Review on Technology and Artificial intelligence intervention for Chronic disease Management

Rihit Wadhwa[1] and Navpreet Kaur[2]

1. Research Intern, Centre for Chronic Disease Control
2. Public Health Foundation of India

Abstract

Background

Noncommunicable diseases (NCDs) represent a growing worldwide health issue because patients need to follow their diseases permanently while actively participating in their care to keep their medications on schedule. Digital health interventions which include telehealth and mobile applications and chatbots and wearables and patient portals enable healthcare providers to deliver individualized support for patient self-management which results in better health results. The current research about these interventions faces challenges because it studies different chronic diseases at different stages of their progression. The research aims to collect and combine evidence about digital and AI-based interventions which treat chronic diseases while it classifies their different types and operational methods and target groups for vulnerable populations.

Method

The authors performed a complete literature review of PubMed databases to identify systematic reviews which appeared between January 2020 and October 2025. The research design employed Medical Subject Headings (MeSH) and free-text terms with Boolean operators to achieve complete literature review of all chronic diseases affecting people of different ages.

Result

This study included a total of twelve studies for the synthesis after screening a total of fifty-one systematic reviews. The included studies were further broadly categorised into six domains: Mobile and App-Based Digital Health Tools, Telehealth and Remote Care Delivery, AI-Driven, Wearable and Sensor-Based Monitoring Technologies, Patient Education and Self-Management Interventions, Home-Based and Community Care Interventions, and Blockchain-Enabled Health Solutions.

Conclusion

The research findings demonstrated that digital interventions function as supportive tools which help patients monitor and control their chronic diseases. The health system receives support from various technologies which operate independently or together to decrease its clinical workload while simultaneously enabling patient participation in disease management. The review presents a detailed analysis of digital technologies through category-based assessment which shows both the operational success and technical structure of digital interventions. Future research needs to use strict research methods which combine design participation approaches to study how these interventions work when healthcare providers use them in their normal practice. The solution to ongoing technological deficits requires healthcare providers and legal experts and technologists and policymakers to work together as a single unit. The system would help people understand all present situations while building a healthcare system which provides equal access to medical services for every person.

Introduction

In the year 2021, Non-communicable diseases (NCDs) accounted for approximately 43 million deaths globally, and 18 million reported deaths were before the age of 70 years. Overall, 73% NCD related deaths occur in low middle income countries (LMIC), with 82% premature deaths occurring before the age of 70 years in LMIC. Cardiovascular diseases remain the leading cause of NCD-related mortality, responsible for approximately 19 million deaths in 2021, followed by cancers (10 million), chronic respiratory diseases (4 million), and diabetes (over 2 million, including kidney disease deaths attributable to diabetes) [1]. The GBD study predicted a continued epidemiological transition, in disease burden from communicable, maternal, neonatal, and nutritional diseases (CMNNs) to NCDs, with 77·6% of global disability-adjusted life years (DALYs) in 2050 coming from NCDs, showing an increase of 13·4% from 2022 levels [2].

In India, between the years 1990 and 2016, the DALY rate fell by 36% [3]. Yet by the year 2016, 27·5% of deaths were due to CMNNs, 61·8% due to NCD. Of the top ten causes of death in India in 2016, deaths due to all NCD causes increased between 1990 and 2016. The age-standardised death rate increased for ischaemic heart disease (12·0%) and diabetes (63·7%) but decreased for chronic obstructive pulmonary disease (COPD; −40·2%) and cerebrovascular disease (−23·7%) [3].

The leading risk factors in India in 2016 responsible for more than 5% of the total DALYs were child and maternal malnutrition (undernutrition; 14·6%), air pollution (9·8%), dietary risks (unhealthy diet; 8·9%), high systolic blood pressure (8·5%), high fasting plasma glucose (6%), and tobacco use (includes smoking, second-hand smoke, and smokeless tobacco 5·9%) [3].

According to the World Health Organization (WHO), chronic diseases affect all ages and regions. Although commonly associated with older adults, 17 million NCD-related deaths occur before 70, with 86% predicted in low- and middle-income countries [4]. The 2030 Agenda for Sustainable Development identifies NCDs as a major challenge. Thus, it has been endorsed to reduce premature mortality from NCDs by one-third through prevention and treatment by 2030 (SDG target 3.4) [5]. To accomplish this objective, it is essential to connect with the large patient populations affected by chronic diseases and encourage optimal health.

Recent advances in modern medical science have significantly enhanced both the diagnostic capabilities and therapeutic approaches for chronic diseases [6]. Over the past decade, advances in public health surveillance and the wider use of electronic health records (EHRs) have made population-level, near-real-time data available for monitoring chronic diseases and testing hypotheses, thereby improving the detection of trends and risk factor associations At the same time, stronger epidemiologic designs, longitudinal cohorts and life-course approaches have clarified how exposures across the lifespan (not just adult behaviors) influence later chronic-disease risk [7].

Studies have indicated that “big data” and machine learning (ML) can make highly accurate disease onset predictions, identify high risk groups and generate testable causal hypotheses which, when applied to the EHRs, registries, wearables, and other real word data compared to basic statistical analysis methods. Simultaneously, the regular indicator updates and shared surveillance frameworks have helped apply these findings into public health policies and practices [8].

Management of these chronic conditions has also benefited from new digital interventions, technologies, and innovative procedures. Given the increased burden of chronic nature of diseases, it is also essential to equip patients with the knowledge, skills, and understanding of their disease processes, enabling them to manage and self-regulate their conditions effectively in partnership with their healthcare providers to improve the quality of life [6,9]. Effective management of chronic disorders necessitates active patient involvement in their follow-up care.

Patients with chronic diseases need to follow extended medical treatment plans but research shows their poor adherence to treatment creates a major public health issue. The prescribed medication receives non-adherence from 30% to 40% of patients who have chronic medical conditions. The situation leads to deteriorating health results and additional medical issues which drive up expenses for healthcare services [10]. The treatment of diabetes and hypertension requires patients to maintain their prescribed medication schedule but most people stop following their treatment plans after their first doctor visit and medication start. Research indicates that numerous patients begin their treatment but fail to continue their antihypertensive or anti-diabetic medication regimen which leads to poor disease control (A large community-based study in Delhi slums demonstrated that patients achieved 81% treatment start but only 50-60% of hypertension cases maintained adherence and 36.12% achieved blood pressure control [11]. Patients who receive their first type 2 diabetes diagnosis will experience elevated mortality rates and cardiovascular complications when they fail to take their medications according to research [12].

These findings highlight that sustained adherence over long periods is a significant challenge in care cascades, affecting the transition from treatment to disease control, leading to complications associated with chronic conditions. Also, various interventions, including pharmacist led interventions, tailored counselling, motivational interviewing, and formulary restrictions have shown effectiveness in improving medication adherence. Nevertheless, these approaches can be tedious, time-consuming, labour-intensive, and costly [13]. Compared to conventional care, the use of digital interventions has significantly improved risk-factor monitoring and medication adherence in adults with chronic conditions [10].

In order to reduce the constantly increasing burden on the public health system, numerous patient-focused interventions have been developed, which include: telehealth consultations, mobile health (mhealth), Wearable devices for surveillance, and Patient portals (PPs). These interventions have been developed to enhance patient knowledge, skills and empower individuals to manage their illnesses and reduce the healthcare burden. For instance, Mobile health (mHealth) improves health outcomes, as it has the advantage of low cost and easy accessibility. Also, reported to significantly improve the medication adherence in adults with chronic conditions compared to the usual care [10]. The development and implementation of AI technologies improve quality of life, are cost effective , and also optimize self-management of chronic conditions by enabling early detection and providing patient centered care [14].

With this background as part of a research internship at the Centre of Chronic Disease Control (CCDC), the first author undertook this Rapid Review to review existing Systematic Reviews that have examined various technological, digital, and Artificial Intelligence interventions to monitor, manage, and mitigate the burden of Chronic Diseases globally and across age groups.

Methodology

Study Design

This study was conducted as a Rapid Review of systematic reviews examining the use of technology and digital interventions in the management of chronic diseases. The aim was to systematically map and categorise the types of technology and AI interventions used in chronic disease management and their intended purposes, based on systematic reviews from the last 5 years. With this aim, interventions from systematic reviews were identified, described, and categorised into the types of technology-based and patient-centred strategies (which are incorporated along with any digital or AI component) as reported in these reviews. As this study did not include quantitative synthesis or formal risk-of-bias assessment, it did not follow PRISMA or PICO frameworks. It was conducted according to accepted methods for descriptive literature synthesis or "narrative overviews of systematic reviews."

Search Strategy

A comprehensive electronic search was conducted in the PubMed database to identify relevant systematic reviews published between January 2020 and October 2025. The search was restricted to English-language publications. Both Medical Subject Headings (MeSH) and free-text terms were used in combination with Boolean operators to ensure comprehensive coverage of the literature across chronic conditions and age-groups.

The search string applied was:

(Technology OR "Artificial Intelligence") AND (Chronic Disease OR Diabetes OR Hypertension) AND ("Patient-centred care")

This search strategy was designed to capture systematic reviews addressing technology-enabled, patient-centred approaches to chronic disease management.

Eligibility Criteria

Systematic reviews were included if they:

1. Focused on patients with one or more chronic conditions, such as diabetes, hypertension, cardiovascular diseases, coronary artery disease, or stroke;

2. Reported the use of digital health technologies**,** artificial intelligence**,** or technology-assisted interventions as part of disease management or patient-centred care along with digital component,

3. Were published in peer-reviewed journals between 2020 and 2025; and

4. Provided descriptive or evaluative outcomes related to patient engagement, health outcomes, or care delivery.

5. Interventions across age groups were included, especially children with Type 1 Diabetes (T1D)

Reviews were excluded if they:

- Did not involve a technology or digital component.
- Focused solely on clinical pharmacotherapy or non-technological behavioral interventions; or patient-centered care without any digital or technological component were excluded.
- Were not systematic reviews (e.g., primary studies, commentaries, or protocols).

Study Selection

The initial search yielded 51 systematic reviews. Titles and abstracts were screened for relevance, and 39 reviews were excluded after abstract screening because they did not include any digital or technology-based interventions. The final sample comprised 12 systematic reviews that explicitly evaluated technology-supported, patient-centered approaches to chronic disease management.

Data Extraction and Descriptive Synthesis

Data were extracted manually using a structured data extraction form. Key variables included:

- Author(s), publication year, and country of origin
- Objectives, Population
- Target chronic condition(s)
- Type, name, and purpose of technology or digital intervention
- Patient-centred components (e.g., self-management, shared decision-making, education, or telemonitoring); and
- Reported outcomes and effectiveness indicators.

A descriptive synthesis approach was applied. Findings were summarised qualitatively and organised thematically into categories based on the dominant type of technological intervention or function reported. No quantitative synthesis or meta-analysis was performed, consistent with the narrative nature of this overview.

Ethical Considerations

As this study synthesised information from previously published systematic reviews, no ethical approval was needed. All data used was obtained from the public domain, and is peer-reviewed literature.

Results

This Rapid review comprises of total of 12 systematic reviews, encompassing a wide range of digital health interventions aimed at providing chronic disease management, patient engagement, treatment adherence and clinical outcomes. The included interventions were mostly implemented in developed nations with minimal representation from the developing countries with underserved population. The interventions were broadly categorized into six domains as explained in and named as Mobile and App-Based Digital Health Tools, Telehealth and Remote Care Delivery, AI-Driven, Wearable and Sensor-Based Monitoring Technologies, Patient Education and Self-Management Interventions, Home-Based and Community Care Interventions, Blockchain-Enabled Health Solutions.

1. **Mobile- and App-Based Digital Health Tools**

Mobile- and app-based interventions appeared in eleven studies [15–25], reflecting strong global uptake of mHealth solutions. These interventions included self-management apps, mobile coaching platforms, SMS-based behaviour change programs, portal-linked mobile interfaces, and mobile apps paired with wearables or medical sensors. Several diabetes-focused applications were identified, including Care4Diabetes [15], MyChart in My Hand [16], MyHealthKeeper [16,17], My Diabetes Coach (Laura) [23], Young With Diabetes (YMD) [24], MyT1Dhero (for teen-parent communication) [24], Webdia (DIY app to reduce HbA1c) [24], Diamob app [24], SweetGoals and FAITH! Mobile application [18]. Their functionalities ranged from symptom reporting, goal setting, uploading glucose and BP readings, carbohydrate and insulin tracking, to accelerometer-linked physical activity monitoring and also provide tailored messages, educational modules. A large subset of apps were used in combination with wearables, such as Fitbit Charge, Charge HR, Flex, or Samsung Charm, to provide feedback on steps, sleep, heart rate, and calorie expenditure [17]. Additional mobile systems included intelligent insole paired with an app for diabetic foot pressure detection (SurroSense Dx) [17], smart wristband–linked CKD self-management apps (WowGoHealth) [17], smartphone apps integrated with wireless BP monitors, and mobile DApps linked with pulse oximeters and temperature sensors in blockchain frameworks [19]. SMS and IVR-based interventions provided tailored or automated digital prompts, including unidirectional reminders, bidirectional communication, and WhatsApp chatbot (GREAT4Diabetes) or WeChat-based educational delivery which share the audio messages and images through WhatsApp [23]. The purpose of these interventions was to enhance daily self-management, improve treatment adherence, support behaviour change, provide real-time personalised feedback, and increase patient engagement through digital accessibility and convenience.

2. **Telehealth and Remote Care Delivery**

Telehealth and remote care delivery interventions were noted in eleven studies [15–20,22–26], encompassing remote monitoring system, providing virtual consultations to patients with chronic disease, and patient portals that supported asynchronous digital communication Patient portal systems (e.g., MyChart, MyOchsner, My HealtheVet, MyHealth at Vanderbilt, e-Vita, My Diabetes My Way) offered various functionalities such as for prescription refill management, secure messaging, scheduling appointments, teleconsultation along with symptom uploading and viewing laboratory or other medical test results, which helps provide remote patient feedback [16]. Also, interventions named as cardiac telerehabilitation systems [17], home-based telemonitoring using Fitbit, Remote feedback via wearable linked platforms [17] enables addressing conditions such as diabetes, hypertension, liver diseases and more.

Telehealth interventions also included nurse- or pharmacist-led remote counselling, home Blood Pressure telemedicine kits, video/ online consultations [22], and autonomous or semi-autonomous remote insulin adjustment systems, i.e., Voice-based AI for insulin titration (VBAI) [23]. There overarching purpose is to enhance remote access, support continuity of care, facilitate early detection and intervention, and reduce the healthcare burden of in-person visits while maintaining clinical oversight.

3. **AI-Driven, Wearable and Sensor-Based Monitoring Technologies**

AI-driven interventions were analyzed in two studies [18,23], including interventions like: Voice- based AI for insulin titration (VBAI) [23], Wireless BP monitor with conversational AI smartphone app using cognitive behavioural therapy [18], humanoid robots (e.g., NAO, SARA) for children for diabetes type1 education [23], and digital chatbots such as COMPASS, Motibot, Roca AI Assistant, Scotty, and Dina for gestational diabetes [23]. These agents provide tailored personalised behavioural support, diet and activity counselling, mental health guidance, and empathetic aid, while AI-enabled predictive tools facilitated clinical risk identification and automated therapy and dose recommendations.

Some new innovative approaches were identified in seven studies [16–21,24], including conversational agents (CAs), AI-based behavioural coaching, machine learning–assisted decision support, and predictive algorithms. Examples included, Continuous Glucose Monitoring (CGM) systems such as real time CGM- Dexcom G4/G6, Medtronic Guardian iPro2, and Intermittently scanned CGM- Freestyle Libre provided continuous, enable real-time glucose data, trend visualisation, behavioural adjustment, and timely therapeutic decision-making [21]. Beyond CGM, many studies incorporated other wearable sensors, including activity trackers (Fitbit Charge, Charge HR, Flex, Samsung Charm, Nike FuelBand, DigiWalker pedometers). These wearables can be worn on chest, wrist, finger ankle aid in encouraging patients for physical activity and improving quality of life of patient with chronic conditions [17].

Some condition-specific wearables were also employed, such as intelligent insole pressure-monitoring systems (SurroSense Dx) for diabetic foot ulcer prevention [17], ingestible sensors paired with wearable adhesive patches for medication adherence, and advanced ophthalmic devices including portable OCT units, handheld fundus cameras, and VR-based perimetry tools. These agents delivered personalised behavioural support, mental health guidance, diet and activity counselling, and crisis-sensitive support, while AI-enabled predictive tools facilitated clinical risk identification and automated dose recommendation.

4. **Patient Education and Self-Management Interventions**

Digital patient education and self-management interventions appeared in nine studies [15–18,20,22–25], cutting across apps, portals, telehealth systems, wearables, and AI-driven tools. Education was delivered through digital modules, interactive prompts, CBT-based mental health frameworks (Wysa) [23], tailored cultural/linguistic materials, and web-based portals for cancer advice such as MyAVL. Examples also included Fitbit-guided physical activity programmes [17], portal-based cancer self-management platforms, and chatbot-enabled education (e.g., Laura, WhatsApp CA) [23], gamification education platform, such as PERGAMON [24].

These interventions supported knowledge acquisition, behaviour change, symptom awareness, and treatment adherence, empowering patients to take active roles in managing chronic conditions.

5. **Home-Based and Community Digital Health Interventions**

Home-based digital interventions were identified in eight studies [16,18,19,22–25] and included remote monitoring and self-management tools designed for use in domestic settings. Examples includes, PHR + Home visit by pharmacists [16], home IoT disease monitoring integrated with blockchain [19], home-based autonomous insulin titration, use of mobile apps for diabetes management by children and parents, and home BP or glucose upload systems paired with portals. Patient portals were designed to be home-based, for patients to access their medical records, request medication refill, book appointment and track lab values from home [25]. These interventions aimed to extend chronic disease care to patients with limited mobility or patients living in remote locations, and reducing reliance on clinic-based encounters and reducing long hospital queues, waiting and traveling.

6. **Blockchain-Enabled Health Solutions**

Single study of twelve studies [19] has evaluated blockchain-enabled interventions, such as Med-PPPHIS, HealthChain chronic disease platform, blockchain clinical trial management platform, and IoT-integrated Ethereum-based blockchain for remote monitoring, and Dapps for biomedical data sharing [19]. These systems enabled secure, decentralised data exchange, tamper-proof record management, and machine-learning integration for privacy-preserving analytics.

The purpose was to improve data integrity, strengthen health information security, and support trustworthy distributed monitoring in chronic disease contexts.

Discussion

The present rapid review aimed to map and categorise the types of digital interventions used in chronic disease management and to understand their intended purposes. It is based on systematic reviews published in the last five years. Twelve systematic reviews were selected, encompassing a diverse range of digital and AI-enabled interventions. The interventions were designed to enhance patient engagement, improve clinical outcomes, and strengthen healthcare delivery systems. Chronic conditions require population-level interventions for prevention and health promotion; however, for treatment and better management of clinical outcomes, technological interventions provide an opportunity to fill the gap of regular monitoring and tailoring intervention as per the patient's individual needs.

In most of the studies included in this review, self-management and behavioural support interventions were predominant, particularly for diabetes, hypertension, and chronic obstructive pulmonary disease. These included mobile and web-based applications. Digital self-management education platforms integrated feedback loops, educational content, and data tracking. For Diabetes applications such as Care4Diabetes, WeChat diabetic programs were integrated. These applications helped in improving glycaemic control and self-efficacy [15,20]. It was noted that for management for chronic disease, patient centered self-management intervention is more preferred over disease based method. Prior evidence has suggested that digital self-management interventions enhance adherence, patient empowerment, and quality of life when tailored to individual needs [15,27]. The reviewed evidence also highlighted that optimising the nurse led intervention with the virtual care to manage the chronic conditions could facilitate wide array of management such as medication adjustment, adherence monitoring, personalizing care, while being cost effective [15,28]. These findings demonstrate that AI-based decision systems aid in reducing clinical burden while maintaining safety and effectiveness in managing chronic conditions [29].

Monitoring and surveillance interventions included in this review demonstrated a clear evolution from basic self-reporting tools to remote patient monitoring ecosystems in improving chronic diseases. Continuous glucose monitoring (CGM) systems such as Dexcom G4/G6 and Freestyle Libre, along with blockchain-based decentralised applications, enabled real-time physiological tracking and automated data sharing with healthcare providers [21] [19]. These technologies have been associated with improved disease control, early detection of health deterioration, and reduced hospital admissions. This review study also indicates that remote patient monitoring, AI based technologies, and wearable technologies significantly enhance self-efficacy and clinical decision-making across chronic diseases. Nonetheless, in LMIC, challenges related to affordability, interoperability, digital literacy and data security and digital literacy persist [30] for instance, the older population with chronic conditions lack access to technology, and lack of confidence to operate the applications and interpret the online information may hinder them from using the technology [31]. Also, patients using wearable devices highlighted issues regarding inaccurate readings due to their movements, patients struggle to attach sensors while maintaining the positioning of the device [21]. Therefore, it is paramount to address these inequities by policy mechanisms to ensure equitable access and standardized infrastructure to support technology adoption, so that shortfalls can be rectified [31].

Telemedicine interventions further reflected shift from episodic to continuous care. Tailored messaging systems, clinically linked communication channels, and teleconsultation platforms, were effective in adopting and promoting adherence and treatment continuity which has been observed and highlighted during the COVID-19, especially in high income countries (HICs)[32,33]. These findings align with the WHO Global Strategy on Digital Health 2020–2025, which recognises teleconsultation and remote support as key components for strengthening health systems globally [34]. However, the benefits of telemedicine are not uniformly distributed;, whereas HICs demonstrate scalability and strong infrastructure, population in the low-resource settings or underserved population at risk often experience healthcare barriers related to network connectivity, reimbursement policies, and digital competence and confidence [35,36].

The reviewed studies emphasised the importance of educational and psychosocial interventions. Community-based telecounselling and AI-driven conversational agents such as Wysa and My Diabetes Coach provided comprehensive education and mental well-being support [23]. The interventions, including the mental health component echoes the growing importance and recognition that emotional well-being is also an essential component in addressing the chronic disease management, and reported studies have shown improving the emotional distress along with enhancing patient engagement [23].

Lastly, in this review, digital record systems such as Patient portals, personal health records (PHRs) [16], and blockchain-integrated applications such as HealthChain [19] and Ethereum-based DApps have enhanced data accessibility and security [19].These applications facilitate data transparency and patient autonomy and also streamline clinical recordkeeping while empowering patients to participate in their care.

The emergence of advanced digital tools employing artificial intelligence, machine learning, and gamification further reflects the progression toward predictive and personalised medicine. These AI-assisted systems have shown promise in early diagnosis and treatment optimisation. However, concerns regarding informed consent in AI-driven health involve both legal and ethical issues, such as cross-border policy on data exchange, data privacy laws, and regulatory cooperation, which are essential considerations while deploying the technologies internationally. To ensure responsible innovation, it is crucial that AI innovations are regulated and align with the ethical and legal imperatives to gain people's trust to make the technology more equitable [37].

From a policy perspective, these findings reinforce the importance of integrated digital health ecosystems that combine clinical, behavioural, and technological approaches. Governments should priorities and focus on investing in inter-operable digital infrastructure, developing AI ethics guidelines, and enhancing digital literacy programs. These interventions will help ensure equitable access and adoption where the resources are limited. Most of the interventions in this review were from the developed countries, with minimal representation from the developing countries.

WHO Global strategy on digital health 2020-2025, has a vision to implement appropriate digital health technologies but also mentioned that it may be difficult to accomplish especially in LMIC [34]. However, studies has reported that prior to COVID 19, telehealth was more focused toward providing accessible care to the underserved people [36]. Therefore, there is a need to invest in efforts to overcome the major barriers that developing countries face in engaging with and accessing new digital health technologies, such as an proper environment to enable, insufficient resources, infrastructure to support the digital transformation, education, human capacity, financial investment and internet connectivity, as well as issues related to legacy infrastructure, technology ownership, privacy, security, and adapting and implementing global standards and technology flows to address the already existing disparities [34].

Global initiatives such as the WHO Digital Health Strategy and the United Nations Sustainable Development Goal 3.4, aim to reduce the premature mortality from NCDs. Along with the alignment with these initiatives, and establishing public public-private partnership will be key to sustaining progress in these areas [38].

The findings of this review highlighted the increasing role of digital interventions in chronic disease management. While different technologies, whether standalone or in combination, aim to reduce the clinical burden on the health system, they also empower patients and involve them actively in disease management. This review provides a comprehensive, category-based synthesis of the digital technologies, emphasising not only the effectiveness and purpose of digital interventions but also there technological architecture. Future studies should adopt rigorous designs, incorporate co-design methodologies, and examine scalability in routine healthcare settings. Lastly, to manage the persistent gaps in the technologies multi-disciplinary collaboration among healthcare providers, legal, technologists, and policymakers is mandatory. This would be helpful in understanding all current scenario and creating an accessible and equitable healthcare for all.

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