

## INPLASY

# Digital Health Interventions in Behavioral Change for Major Non-Communicable Chronic Disease Management throughout the Disease Continuum Following the WHO Guideline: a Scoping Review

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**ADMINISTRATIVE INFORMATION****Support** - None.**Review Stage at time of this submission** - Data analysis.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202560105**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 June 2025 and was last updated on 27 June 2025.**INTRODUCTION**

**Review question / Objective** 1.Population: Adults with or at risk of CKD, CVD, chronic respiratory disease, diabetes, or cancer. 2.Concept: Digital health interventions incorporating behavioral science strategies aimed at changing patient behavior directly or indirectly. 3.Context: Any stage of the care continuum—prevention, screening, diagnosis, and treatment. Only review articles published in English since 2020 will be included.

**Background** With 43 million fatalities in 2021 (about 75% of all non-pandemic deaths), non-communicable chronic illnesses (NCDs) are the world's largest source of morbidity and mortality. Diabetes, cancer, chronic respiratory diseases, cardiovascular diseases, and chronic kidney diseases are examples of major NCDs that need long-term care and patient involvement. In order to avoid issues and enhance results, these disorders all require long-term behavioral adjustments, such as quitting smoking, maintaining a healthy diet, exercising, and

adhering to drug regimens. However, at every step of the care continuum—from screening and prevention to diagnosis, treatment, and continued self-management—patients encounter substantial behavioral and psychological difficulties. Since promoting patients' behavior change and psychological health is essential to effective NCD care, overcoming these obstacles is imperative. DHIs have the potential to significantly improve the delivery of health services and promote universal health coverage. Chronic condition prevention, monitoring, and treatment can be facilitated by digital technologies such as wearables, telehealth platforms, electronic decision support systems, mobile health apps, and other eHealth/mHealth solutions. The use of digital interventions for managing noncommunicable diseases (NCDs) has grown rapidly in recent years, particularly during the COVID-19 pandemic. Digital health techniques for a variety of chronic conditions have been the subject of numerous systematic and scoping reviews, which have shown advantages like better patient education, better drug adherence, and better blood pressure control. Despite these advancements, there are still significant knowledge

gaps about how well these digital interventions apply behavioral science concepts to patient-level issues.

In the management of chronic diseases, behavioral science strategies including as theory-driven interventions, motivational methods, and behavior change techniques (BCTs) are essential for involving patients and maintaining long-term behavior change. Preliminary data, however, indicates that many digital health interventions for chronic illnesses do not fully utilize behavioral theories. For instance, a recent review discovered that digital interventions generally make poor use of theory, with only modest health outcomes and low fidelity in connecting BCTs to theoretical constructs. This suggests a lack of understanding of the application of behavioral science in the context of digital health and the degree to which theory-based approaches are used or documented.

Furthermore, there is a lack of a comprehensive map connecting which behavioral challenges are being targeted, how they are being addressed via digital tools, and whether these efforts align with established frameworks. This is because the landscape of digital health solutions is usually discussed in silos (by disease or by intervention type). The WHO created the Classification of Digital Health Interventions (DHI) v1.0, which divides digital health solutions into 28 different intervention categories based on the intended user (clients, providers, health system management, and data services). By comparing current interventions to this paradigm, saturation or underutilization can be identified. In fact, only 14 of the 28 WHO-defined digital intervention categories were represented in the literature, according to a recent scoping assessment of digital health for NCDs in primary care. This suggests that many different kinds of digital functionality are critically underutilized. This emphasizes the necessity of determining which areas of digital health have been used to influence behavior in the management of chronic diseases and which are still unexplored.

**Rationale** In order to effectively manage chronic non-communicable diseases (NCDs) from prevention to treatment, including diabetes, cancer, heart disease, and chronic respiratory conditions, long-term behavioral changes are necessary. Though their incorporation of behavioral science procedures (such as behavior change approaches and psychological theories) is inconsistent and poorly understood, digital health interventions (DHIs) provide scalable options to support this process. Furthermore, although there are many reviews, they frequently only cover a

limited range of illnesses or technological advancements, leaving a partial picture of behavioral applications in the context of digital health. In order to determine what kinds of digital health interventions have been used to address behavioral and psychological issues, how behavioral science has been applied in digital health interventions targeting major noncommunicable diseases, and how well they align with the WHO Digital Health Intervention framework, a scoping review is being carried out. By doing this, the review will draw attention to prevalent methods, underutilized approaches, and important gaps, providing precise guidance for further study and intervention development. It seeks to close the gap between digital health practice and behavioral science and offer a theoretical framework for better, theory-based digital solutions for the treatment of chronic illnesses.

## METHODS

**Strategy of data synthesis** We will perform a comprehensive literature search across multiple databases to identify relevant review articles. The databases to be searched include PubMed (MEDLINE), Embase, Web of Science, CINAHL (Cumulative Index to Nursing and Allied Health Literature), and the Cochrane Library (specifically the Cochrane Database of Systematic Reviews). These databases cover a broad range of biomedical, public health, and interdisciplinary research and are likely to index the majority of relevant reviews in this domain. The search will be designed to capture scoping reviews, systematic reviews, meta-analyses, and other types of evidence syntheses. A tailored search strategy will be developed for each database, incorporating controlled vocabulary (e.g., MeSH terms in PubMed) and free-text keywords. The search terms will reflect the PCC elements:

Population terms: keywords for the major NCDs of interest (e.g., “chronic disease”, “non-communicable disease”, “cardiovascular disease”, “heart disease”, “stroke”, “diabetes”, “diabetic”, “cancer”, “oncology”, “chronic kidney disease”, “renal disease”, “chronic kidney”, “chronic renal”, “chronic respiratory”, “COPD”, “asthma”, etc.). We will also include general terms like “chronic illness” or “chronic condition” to ensure we capture broader reviews that cover multiple NCDs.

Concept terms (digital health): a range of terms for digital interventions, such as “digital health”, “mHealth”, “eHealth”, “mobile application”, “mobile app”, “telemedicine”, “telehealth”, “wearable”, “digital intervention”, “mobile health intervention”, “text messaging”, “sms”, “wearable”,

“internet-based intervention”, “web-based intervention”, “health IT”, etc. We will also include specific tool terms like “wearable devices”, “fitness tracker”, “electronic health record (EHR)”, “patient portal”, “digital coaching”, etc., and terms for behavior-focused technologies like “behavior change technology”, “digital behavior change intervention (DBCI)”.

Concept terms (behavioral science strategies): keywords relating to behavior change and psychological support, such as “behavior change”, “behavioral intervention”, “behavioural science”, “behavioral medicine”, “behavior therapy”, “self-management support”, “adherence intervention”, “motivational interviewing”, “counseling”, “habit”, “psychosocial”, “theory”, “theoretical framework”, “cognitive behavioral”, “health belief”, “self-efficacy”, “motivation”, “BCT” (behavior change technique), “behavior change technique”, “behavioral strategy”, etc. Including these will help focus the search on interventions that explicitly mention a behavioral approach.

**Eligibility criteria** Population: Adults ( $\geq 18$  years old) who have or are at risk for major noncommunicable chronic diseases (NCDs), including diabetes, cancer, chronic respiratory diseases, cardiovascular diseases, and chronic kidney disease. Studies involving patients in any of these disease categories will be included. Reviews with mixed populations will only be included if it is possible to identify data pertinent to these settings. Patient-facing outcomes (clinical, behavioral, or psychological) pertaining to the management of NCDs are of interests.

Concept: Digital health interventions that use behavioral science techniques to assist or modify patient behavior in connection to managing noncommunicable diseases. Any health intervention that is provided by or made possible by digital technology is referred to as a “digital health intervention.” Examples of such interventions include wearable sensor-based interventions, telehealth or telemedicine programs, web-based platforms, digital decision support tools, online educational or counseling programs, gamified behavior change programs, mobile health apps, and electronic reminders or text messaging programs. The deliberate use of behavioral or psychological strategies to affect patient behavior—such as lifestyle choices, treatment compliance, self-management practices, or coping mechanisms—is the central idea of interest. Interventions that are described as utilizing psychological theories, motivational tactics, behavior change techniques, or other elements informed by behavioral science will be included. Digital tools that are only clinical and don't involve

any behavioral elements—such as an AI diagnostic tool that is used independently and doesn't involve patient behavior—will not be included. Although our focus is on patient or consumer-level interventions, we will also take into account digital interventions that are provider-facing or system-level insofar as they involve tactics to change patient behavior (for instance, a clinical decision support system that prompts providers to deliver behavior counseling could fall within scope).

Context: Every step of the NCD care continuum, including prevention (reducing risk factors in healthy or at-risk individuals), screening (e.g., promoting screening program participation), diagnosis (e.g., providing patients with psychological support or behavior change around the time of diagnosis), treatment (including acute treatment, chronic therapy, medication adherence, lifestyle modification, and rehabilitation), survivorship, or long-term management (including palliative care or secondary prevention). We will incorporate literature from any country or region, recognizing that digital health for NCDs is a worldwide concern (with special attention in how interventions may differ across high-income vs. low- and middle-income settings). There are no constraints on geography or health system setting. Additional inclusion criteria and restrictions: Only peer-reviewed review articles that synthesize evidence on digital health interventions within the above Population and Concept will be included, including systematic reviews, scoping reviews, meta-analyses, and other umbrella/overview reviews. Given the proliferation of digital health research in recent years, the decision to include solely review papers (rather than original empirical investigations) was made in order to rapidly map a large body of already synthesized knowledge. As a result, our work is essentially an evidence map of reviews or “umbrella review.” Review articles published after January 2020 will be included. This date limit was chosen in order to gather the most recent data because the 2020–present timeframe includes important advancements in digital health, especially those prompted by the COVID-19 pandemic. We focus on 2020+ to manage the breadth and reflect current trends, therefore earlier literature (pre-2020) is eliminated on the grounds that recent reviews will have included earlier works. Only English-language publications will be accepted. To allow for thorough data extraction, only sources having full-text accessibility will be featured. Conference abstracts, editorials, commentaries, and protocols will not be included unless they are published protocols of reviews with outcomes that we can extrapolate from a full review. In keeping with our emphasis on peer-reviewed syntheses, grey literature (such as

unpublished papers and dissertations) will not be searched for or included.

**Exclusion criteria:** Studies that don't fit the PCC characteristics listed above will be disqualified. For instance, we will not include reviews of digital health studies that do not address behavioral or psychological components, evaluations of solely clinical interventions without a digital component, or reviews involving primarily on pediatric populations or unrelated conditions. Except in cases where they may be included in review articles (we will gather insights from primary studies via those reviews), primary studies (non-reviews) will typically be excluded.

**Source of evidence screening and selection** A systematic two-stage screening procedure in accordance with JBI methodology and PRISMA-ScR guidelines will be used for study selection. A second reviewer will independently confirm the decisions after one reviewer has finished the initial screening of all records at the title/abstract and full-text stages. Any disagreements or questions will be discussed and, if necessary, a third reviewer will be consulted.

**Screening of the title and abstract:** Following deduplication, the first reviewer will use predetermined inclusion and exclusion criteria to filter the titles and abstracts of all retrieved references. Every inclusion/exclusion decision will be verified by a second reviewer. For full-text screening, references that are identified as "unsure" or ambiguous will be kept. To ensure consistent application and calibrate the interpretation of the criteria, a pilot screening of around fifty records will be carried out. A systematic two-stage screening procedure in accordance with JBI methodology and PRISMA-ScR guidelines will be used for study selection. A second reviewer will independently confirm the decisions after one reviewer has finished the initial screening of all records at the title/abstract and full-text stages. Any disagreements or questions will be discussed and, if necessary, a third reviewer will be consulted.

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has examined the decisions. To decide whether to include or exclude, the primary and second reviewers will discuss the conflicting references. A third team member will be consulted to serve as an adjudicator if they are unable to agree on a specific research. Every choice made at this point will be recorded.

**Data management** We will extract data from every source of evidence that is included using Excel. The data charting form will be based on the JBI Scoping Review data extraction template. We intend to extract the following data from each included review:

Details of the citation: Journal, year of publication, and author(s).

Type of review and methodology: if the paper is an umbrella review, meta-analysis, scoping review, systematic review, etc. The quantity and kinds of primary studies that were part of the review .

Types of digital health interventions: We will extract details on the digital interventions covered. We will record the terminology the review uses and possibly map it to broader categories. We will also later align these with the WHO DHI classification, but here we'll list them as described.

Behavioral science components: We will chart what behavioral or psychological strategies are mentioned as part of the interventions in each review. This includes any mention of theoretical frameworks, or specific behavior change techniques utilized. The specific behavioral change will also be documented.

Summarized results: We will gather any general outcome trends that are observed, even while our scoping is not primarily focused on effectiveness. This will aid in the synthesis by placing the effects of behavioral tactics in perspective.

Research needs or gaps identified by the authors: Any conversations regarding limits or gaps in the literature will be documented in the review.

One reviewer will extract each included review, and a second reviewer will confirm that it is accurate and comprehensive. The team will be consulted in order to address any discrepancies or uncertainties in the extraction. One reviewer will extract each included review, and a second reviewer will confirm that it is accurate and comprehensive. The team will be consulted in order to address any discrepancies or uncertainties in the extraction.

**Reporting results / Analysis of the evidence** We will give a descriptive numerical summary of the sources that are included. Each included review will be summarized in a table comprising columns for author/year, NCD focus, number of primary studies, intervention methods, behavioral



strategies addressed, notable findings, etc. Counts and frequencies will be reported. We will also provide an overview of the variety of behavioral strategies that were found.

**Thematic Analysis of Behavioral Strategies and Challenges:** We will perform a thematic analysis of the reviews' content that explains the difficulties that patients encounter. To find overarching themes, we will take assertions about challenges from the reviews and code them inductively. This will enable us to outline a number of important behavioral and psychological difficulty areas related to various NCDs. Accordingly, we will see patterns in the kinds of methods employed for behavioral techniques. We might group techniques according to the well-known BCT Taxonomy groupings. We'll map out which approaches are frequently used for which problems.

**WHO Digital Health Intervention Framework Mapping:** We will match each type of intervention found in our data extraction to the DHI classification categories established by the WHO. Based on the available research, we will develop a conceptual map or table that illustrates which of these categories have been applied to behavior modification for NCDs.

**Conceptual Mapping of BCTs to Challenges:** We intend to create a conceptual diagram or logic model that, within the framework of NCD care stages, aligns the behavioral challenges, behavior change approaches/theories, and digital intervention modalities used to address them. If applicable, we will also explain how these relate to prevention versus therapy, etc.

**Narrative Synthesis:** We will offer a narrative synthesis. Examples from the literature that demonstrate how behavioral methods were used to tackle a problem will be included. We will also provide a summary of the results.

**Presentation of the results** A PRISMA flow chart, a table of BCTs found mapped to the quantity of interventions/reviews utilizing them; a summary table of the features of the included reviews; a table or chart that maps interventions to WHO categories with counts, maybe emphasizing the gaps in the areas that aren't addressed; and the conceptual map that aligns strategies, interventions, and obstacles.

**Language restriction** English.

**Country(ies) involved** China.

**Keywords** Digital health interventions; Behavior change techniques; Chronic non-communicable diseases; cardiovascular diseases; cancer;

diabetes; chronic respiratory diseases; chronic kidney diseases.

### Contributions of each author

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