





# Challenges and opportunities in employing digital health to address self-management needs of people with NCDs in India

Nachiket Gudi <sup>1</sup>, Uday N Yadav <sup>2</sup>, Oommen John <sup>3</sup>,  
Ruth Webster <sup>4</sup>

<sup>1</sup>The George Institute for Global Health, New Delhi, India

<sup>2</sup>University of New South Wales, Sydney, New South Wales, Australia

<sup>3</sup>The George Institute for Global Health, University of New South Wales, New Delhi, India

<sup>4</sup>University of Technology Sydney, Sydney, New South Wales, Australia

## Correspondence to

Uday N Yadav, University of New South Wales, Sydney, NSW 2052, Australia; u.yadav@unsw.edu.au

Received 15 December 2020

Accepted 17 August 2021



© Author(s) (or their employer(s)) 2021. No commercial re-use. See rights and permissions. Published by BMJ.

**To cite:** Gudi N, Yadav UN, John O, et al. *BMJ Innov* Epub ahead of print: [please include Day Month Year]. doi:10.1136/bmjinnov-2020-000620

The WHO declared COVID-19 as a Public Health Emergency of International Concern on 30 January 2020.<sup>1</sup> On 22 March 2020, the Government of India imposed the ‘Janata Curfew’ to enforce rapid physical distancing measures and prepare the health system to reduce the spread of COVID-19. This lockdown was repeated three times until 17 May 2020, adversely affecting large sectors of people due to lack of access to health services and staff for usual medical care.<sup>2</sup> Evidence shows that people living with non-communicable diseases (PLWNCDS) in India are presenting less to health facilities and also there are denial of healthcare services under the nation’s lockdown.<sup>3 4</sup> PLWNCDS were not able to see their physicians in a regular consultation, and access to lab services was limited as many of these labs were converted to COVID-19 testing centres. Access to regular counselling sessions and healthy lifestyle behaviours were affected as PLWNCDS were forced to limit their activity.<sup>3</sup> They were also unable to secure healthy foods and had limited access to preventive or health promotion services owing to strict lockdown. A WHO survey from 2020 highlighted the disruption of NCD services for diabetes, cancer treatment and cardiovascular emergencies thereby urging countries to promote innovations to address an emerging tsunami of NCDs.<sup>5</sup> The ongoing pandemic has had well-documented economic, sociocultural and systemic impacts which have been well debated in the press and academic literature, but there is also growing concern

of the effect on health for PLWNCDS and is termed as the syndemic effect of COVID-19.<sup>6</sup>

## THE ROLE OF DIGITAL HEALTH TOOLS FOR SELF-MANAGEMENT IN NCDs

With an increasing burden of NCDs in resource-constraint settings, self-management of PLWNCDS has been gaining attention. The COVID-19 pandemic and its consequent impacts on healthcare service availability are unlikely to resolve soon. This is true for high-income countries (HICs) and even more so in low/middle-income countries (LMICs) with high burden of COVID-19 such as India because of emerging fast-spreading variants of COVID-19. This therefore highlights the importance of novel solutions for delivering self-management support for PLWNCDS where the use of digital technology could be an effective means of improving health outcomes. Self-management practices are defined as ‘the ability of the individual, in conjunction with family, community and healthcare professionals, to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions’.<sup>7</sup> There is potential for simple digital health tools to address some of these issues through smartphone applications, medical device deployment and telemonitoring systems.<sup>8</sup> Results from a systematic review on NCD management shows that digital health interventions are promising in achieving positive health outcomes including better self-management, increased patient–provider

communication, improved medication adherence and reduced disease symptoms.<sup>9</sup>

Digital health tools are already being harnessed to support the public health response to COVID-19 worldwide, including surveillance of COVID-19, case contact tracing and consultations with healthcare providers in both HICs and LMICs such as the USA, Canada and India.<sup>10 11</sup> However in this article, we argue that digital technology could also be useful for self-management of NCDs amid COVID-19 in an LMIC such as India. The world has seen a rapid increase in the number of mobile phone users in the last decade with the curve achieving its peak from the year 2000 across geographies, including 1.15 billion mobile phone users in India.<sup>12</sup> India has acknowledged the potential role of digital health with the telemedicine practice guidelines released on 25 March in response to COVID-19, and the National Digital Health Mission (NDHM) launched on 15 August.<sup>13 14</sup> Therefore, there is good evidence and precedent to believe that digital health tools could be used for self-management support to people with NCDs amid COVID-19 in India.

### PROPOSED USE OF DIGITAL HEALTH IN INDIA

To facilitate adoption and scale up of digital health interventions in India, the need for understanding digital literacy levels, which in turn impacts the usability of a digital health tool, is important. Interventions that originate in HICs, which are often technology intensive, demanding higher levels of digital literacy, may be diffused to LMICs however seldom scale up, thus leading to 'pilotitis'.<sup>15</sup> Therefore, employing a realist approach to inform the deployment of digital health interventions, with local knowledge and understanding, is particularly important.<sup>16</sup> Researchers and policymakers are advocating for many digital health interventions through different platforms to deliver healthcare services during the ongoing pandemic; however, just because the pandemic is unprecedented should not mean that rigour and method for evaluation of the suitability and sustainability of these tools should be casted aside.<sup>17 18</sup> Evaluating these interventions during the pandemic would justify the true value of these tools thus ensuring that there is emphasis on contextualisation rather than 'one-size-fits-all' approach.

Digital health interventions to manage NCDs should be designed using a co-design approach where the end users are involved in the overall design phase as it would enhance uptake and use.<sup>19</sup> These interventions should be evidence informed, and debates about evidence-based practice being time-consuming have paved the way for embedding Rapid Evidence Synthesis methodology in strengthening health systems.<sup>20</sup> This methodology can also be used to inform the development of digital health tools by identifying promoters and barriers to adoption and scaling up. The non-adoption, abandonment, scale-up,

spread, and sustainability (NASSS) framework also offers insights on factors influencing 'adoption, non-adoption, abandonment, spread, scale-up and sustainability of patient-facing health and care technologies'. It is recommended to evaluate the interventions based on a theoretical underpinning.<sup>21</sup>

### CHALLENGES AND OPPORTUNITIES

Delivering NCD care through telemedicine, text messaging services and apps customised such that they cater to multiple NCDs as opposed to a single disease can help patients receive holistic care. Challenges for implementing digital health interventions to manage NCD care in India are low digital literacy,<sup>22</sup> lack of specific guidelines on cross-border consultations,<sup>13</sup> privacy and affordability issues.<sup>23</sup>

The NDHM has launched a national health ID which would help create longitudinal electronic health records for the citizens.<sup>24</sup> With the national health ID, personal health record and electronic medical record web app, there is an opportunity for the health system to improve the continuum of care and coordination of care in the management of NCDs in India. However, as previously discussed, evaluation of the safety, effectiveness and other impacts of such interventions is needed ideally through a formal Health Technology Assessment (HTA) framework. However, there are few HTA frameworks tailored to evaluate digital health interventions.<sup>25 26</sup> HTA is the systematic evaluation of properties, effects or other effects of health technology and is predominantly used to inform policymaking.<sup>27</sup> HTA is conducted with explicit analytical frameworks to ensure rigour and consistency in such evaluations. However, the traditional methods used to evaluate effectiveness of interventions, such as long-term, randomised trials, may not be easily used in the digital health space. Apps or other types of software are developed and put into the market within weeks to months and quite possibly will exit the market just as fast. App updates will rapidly follow the first version often with different characteristics or functionality, adapting to stakeholder needs and wants. It is rare that a digital health app or piece of software will stay the same for years and yet many trials require the intervention to do just that. We suggest that digital health HTA frameworks should consider the specific requirements of this sector and adapt accordingly. Shifting our thinking to considering alternative frameworks such as pragmatic trial designs,<sup>28</sup> utilisation of routinely collected datasets<sup>29</sup> and ensuring that short time frames for software development are considered in any study design will move us along the path towards a relevant framework that is current and relevant to digital health development. This, in turn, will assist in identifying those truly effective and cost-effective digital health solutions.

## CONCLUSION

The use of digital health-supported self-management tools in NCDs is promising as has been demonstrated by the acceptance and widespread adoption of digital health tools for NCD management before the COVID-19 pandemic. However, to leverage the digital health self-management tools as health systems interventions, large-scale effectiveness and novel HTA approaches are required to strengthen the evidence to inform implementation strategy.

Although the effectiveness of self-management interventions delivered digitally is well documented in high-income setting, the deployment and use of these in the low/middle-income setting such as India are yet to be systematically evaluated. The COVID-19 pandemic is forcing PLWNCDS to adopt self-management for their conditions and therefore offers an opportunity to design well-contextualised digital health tools and evaluate them to assess the potential role of digital health-enabled self-management strategies for NCDs. However, dedicated funding will be required by organisations with the capacity to see the broader landscape of need that this pandemic has created.

**Twitter** Nachiket Gudi @GudiNachiket and Oommen John @Oommen\_john

**Contributors** Conceptualisation—NG and UNY. Draft manuscript—NG, UNY, OJ and RW. Approval of final draft—NG, UNY, OJ and RW.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

## ORCID iDs

Nachiket Gudi <http://orcid.org/0000-0003-3322-2964>

Uday N Yadav <http://orcid.org/0000-0002-6626-1604>

Oommen John <http://orcid.org/0000-0002-9008-1726>

Ruth Webster <http://orcid.org/0000-0002-7444-3037>

## REFERENCES

- World Health Organization. COVID-19 public health emergency of international concern (PHEIC) global research and innovation forum Geneva, 2020. Available: [https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-\(pheic\)-global-research-and-innovation-forum](https://www.who.int/publications/m/item/covid-19-public-health-emergency-of-international-concern-(pheic)-global-research-and-innovation-forum)
- LIne B. PM Modi calls for 'Janata curfew' on March 22 from 7 AM-9 PM. *The Hindu*, 2020.
- Kumar A, Rajasekharan Nayar K, Koya SF. COVID-19: challenges and its consequences for rural health care in India. *Public Health Pract* 2020;1:100009.
- Mudur GS. *How coronavirus hit rural health system*. The Telegraph Online, 2020.
- World Health Organization. *COVID-19 significantly impacts health services for noncommunicable diseases*, 2020.
- Yadav UN, Rayamajhee B, Mistry SK, *et al*. A Syndemic perspective on the management of non-communicable diseases amid the COVID-19 pandemic in low- and middle-income countries. *Front. Public Health* 2020;8:508.
- Hebbar PB, Sudha A, Dsouza V, *et al*. Healthcare delivery in India amid the Covid-19 pandemic: challenges and opportunities. *Indian J Med Ethics* 2020;:-215–8.
- Devi R, Kanitkar K, Narendhar R, *et al*. A narrative review of the patient journey through the lens of non-communicable diseases in low- and middle-income countries. *Adv Ther* 2020;37:4808–30.
- Hossain MM, Tasnim S, Sharma R, *et al*. Digital interventions for people living with non-communicable diseases in India: a systematic review of intervention studies and recommendations for future research and development. *Digit Health* 2019;5:205520761989615.
- Ankuda CK, Woodrell CD, Meier DE. *A beacon for dark times: palliative care support during the coronavirus pandemic*. Nejm Catalyst Innovations in Care Delivery, 2020.
- Pandey N, Srivastava RM, Kumar G, *et al*. Teleconsultation at a tertiary care government medical university during COVID-19 Lockdown in India - A pilot study. *Indian J Ophthalmol* 2020;68:1381.
- The World Bank. Mobile cellular subscriptions, 2020. Available: <https://data.worldbank.org/indicator/IT.CEL.SETS>
- Board of governors in supersession of the Medical Council of India. *Telemedicine practice guidelines: enabling registered medical practitioners to provide healthcare using telemedicine Delhi*, 2020.
- The Hindu. PM Modi announces launch of national digital health mission from today, all Indians to get health ID; 2020.
- Huang F, Blaschke S, Lucas H. Beyond pilotitis: taking digital health interventions to the National level in China and Uganda. *Global Health* 2017;13:1–11.
- Huxley CJ, Atherton H, Watkins JA, *et al*. Digital communication between clinician and patient and the impact on marginalised groups: a realist review in general practice. *Br J Gen Pract* 2015;65:e813–21.
- Kapoor A, Guha S, Kanti Das M, *et al*. Digital healthcare: the only solution for better healthcare during COVID-19 pandemic? *Indian Heart J* 2020;72:61–4.
- Ministry of Health and Family Welfare GoI. *Enabling delivery of essential health services during the COVID 19 outbreak: guidance note*, 2020.
- Andersen TO. Large-Scale and long-term co-design of digital health. *Interactions* 2019;26:74–7.
- World Health Organization Alliance for Health Policy and Systems Research. *Rapid reviews to strengthen health policy and systems: a practical guide*, 2017. Available: <https://www.who.int/alliance-hpsr/resources/publications/rapid-review-guide/en/>
- Greenhalgh T, Wherton J, Papoutsis C, *et al*. Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. *J Med Internet Res* 2017;19:e367.
- Nedungadi PP, Menon R, Gutjahr G, *et al*. Towards an inclusive digital literacy framework for digital India. *ET* 2018;60:516–28.
- Vokinger KN, Nittas V, Witt CM, *et al*. Digital health and the COVID-19 epidemic: an assessment framework for apps from an epidemiological and legal perspective. *Swiss Med Wkly* 2020;150:w20282.
- Ministry of health and family welfare GoI. health ID FAQ, 2020. Available: [https://ndhm.gov.in/home/health\\_id\\_faq](https://ndhm.gov.in/home/health_id_faq)

- 25 Haverinen J, Keränen N, Falkenbach P, *et al.* Digi-HTA: health technology assessment framework for digital healthcare services. *Finnish Journal of eHealth and eWelfare* 2019;11:326–41.
- 26 Kolasa K, Kozinski G. How to value digital health interventions? A systematic literature review. *Int J Environ Res Public Health* 2020;17:2119.
- 27 Goodman CS. *Introduction to health technology assessment*. Virginia, USA: The Lewin Group, 2004.
- 28 Patel A, Webster R. Pragmatic trials for noncommunicable diseases: relieving constraints. *PLoS Med* 2016;13:e1001986.
- 29 Webster R. Fixed-Dose combination medications for non-communicable diseases. *Heart* 2019;105:176–7.