomes of people in rural or remote communities.

2.1.2 Lack of internet access

Limited access to the internet or to smart devices was repeatedly discussed by presenters. Whilst innovative solutions and ideas were shared to meet this accessibility challenge, providing high-quality, equitable digital health care to individuals and people with disabilities with poor internet access remained an ongoing challenge identified during presentations.

> *"But to our surprise, the challenges faced by the users there have been majorly centred around the internet access, the internet services were not all that good, even 50 kilometres from the state capital."* **- Dr Sanjay Sood.**

2.1.3 Lack of accessible information for people with disabilities

Digital health and technology interventions must meet the individual needs of people, including those with disabilities, by presenting information in accessible formats (including for carers, parents, or guardians) to assist in ensuring the success of digital healthcare interventions.

> *"The knowledge of preventive methods, prevention strategies, very poor knowledge. And those who are hearing impaired, the use of masks made it difficult for them because they could not lip read any longer. Communication guidelines, not available in accessible formats."* **- Prof GVS Murthy**

2.2 ACCESS TO QUALITY, STRUCTURED, DISAGGREGATED, STRATIFIED DATA

Access to quality, structured, disaggregated, and stratified data to drive digital health and technology interventions was a key challenge identified by presenters. Researchers repeatedly identified the lack of access to this data in their work, and drew attention specifically to the need to collaborate on generating better data sets and systems. This was an even more pronounced problem relating to people with disabilities with critical data sets, such as the Indian census data being misrepresentative of people with disabilities. The need to collaborate on improving the collection and nature of current data in Australia and India was a point of consensus among presenters.

> *"But if you look at what is happening, most of the people who received the teleconsults, there is no way to make out whether they were visually impaired. So, what proportion of the visually impaired, or people with other impairments, actually use the consults is not known."* **- Prof GVS Murthy**

> *"But most important for us when we are looking at whether inclusion is working is to have disaggregated stratified analysis by disability. And that is what is going to be important to measure inclusion. If we don't do that, we don't know whether we are reaching a person with a disability."* **- Prof GVS Murthy.**

> *"So today, any kind of AI or whatever (DHCS) that we want to use needs quality data for understanding and predicting health conditions or a behaviour of the patient. Now, there are a lot of limitations in our ability to get real time or real patient data."* **- Manjunatha Gurulingaiah Kukkuru.**

> *"Getting data of the patient in one place, that itself is a challenge... So we are trying to see how we can leverage the Indian health stack that you may have heard about to build solutions around very secure and privacy led data sharing of patients across hospitals, which can then give a doctor a reasonably good understanding of the patient's condition, prior history, et cetera...and all of these are assisted by the way, this is not just plainly putting up at certain data in front of the doctor. It is about being able to have diagnostics behind it and giving lead indicators to the doctor."* **- Manjunatha Gurulingaiah Kukkuru.**

"There has always been an efficient use of technology for chronic illness like tuberculosis and HIV, but I think regarding disability services, it is later renewed and probably mediocre. Research also in this field is probably lacking and probably will have to take it forward with such illustrious growth here."
- Dr Deepthi N Shanbhag.

"So, I'll be telling out those small experiences which we have with persons with disability, as you all know, India has five to 10. Actually, the census, which was done in 2011, said that it's around 1.5% of the population. WHO says it's 10%, but... it's probably considered the world's largest minority." **- Dr Deepthi N Shanbhag**

"And I'm talking of persons with disability, as well as eye and ENT patients' lack of coordination between community and the rural health centre, standardisation of data, which is very important for us, which we didn't have, most important for me was paper storage. We had a lot of registers and a lot of places which we had to store. This project has been running for 20 years. So, we had to store everything, and we shouldn't miss out. So, this was the important reason why I had approached our health informatics division to do something for our data, digitise it, and do something difficult to (allow us to) analyse data." **- Dr Deepthi N Shanbhag.**

"Of course, the challenge is, as one of our colleagues was just mentioning in the previous presentation, quality data is lacking, right? We need to generate good quality data and, more importantly, continuum data. It can't be something in a time point, like a retrospective study. It is time dependent, and also standardisation of collection is an issue across different geographies." **- Dr Vipin Das**

"More importantly, you need good, structured data for you to have good insights. So EyeSmart, at least 70% of the data is very structured. It's something we are grateful that we did 12 years ago. Today we are reaping the benefits. **- Dr Vipin Das**

"Why will a doctor basically use an insight that is being told by a machine as opposed to decades of experience, and you all know that clinical validation is the final nail on the coffin." **- Dr Vipin Das**

2.3 SCALABILITY AND FACILITATING MULTIDISCIPLINARY TEAMS:

Digital health and technology solutions often require multidisciplinary teams to research, develop, design, implement and evaluate their effectiveness. Consultation with people with disabilities, software engineers, end-users, carers, academics, and funding bodies is a challenge facing digital health and technology interventions. Facilitating and scaling digital healthcare interventions with multidisciplinary teams effectively was identified as a challenge by presenters.

On rapidly scaling a digital health intervention, "moved from a sort of research and development phase with a team of about 20. And now he's got about 120 people delivering this platform. And you can imagine the challenges that he has at the moment implementing this. Every new clinic that they put on has to learn how to use the technology and interface with the patients correctly and sign them up." - Prof McGuckin.

"But if you look at those ten themes where we can actually make a difference, if you look at it still, a lot of work needs to be done. The trajectory is slow. We need to pick up pace and look at it being more comprehensive so that all the other areas where digital technology can play a role can be brought to the fore."
- Prof GVS Murthy.

"Solving major health challenges increasingly is requiring multidisciplinary approaches to tackle those problems. And wherever possible, we are putting together teams across disciplines, our clinicians, our fundamental, basic science researchers, but also with engineers and IT specialists, with government, with industry where necessary to try and tackle these problems. And of course, digital, there's a lot of hope that digital solutions can increase the efficiency and effectiveness of healthcare and importantly, address health inequities by improving access to people, including those with disability." **- Prof McGuckin.**

2.4 DIGITAL HEALTHCARE SOLUTIONS NOT DESIGNED TO IMPROVE ACCESS FOR PEOPLE WITH DISABILITIES.

DHCS apps that have been designed and implemented without consultation or consideration of the needs of people with disabilities create challenges for ensuring inclusive functions are built in later versions. Ensuring guidelines and standards regarding digital health and technology and including people with disability can help to alleviate this challenge.

On scaling inclusive digital healthcare: "And I mean, independently people, especially disabled people, have not been able to use E-Sanjeevani, but they say that they come along with their attendance, and they are able to sort of consult doctors with the help of the attendants who are from the family who come with them. So that is the medium as of now." - Dr Sanjay Sood.

2.5 FUNDING AND SUSTAINABLE REVENUE STREAMS FOR DIGITAL HEALTHCARE SOLUTIONS

Gaining access to and generating revenue was a challenge for researchers and entrepreneurs in the digital healthcare sector.

> *"It's a program that at the moment has been supported by research grants, both in the development phase and now in a wider testing phase. But it needs to move into a system where it could save the healthcare system, a lot of money down the track, but who's going fund it?"* - **Prof McGuckin**

2.6 EXCLUSION OF PEOPLE WITH DISABILITIES FROM THE DECISION-MAKING PROCESS

The exclusion of people with disabilities from decision-making processes across all levels of development and implementation of digital healthcare and technology interventions was a repeated challenge presenters identified. Implementing co-design principles and methods was identified as a potential solution to this challenge, opening an opportunity for research collaboration between Australian and Indian researchers.

> *On people with disabilities' inclusion in decisions regarding their needs and COVID-19, "The problems are very similar, exclusion in decision making in relation to the COVID response."* - **Prof GVS Murthy**

2.7 BALANCING DIGITAL AND IN-PERSON HEALTHCARE SOLUTIONS:

Presenters discussed the need to have a balance of digital (telerehabilitation/consultation) and in-person healthcare. A review acknowledging the uses and limitations challenge of digital healthcare approaches can help to ensure the benefits of digital healthcare solutions (cost, efficiency etc.) can be taken advantage of without compromising patient healthcare outcomes.

> *"Therefore, to have a more level playing field, having in-person care, synergistically balanced with digital healthcare may bring about the inclusion of persons with disability, with outcomes, which are far better than what we have today."* - **Prof GVS Murthy**

2.8 DESIGNING DIGITAL HEALTHCARE INTERVENTIONS WITH FEEDBACK AND EVALUATION MECHANISMS.

A major challenge inhibiting effective DHCS was ensuring digital health and technology interventions abide by adequate testing standards and have in-built systems for feedback and evaluation.

> *"You know, there's a plethora of digital health solutions that are being created by researchers, but also by sort of non-experts out there. Many of these are reasonably poorly developed, and not really subjected to rigorous testing, and lots of these interventions fail to get really implemented into healthcare."* - **Prof McGuckin**

2.9 PRIVACY

Ensuring the privacy and security of personal information and data captured in digital health and technology interventions is a critical challenge for both nations. The need for digital healthcare interventions to have both better access to high-quality data and maintain standards of privacy and security is vital to the success and reputation of digital healthcare interventions.

SPEAKER BIOGRAPHIES:

Dr Anthony Vipin Das
Consultant Ophthalmologist,
LV Prasad Eye Institute, Bengaluru, India

Dr Anthony Vipin Das completed his post-graduate training in Ophthalmology at Kakatiya Medical College, Warangal. Dr Vipin is the Team Principal and Chief Architect of eyeSmart EMR, a revolutionary award-winning Electronic Medical Record and Hospital Management System developed in-house at LV Prasad Eye Institute. He is also the Founder of REPOrT (Rural Education and Prevention of Ocular Trauma), which has addressed over 20,500 rural children in the prevention of Ocular Trauma and is an ongoing project. He is a Member of the International Task Force for Emerging Technologies for Teaching and Learning at the International Council of Ophthalmology (ICO). He is also a Chevening Scholar from the St. Cross College, University of Oxford, UK. His specific interests include Ocular Trauma and Community Ophthalmology, and he is currently pursuing research in the field of Regenerative Medicine and Eyeball Transplantation.

Mr Arun Zechariah
Director of Education Technology Unit,
CMC Vellore, Vellore, India

Mr Arun Zechariah has A broad range of experience in crafting technology solutions for complex and disparate problems. With a keen interest in the usage of emerging technologies, Mr Zechariah has crafted solutions to develop and disseminate learning material in his role as Director of Education Technology Unit at CMC Vellore. Mr Zechariah has created applications for mobile and desktop on various cloud services, including AWS, alongside systems engineering skills with a wide range of experience in system planning, deployment, and support in large install environments. Mr Zechariah has been responsible for the enterprise-wide rollout and integration of software and services.

Professor B.R. Shamanna
(Chair), School of Medical Sciences,
University of Hyderabad, India

Prof. B.R. Shamanna completed his medical education at Karnataka Medical College, Hubli, and his Doctoral studies (MD) in Community Medicine at the All India Institute of Medical Sciences, New Delhi. He is a visiting faculty to the Masters in Public Health Eyecare at the London School of Hygiene and Tropical Medicine since 2002 and an Adjunct Faculty with the Public Health Foundation of India. He is on the ethics committee of the Fernandez Hospital for Mother and Child in Hyderabad, L.V. Prasad Eye Institute, Hyderabad, Indian Institute of Public Health, Hyderabad, and the National Institute of Animal Biotechnology, Hyderabad. He chairs the IEC of Piramal Swasthya Health Management and Research Institute, Hyderabad and is the Member Secretary for the Institutional Ethics Committee, University of Hyderabad.

Dr Deepthi N Shanbhag
Department of Community Medicine
St John's National Academy of Health Science,
Bengaluru, India

Dr Deepthi N Shanbhag is a Professor (Associate) at St. John's National Academy of Health Sciences. Dr Shanbhag heads the Unit of Hope, a multidisciplinary department for children with disability at the St. John's National Academy of Medical Sciences. This is a unique facility where all needs of children with disability are addressed under one roof. Dr Shanbhag also provides leadership for the Community outreach activities of the Academy, addressing the needs of persons with disabilities in rural areas of Karnataka.

Dr Delvin Varughese

Lecturer, Department of Human Centred Learning, Action Lab, Monash University, Melbourne, Australia

Dr Delvin Varghese is a Lecturer within Action Lab in the Faculty of Information Technology at Monash University. His research focuses on the design of technologies for non-profits and community organisations to support community voice and inclusion. Relying on co-design and participatory methods, Dr Varughese works with government bodies and non-profits, both in Australia and overseas, to design more equitable digital processes for community development. He has conducted fieldwork and worked on projects in countries in Asia, Africa, South America, Europe, and Australia. Within Australia, he has active partnerships with non-profits that work with marginalised communities and state government bodies such as Victoria's Department for Premier and Cabinet (DPC) and Department for Families, Fairness and Housing (DFFH).

Dr Emma George

Senior Lecturer, School of Allied Health Science and Practice, Faculty of Health and Medical Sciences, University of Adelaide, Australia

Dr Emma George is a Senior Lecturer at the University of Adelaide and an occupational therapist. Dr George is interested in research that explores policy, health inequity and injustice. Dr George's research focuses on addressing health inequities among marginalised people and communities, policy implementation, the health and well-being of Aboriginal and Torres Strait Islander people, and the recovery from exploitation and modern slavery in Australia and overseas. As an Occupational therapist, Dr George is fascinated by the role and importance of occupation for health and well-being. Dr George's research aims to learn more about occupational injustices (marginalisation, alienation, deprivation, imbalance, apartheid, and dysfunction) in order to promote equity and justice, culturally safe practice, and trauma informed care.

Professor GVS Murthy

Director, Indian Institute of Public Health, Hyderabad, and Vice-President (South), Public Health Foundation of India

Professor GVS Murthy's work revolves around improving global health and fostering international partnerships to improve the health status of populations. He established the first Community Ophthalmology Department in the public sector in India. He is an international expert on public health disability and has been engaged in generating evidence on health care access and health concerns of persons with disability and in developing innovative interventions to dismantle these barriers. Professor Murthy has nearly 300 publications which are indexed in Pubmed, and has undertaken research projects in India, Bhutan, Bangladesh, Pakistan, Nigeria, Nepal, and Sri Lanka.

Mr Manjunatha Gurulingaiah Kukkuru

Associate Vice President and Principal Research Analyst, Infosys Centre for Emerging Technology Solutions, Bengaluru, India

Mr Manjunatha G Kukkuru is an intrapreneur incubating emerging technology led offerings for Infosys. He leads the development of new offerings across artificial intelligence, blockchain, robotic process automation, autonomous systems, and automation, in particular for software quality assurance. Mr Kukkuru plays a role in taking Blockchain and other emerging technology offerings to market and creating First-of-a-Kind market opportunities for Infosys. He has been a key contributor in creating a culture of innovation and innovation infrastructure for Infosys with programs like Co-creation, Flatworld, Building Tomorrow's Enterprise, Murmuration, Hackathon, Labstorm and Zero Distance. He is an Engineer, MBA, and is a Chevening Scholar from the University of Oxford on Innovation.

Professor Mike McGuckin
Deputy Dean, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, Australia

Professor Mike McGuckin is Deputy Dean and Director of Research Strategy in the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne. In this role, he has strategic oversight of a broad spectrum of health research across this prestigious Faculty which is ranked #11 internationally by the Times Higher Education Rankings. He is a former NHMRC Principal Research Fellow and, before taking up his current role, was the Deputy Director (Research) of the Mater Research Institute –The University of Queensland. Prof McGuckin is the author of over 150 scientific publications and is heavily involved in national and international peer reviews.

Professor Nathan Grills
Melbourne School of Population and Global Health, University of Melbourne, Australia

Professor Nathan Grills is a Public Health Physician and Senior Research Fellow at the Australia India Institute and the Nossal Institute at the University of Melbourne. He researches non-communicable diseases, public health, and disability largely in the context of community settings in India. In partnership with the World Health Organisation, Professor Grills has extensively researched the role of non-government organisations partnering with the Government to respond to HIV and disability in India (DPhil at Oxford University, Rhodes Trust). He has also undertaken community health and development research and training in PNG, Fiji, Bangladesh, Nepal, Kenya, Thailand, and Mozambique. Professor Grills also has honorary/faculty positions with the Public Health Foundation of India, CMC Vellore the Emmanuel Health Association.

Dr Sanjay Sood
Project Director of e-Sanjeevani and Associate Director and Head (Health Informatics), Centre for Development of Advanced Computing (C-DAC) Mohali, India

Dr Sanjay Sood holds a PhD in information technology (telemedicine) and has a global outlook. He has been associated with the domain of telemedicine for two decades. Dr Sood led (1998-2003) the team that developed the Indian Government's first indigenous Telemedicine Technology (Sanjeevani) at C-DAC Mohali, which has been successfully implemented in India and overseas. Dr Sood is the founder-Director and Head of the School of C-DAC School of Advanced Computing in Mauritius (University of Mauritius). Dr Sood is the Associate Director and Head (Health Informatics) at the Centre for Development of Advanced Computing (C-DAC) Mohali. At C-DAC, as The Project Director eSanjeevani (India's National telemedicine service), he is leading the world's largest telemedicine network.

Dr Sara Varughese
Managing Trustee of CBM (Formerly Christian Blind Mission), Delhi, India

Dr Sara Varughese, an ophthalmologist and public health specialist, is the Managing Trustee of CBM (formerly the Christian Blind Mission), which works for an inclusive society where people with disabilities achieve their full potential. Dr Varughese earlier worked with the World Health Organization, Southeast Asia Regional Office as Programme Manager in disability & rehabilitation. Dr Varughese graduated from CMC Vellore, India and is a fellow of the Royal College of Surgeons, Edinburgh. With an experience in health systems in developed countries (UK), middle income (South Africa) and developing countries (India, Nepal, Bangladesh). Dr Varughese has served the World Health Organisation (WHO), Southeast Asia Regional Office as programme Manager in disability & rehabilitation for the 11 countries of Southeast Asia. Dr Varughese also served as Medical Advisor for CBM South Asia Regional Office-North dealing with cross disability programs.

Dr Shrutika Murthy
Research Assistant
The George Institute for Global Health,
New Delhi, India

Dr Shrutika Murthy is a Research Assistant at the George Institute, working on the ARISE Hub – a project aimed at strengthening accountability mechanisms for improving equitable health and well-being for people living and working in informal urban spaces. Dr Murthy possesses an interdisciplinary background, having graduated with a bachelor's in economics from Symbiosis International University, Pune, and a master's in politics with a specialisation in International Relations from Jawaharlal Nehru University, New Delhi. Dr Murthy's work and research interests revolve around caste, gender, urban poverty, public health, and health systems and policy.

AUSTRALIA INDIA INSTITUTE