Environmental Scan of Existing Digital Health Solutions for Older Adults Living with Neurocognitive Disorders (Mild and Major) and Their Informal Caregivers: Summary Report

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Abstract: Digital health has added numerous promising solutions to enhance the health and wellness of people living with dementia and other cognitive problems and their informal caregivers. This work aims to summarize currently available digital health solutions and their related characteristics to develop a decision support tool for older adults living with mild or major neurocognitive disorders and their informal caregivers. We conducted an environmental scan to identify digital health solutions from a systematic review and targeted searches for grey literature covering the regions of Canada and Europe. Technological tools were scanned based on a preformatted extraction grid. We assessed their relevance based on selected attributes. We identified 100 available digital health solutions. The majority (56%) were not specific to dementia. Only 28% provided scientific evidence of their effectiveness. Remote patient care, movement tracking and cognitive exercises were the most common purposes of digital health solutions. Most solutions were presented as mobility aid tools, pill dispensers, apps, web, or a combination of these platforms. This knowledge will inform the development of a decision support tool to assist older adults and their informal caregivers in their search for adequate eHealth solutions according to their needs and preferences, based on trustable information.

1 INTRODUCTION

The prevalence of mild or major neurocognitive disorders (NCDs) is expected to increase to 70 million by 2030 and 139 million by 2050 (World Health Organisation, 2021). In this paper, we use the terminology "major neurocognitive disorders" instead of dementia and "mild neurocognitive disorders" for

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mild cognitive impairment, based on the DSM-5-TR (American Psychiatric Association, 2022).

Over the past years, several digital health solutions have been developed in Europe and Canada to enhance the quality of life of older adults living with mild or major NCDs (Ghani et al., 2022; Sixsmith, 2021). Digital health solutions use information and communication technologies to improve human health, healthcare services, and wellness for individuals and populations (Kostcova, 2015). They are mostly behavioral-based health interventions delivered through the Internet, mobile devices, electronic/digital processes in communication, and related technologies (Christie et al., 2018). These solutions mostly focus on improving the independence and autonomy of people living with NCDs, and providing knowledge and assistance to primary caregivers. Thus, digital health is considered a promising solution for older adults living with mild or major NCDs (Hopwood et al., 2018). It is important to get a comprehensive view of currently available technologies and document their outcomes and conditions of success to inform recommendations regarding digital health solutions for this population. Hence, this environmental scan is designed to identify existing digital health solutions relevant for people with mild or major NCDs and their informal caregivers in Canada and Europe.

2 OBJECTIVES

This environmental scan aims to identify digital health solutions for older adults living with mild or major NCDs and their informal caregivers and to document their characteristics to inform the implementation of such solutions in Europe and Canada. The specific objectives are to:

- Inventory digital health solutions for the targeted populations available in Europe or Canada.
- Summarize the characteristics of these digital health solutions, including their features and outcomes, implementation factors, and conditions of success.

3 METHODS

To achieve these objectives, we performed an environmental scan. Although environmental scans are gaining popularity in health research as a methodological approach to examining a specific health issue, there is no gold standard for this method (Charlton et al., 2021). Environmental scan is

considered as an effective assessment and data collection tool to analyze multifaceted issues, explore a policy, appraise current evidence, and for planning and decision making. For instance, an environmental scan can identify the knowledge-to-action gap meaningfully (Robinson et al., 2021). Several studies have described the usefulness of environmental scans for assessing community needs for program and policy development (Kebede et al., 2021).

3.1 Search Strategy

We performed comprehensive bibliographic searches to identify recent digital health solutions for older people with mild or major NCD or dementia and their informal caregivers. Initial data searches were done through a systematic review by Dequanter et al. (2021), and were updated (until September 2022) by two research assistants (one in Quebec and one in Flanders) by gathering all available digital health solutions in their respective jurisdictions (Canada and Europe) through databases and web searches. We identified solutions that were then reviewed by experienced investigators (MPG, MS, RB).

3.2 Inclusion and Exclusion Criteria

Included digital health solutions have the purpose to support and/or improve health and well-being in the daily life of the targeted populations such as apps providing information about health or services, mental exercises and games, virtual assessments, etc.; are produced within the last five years (so as of January 2018 up to the date of the search in 2022) and are available in Europe or Canada. We included relevant solutions provided by any public or private entity, free of charge or those requiring some payment.

Digital health solutions that are not currently available or for which we cannot confirm availability were excluded. Solutions that are only available in languages other than English, French or Dutch were also excluded.

3.3 Data Extraction

We used an extraction grid to document the characteristics of digital health solutions, based on the main attributes identified through the qualitative component of the larger research project (Dequanter et al., 2021). Collected information included: solution's name, purpose, software used, target population, domain, features, geographic availability, summary of the invention, scientific evidence of impacts and evidence details, primary author or

company contact information (email and phone number). We piloted the extraction grid on a sample of five solutions. Then, one author (AJ) did the extraction for all identified technologies, and another author (MS or MPG) checked for accuracy.

3.4 Data Analysis

We gathered detailed information based on selected attributes and listed all available digital health solutions for the targeted populations in Europe and Canada. This provided data for the first objective. Then, we analyzed each technology based on the selected attributes, synthesized quantitative and qualitative data, and triangulated the results to understand implementation factors and conditions of success.

4 RESULTS

We used a narrative approach with charts and figures to summarize the results according to the key characteristics of the technological solutions. Classifying digital health solutions based on their main function reveals their importance for patients and informal caregivers and their documented advantages, implications, and potential drawbacks.

4.1 Geographical Availability

We identified 100 distinct digital solutions available in Canada, Belgium, the UK, Germany, the Netherlands, Norway, and Sweden (Figure 1). A larger proportion of solutions in our sample are from Belgium and Canada.
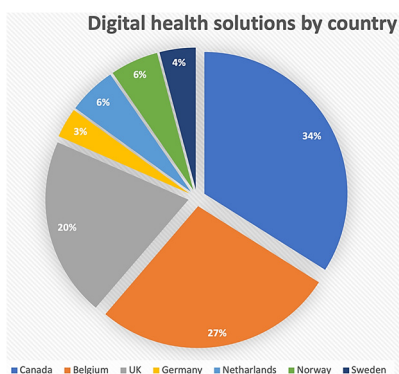

Figure 1: Distribution of the countries where digital health solutions are available.

4.2 Target Population

Most digital health solutions target older adults in general (56%), while 17% of the solutions are specifically for older people with NCDs and their informal caregivers. However, 23% of solutions are applicable to all age groups.

4.3 Available Evidence

We considered scientific evidence supporting digital health interventions and found that most solutions do not have any evidence of their effectiveness. Only 28 of the 100 solutions identified present scientific evidence of their effectiveness, most often based on clinical trials. Other types of evidence, such as media releases, awards and recognitions, user reviews, and feedback are available for 34 solutions. However, no supporting scientific or non-scientific evidence is reported for the remaining 38 solutions.

4.4 Purpose

As seen in Figure 2, classification based on their main purpose shows most digital health solutions are for remote patient care (23), cognitive exercise (20) or tracking movements (17). Twelve solutions aim at fall prevention, and 10 offer alert and security functions. The other types of solutions offer decision support (2) and robotic interactions (2).
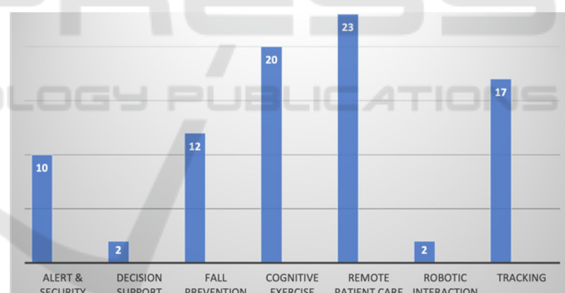
Figure 2: Purpose of digital health solutions.

4.5 Technological Support

This parameter defines the technology platforms the solutions are based on. There are 6 main categories of platforms (Table 1) that are shortly described below.

Table 1: Types of platforms and number of solutions.

Type of platform used	Number of solutions
Mobility aid tool	25
Mobility aid tool + App	10
App	21
Pill dispenser + App	14
Web	9
Web + App	17

Mobility Aid Tool: Healthcare mobility support is used for neuromuscular rehabilitation of patients with mobility challenges. It uses wearable technology solutions and walker sensors for neuromuscular rehabilitation for patients with brain injury, neurological disorders, or mobility challenges. They function autonomously using their sensory capability, thus not requiring external input. These solutions are user-friendly, affordable, and relevant for people with dementia.

Mobility Aid Tool and App: This category is an extension of the former and includes Aid tool and App. These are useful for older adults who require personalized rehabilitation plans. They help in early complication identification as app is useful for daily remote medical care. Exercise videos with a system to provide feedback are also included in this category.

App: This category includes mobile systems that help to ensure client safety, for instance by keeping track of the person's movements. An example is an electronic door opener that is activated by a key app to allow easy access to the person's home for caregivers and family members. These solutions are generally easy to use, safe and acceptable as the client determines who gets access to their information.

Pill Dispenser and App: Electronic pill dispenser technology helps people with cognitive problems who require regular medicine by providing helpful reminders through chimes and lights, and phone or text alerts to remind the person of any delay in taking their medication. This is facilitated by the coordination with pharmacy and care teams by pre-set pill bottles to alert and message medication schedules. It also allows integration with healthcare professionals and pharmacies for real-time tracking and updates. No technical skills are required for easy usage. However, this solution is specific to pills and will not work with injections, drops, inhalers, etc., and is available only through partner pharmacies.

Web: Remote patient monitoring can be performed by using secure web tools. For these types of solutions, a case manager often coordinates the care plan and ensures the proper functioning of the network. Supporting functions for patients and their relatives are coordinated through a web portal for primary care coordination and support service for palliative care.

Web and App: The addition of mobile apps to the previous category allows for extended coverage and functionalities. Tracking is facilitated and coordination of care is improved. These solutions are notably useful to support mobility of people with cognitive problems.

5 DISCUSSION

Studies often mention that eHealth technology utilization has changed the way people live in and out of their homes. For older people with mild or major NCDs, supporting cognitive functions, activities of daily living, and safety can promote their autonomy and independence (Malinowski et al., 2010; Irazoki et al., 2020). Based on the available technology reviewed, pill dispensers and apps remind people with dementia to take their medications on time, offer cognitive exercises that can limit memory problems, and mobile applications that may assist in activities like cooking or self-management skills. Other digital health solutions offer safety or social support by connecting the person with family members and caregivers. Interactive devices such as socially assistive robots, may offer time orientation, stimulate alertness, communication and entertainment, and alleviate feelings of loneliness.

Although digital health technologies offer many benefits, they can also sometimes challenge and trouble some older adults with NCDs (Guisado-Fernández et al., 2019). Some technologies do not exactly meet these people's needs although they claim effectiveness. In fact, no study clearly analyzed how the technology is used by people with NCDs in their daily activities. Therefore, more studies are required to monitor usage, usability, effectiveness and barriers related to the uptake of these solutions by people with dementia or other NCDs and their informal caregivers.

6 CONCLUSIONS

This environmental scan allowed identifying current digital health solutions for older adults with mild or major neurocognitive disorders and their informal caregivers. Based on the features of these solutions, it seems possible to design an effective decision-making tool that could support them when deciding to use such technology. Findings from the environmental scan highlight the need for additional approaches to strengthen digital health interventions for the well-being of dementia patients and their informal and formal healthcare providers.

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