Review

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Challenges and Opportunities in Implementing the Internet of Things in Nutritional Management of Post-Stroke Patients with Cognitive Impairment: A Scoping Review

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Abstract: Background/Objectives: The Internet of Things (IoT) technology connects objects to the Internet, and its applications are increasingly used in healthcare to improve the quality of care. However, the use of IoT for the nutritional management of patients with cognitive impairment resulting from stroke or related factors is still in development. This scoping review aims to describe the integration of IoT and its applications to support monitoring, interventions, and nutritional education for post-stroke patients or those with cognitive impairment. Methods: A scoping review was conducted using the Cochrane, PubMed/Medline, CINAHL, Embase, Scopus, and Web of Science databases, following the Arksey and O'Malley framework. Results: Of the 483 records identified, 10 were included in the review. Most of the articles were peer-reviewed proceedings from technology conferences or publications in scientific and technology journals. IoT-based innovations in nutritional management were discussed in methodological articles, case studies, or project descriptions. Innovations were identified across three key areas: monitoring, intervention, and education. Conclusion: IoT technology offers promising innovations for the nutritional management of post-stroke patients or those with cognitive impairment. However, IoT capabilities in this field are still in the early stages of development and are not yet highly specific.

Keywords: Internet of Things; stroke; home healthcare; nutrition; sensors; cognitive impairment

1. Introduction

Stroke, a leading cause of disability and mortality worldwide, has prompted the healthcare sector to explore innovative approaches to patient monitoring and care [1–3].

One promising approach is the application of Internet of Things (IoT) technology, which has the potential to revolutionize the way stroke patients' health, including their nutritional status, is tracked and managed [4,5]. People with moderate cognitive impairment often struggle with preparing and consuming appropriate foods [6], increasing their risk of malnutrition.

Studies have indicated that cognitive impairment is a common consequence of stroke and can significantly impact long-term prognosis and quality of life. Cognitive impairment following a stroke is associated with increased disability and dependence in activities of daily living [7]. Adequate

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nutritional monitoring in post-stroke patients is essential for improving quality of life, as highlighted by a recent systematic review [8]. Cognitive impairment negatively affects the ability to perform independent activities of daily living and complicates proper nutritional management in these patients.

The integration of IoT-enabled devices and sensors can provide continuous, real-time monitoring of stroke patients' vital signs, activity levels, and dietary intake [5]. By collecting and transmitting this data to healthcare providers, IoT systems can facilitate early detection of nutritional deficiencies or other health issues, allowing for timely interventions to prevent complications and improve patient outcomes. Moreover, IoT-powered wearables and mobile applications can empower stroke patients to take a more active role in managing their health, including monitoring their diet and physical activity [5,9].

Existing research has demonstrated the potential of IoT-based solutions in managing chronic conditions like diabetes, where the technology has been used to track patients' diet, physical activity, and medication adherence. Similarly, IoT devices can be leveraged to enhance the quality of life for stroke patients by providing personalized nutrition recommendations, reminders, and feedback to support their recovery and long-term well-being. A review of the literature on IoT in healthcare reveals several key insights: IoT-enabled devices can improve patient monitoring and care, though security and privacy remain critical concerns that must be addressed [1,5–10]. Ongoing research and development in the field of IoT in healthcare aims to tackle these challenges and unlock the full potential of this technology to transform the lives of stroke patients. The potential benefits of IoT in healthcare extend beyond stroke patients to include a broader range of chronic degenerative diseases. For individuals managing conditions such as diabetes, heart disease, post-stroke recovery, or age-related cognitive impairment, IoT-enabled devices offer a transformative approach to home nutrition monitoring and management. For instance, smart sensors in refrigerators or pantries can track food consumption patterns, while wearable devices can monitor blood sugar levels or other relevant physiological indicators. This continuous flow of data provides valuable insights into a patient's eating habits and overall health [10]. By integrating this information with personalized nutritional recommendations and alerts, healthcare providers can better manage these patients by identifying potential warning signs and intervening proactively to prevent complications [12]. This personalized approach to nutrition management empowers patients to take control of their health, improves adherence to dietary guidelines, and ultimately enhances their overall well-being [13,14].

The aim of this scoping review is to describe and map the use of the Internet of Things and its applications, either currently available or under development, in the management and monitoring of nutrition in patients with stroke or cognitive impairment.

2. Methods

The review was conducted and reported according to the Preferred Reporting Items for Scoping Reviews (PRISMA-ScR, see Table S1) [15]. For this scoping review, we adopted the methodology outlined by Arksey and O'Malley [16], which provides a structured framework for mapping a broad range of evidence, including emerging, quantitative, qualitative, or mixed studies. Preliminary registration in OSF database was produced (https://doi.org/10.17605/OSF.IO/4ESDC).The primary aim is to identify key sources and highlight potential gaps in the current body of knowledge. Arksey and O'Malley's approach begins with formulating the research question, followed by the identification and selection of relevant studies, data extraction, synthesis of findings, and, in some cases, consultation with stakeholders.

2.1. Identification of the Research Question

For the present study, the research question was formulated using the PCC model [17]. The PCC model is a framework used to refine research topics by focusing on three core elements: Population (P), Concept (C), and Context (C). In this review, the followingaspects were considered based on this approach: P: Patients with chronic stroke disease; C: The role of IoT and related technological applications in managing and monitoring nutritional status; C: Home, remote healthcare, medical centers.

2.2. Identification of Studies Relevant to the Research Question

The search was carried out in August 2024 in the databases PubMed/Medline, Em-base, CINAHL, Scopus, Web of Science, using the keywords: "Internet of Things", "Stroke", "nutrition" and their variations, opportunely combined by Boolean operators. A manual search was conducted scanning the reference lists of relevant articles and Google Scholar to retrieve additional records; full search algorithms are available in the data available statement (Table S2).

2.3. Inclusion and Exclusion Criteria

2.3.1. Inclusion Criteria

1. Primary study: Any type of experimental or observational study design, including qualitative and mixed-method studies
2. Related to management and monitoring nutritional status in chronic stroke patients
3. Participants: chronic stroke patients over 18 years; 3. Secondary studies related to the topic of review; 4. Proceedings of Congress contribution.

2.3.2. Exclusion criteria

1. Studies not related to the topic of review and that do not meet the inclusion criteria
2. Book chapters or editorials.

2.4. Data Charting Process

In accordance with the Arksey and O'Malley framework, a rigorous and systematic protocol was adopted for the "Charting of Information and Data" phase. This study strictly followed the standards established by the PRISMA-ScR Checklist [15], a widely recognized guideline specifically designed for scoping reviews. PRISMA-ScR provides clear and specific criteria, including both essential reporting elements and optional additional components, tailored to address the unique challenges of scoping reviews.

The researchers (MS and SM) underwent a stringent process to select and include publications in the study. The authors individually reviewed all titles and abstracts identified through searches in electronic databases. Duplicates and irrelevant records were removed using Rayyan software, available at https://rayyan.com/ [18]. Disputes were resolved with the involvement of a third reviewer (GC). Full texts of the remaining studies were then obtained, and two reviewers (MS and SM) independently assessed their eligibility based on the previously established criteria. Disagreements were resolved through consensus meetings, during which a third reviewer (GC) served as the arbitrator. It is important to note that the third reviewer did not participate in the initial review of the papers. This methodological approach focused on identifying and abstracting key themes, interventions, primary findings, and other relevant information in alignment with the research objectives. All the information gathered from different sources was subsequently consolidated into a unified framework, ensuring a consistent and comprehensive analysis that captures the essence and complexity of a scoping review.

2.5. Data Extraction and Synthesis

The following data were extracted: author, year, country, study design, sample size, setting, comorbidities, healthcare interventions, IoT tools, and objectives or findings. The included studies were categorized based on the identified review objectives and summarized through narrative synthesis.

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3. Results

A total of 483 articles were identified through the database searches: 121 from PubMed-Medline, 279 from Embase, 7 from CINAHL, 10 from Scopus, 61 from Web of Science, and 5 from other sources (IEEE Xplore, ACM Digital Library, and Google Scholar). After 125 duplicates were removed, all titles and abstracts were screened, and articles were evaluated for eligibility. Of these, 294 were judged not to be relevant, and the remaining 64 full texts were assessed. 54 of these were subsequently excluded as they did not meet the selection criteria for our research. The screening process ultimately included 10 studies in this scoping review (Figure 1).

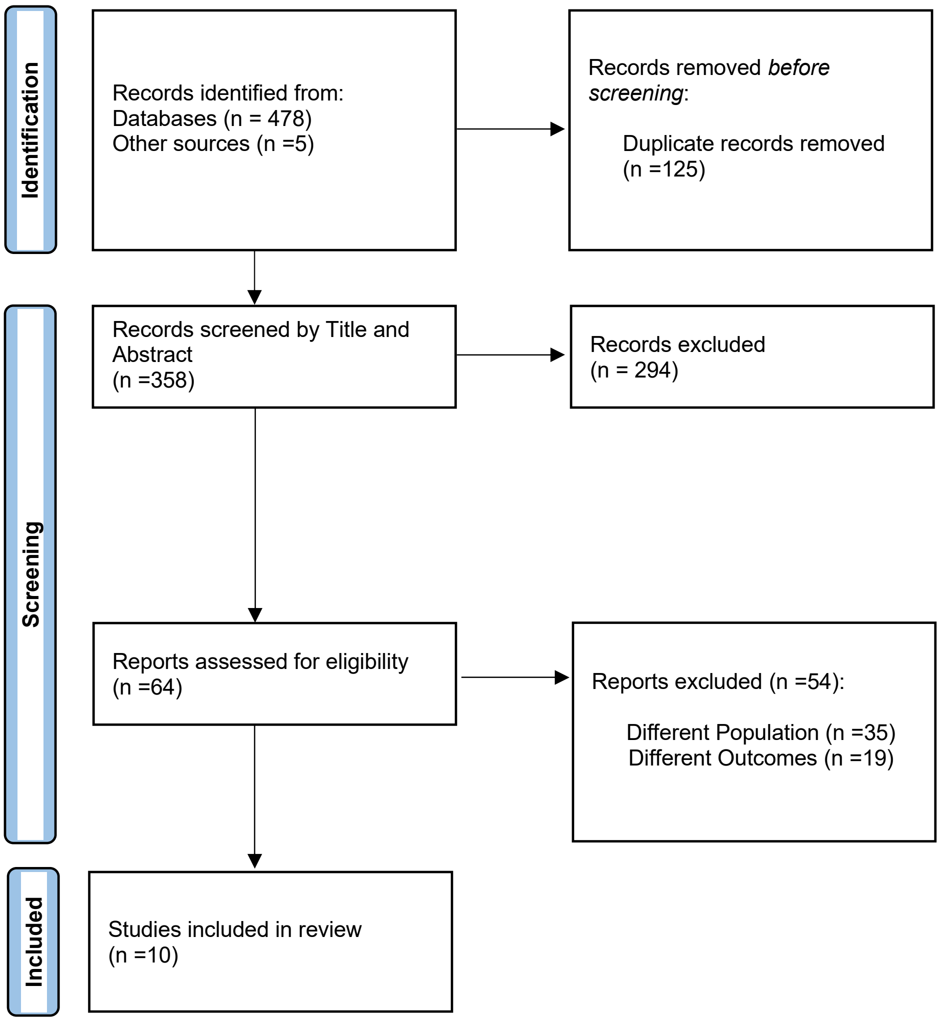

Figure 1. Prisma ScR Flowchart.

3.1. General Characteristics of the Studies Included

Most of the studies were conducted in Western countries (n = 9; 90%) [19–27]. The articles featured a variety of study designs, including Randomized Controlled Trials (RCTs) (n = 5; 55.6%) [19,22,24,27,28], project studies (n = 2; 22.2%) [20,23], quantitative studies (n = 1; 11.1%) [21], and qualitative studies (n = 1; 11.1%) [26] (Table 1).

The studies were conducted in several countries, including the USA (n = 3; 33.3%) [19,26,27], Australia (n = 1; 10%) [28], Canada (n = 2; 22.3%) [20,22], the United Kingdom (n = 1; 10%) [21], Italy (n = 1; 10%) [23], Germany (n = 1; 10%) [24], and Portugal (n = 1; 10%) [25].

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Table 1. Characteristics of the Studies Included.

Characteristic	Frequency (n = 10)	Percentage
	Publication year	
2023	1	10%
2022	3	30%
2021	1	10%
2020	1	10%
2019	1	10%
2018	1	10%
2013	1	10%
2012	1	10%
	Geographical distribution	
Western Countries	9	90%
Usa	3	33.30%
United Kingdom	1	11.10%
Germany	1	11.10%
Canada	2	22.30%
Italy	1	11.10%
Portugal	1	11.10%
Eastern countries	1	10%
Australia	1	100%
	Type of studies	
Primary	9	90%
Qualitative Study	1	11.10%
Quantitative Study	1	11.10%
Randomized Control Study	5	55.60%
Study project	2	22.20%
Secondary	1	10%
Review	1	100%

The combined patient sample from these studies totaled 713, ranging from as few as 12 to as many as 200 patients per study.

The included studies were divided by topics of investigation: intervention, management/monitoring, and education. Most of the studies focused on monitoring and management (50%) [20–23,27]; only two studies investigated the educational aspect (20%) [19,24], and three reports described clinical interventions (30%) [25,26,28].

This scoping review aimed to explore the use of telemedicine interventions and IoT technologies to improve nutritional outcomes and quality of life in individuals with previous stroke and cognitive impairment. The results were analyzed according to the purpose of using IoT technologies (Table 2 and Figure 2).

Table 2. Data Extraction of Included Studies.

Author	Country	Study design	Sample	Comorbiditi es	Settin g	Topic	Tele-healthcare interventio n	IoT tool	Objective Findings
Eskin Y et al., 2012 [20]	Canada	Study project	NA	Cognitive impairment Dementia	Home	Monitoring	Nutritional analysis monitoring dietary patterns	Image capture Food recognition algorithms based on machine learning Portion estimation tools.	Achieved an 87.2% recognition accuracy Achieved reliable nutritional assessments

									by identifying and estimating food portions
Rimmer JH et al., 2013 [27]	USA	RCT	Patients (n = 102)	Multiple sclerosis Spina bifida Cerebral palsy Stroke	home	Monitoring	Weight manageme nt program	Telephone coaching Web-based remote coaching tool Physical activity plus nutrition (POWERS^{plus})	Significant group-time interaction in post-intervention body weight POWERS and POWERS^{plus} groups demonstrate d greater reduction in body weight compared with the control group
Kosch T et al., 2018 [26]	USA	Qualitative study	Patients (n = 12)	Cognitive impairment	home	Interventio n	Food preparation	Smart intelligence kitchen	Creation of calorie and nutrition aware contextual cooking plans Semantic cookbook to share your recipes between smart kitchens and display them on an output device
Casaccia S et al., 2019 [23]	Italy	Study project	NA	Cognitive impairment	Senior centre	Manageme nt	Self-manage (various activities including nutrition)	Modular integrated platform Open Application Programming Interfaces Wearable devices Lifestyle monitoring systems	NA
Amella K et al., 2020 [19]	USA	RCT	Patients (n = 60) Caregivers (n = 60)	Cognitive impairment Dementia	Respit e Care Center s	Education	Trainer mealtime interventio n	Video conferencing Digital communication platforms C3P Model	Weight maintenanc e or gain of the person with dementia Improving QoL of caregiver
English C et al., 2021 [28]	Australi a	RCT	Patients (n = 80)	Stroke	Home	Interventio n	Dietary Interventio n (AusMed diet program)	“Attend Anywhere” system	Feasibility

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							Provision of supporting resources		Safety
						Education	Education about physical activity and healthy eating	"Zoom" video conferencing	Reducing recurrent secondary stroke risk factors (blood pressure, physical activity levels, diet quality). Fatigue, mood, and quality of life at 3, 6, and 12 months.
Sakakibar BM et al., 2022 [22]	Canada	RCT	Patients (n = 126)	Stroke	home	Manageme nt	Stroke Coach telehealth self-manageme nt program	SmartDiet Questionnaire	Post-intervention results showed no significant differences in lifestyle
Scheerbau m P et al., 2022 [24]	German y	RCT	Patients (n = 200)	Cognitive impairment	home	Education	Nutritional counselling .	CCT Online counselling.	NA
Neves PA et al., 2022 [27]	Portuga l	Review	NA	Cognitive impairment	NA	Interventio n	Food intake detection	Inertial sensors Acoustic sensors, Cameras	Mapping the use of sensors for the detection of food intake episodes is an exciting field
				Dementia				Electroglotography and piezoelectric sensors	
Fletcher-Lloyd N et al., 2023 [21]	UK	Quantitati ve study	Househol ds (n = 73)	Cognitive impairment	Home	Monitoring	Monitoring living activities	PIR motion sensor (kitchen)	Increase in daytime kitchen activity
				Dementia				Fridge door sensor.	Significant decrease in nighttime kitchen activity
				Alzheimer's Disease				Kettle sensor Oven sensor	Potential changes in eating and drinking habits

Legend: RCT: Randomized Controlled Trial; C3P: Change the Person, People, and Place; QoL: Quality of Life; PIR: Passive Infrared Motion; CCT: Computerized Cognitive Training; POWER: Personalized Online Weight and Exercise Response System.

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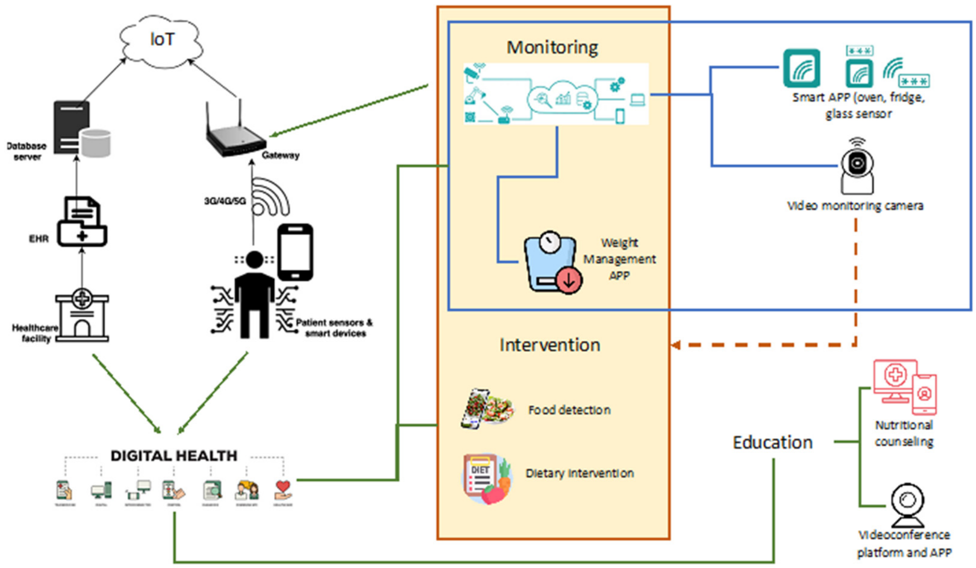

Figure 2. IoT Application in Home Nutrition Management. Legend: EHR: Electronic Health Record; IoT: Internet of Things; APP: Web or Mobile Application; 3G/4G/5G: Mobile Network Connectivity.

3.2. Education

Two studies [19,24] described the application of IoT technologies aimed at providing nutritional education for both patients and caregivers.

Amella K. et al. [19] demonstrated the effectiveness of a telemedicine-based meal training program through the use of video conferencing and digital communication platforms, which led to weight maintenance or gain for the person with dementia and improved quality of life for the caregiver. The study analyzed an approach called "Partners at Meals" (PaM), which involved a "train-the-trainer" program for volunteers at Respite Care Centers (RCC). The program included two initial training sessions (60-90 minutes) conducted by a research team trained in the C3P (Change the Person, People, and Place) method. The telemedicine platform used was "Doxy.me." The PaM program is based on the C3P model, which focuses on three factors that influence eating behavior: the person with dementia, the people involved in the meal, and the place where the meal takes place. However, the study does not report preliminary results but lays the foundation for examining the effectiveness and sustainability of a telemedicine program to help families manage meals at home while promoting the quality of life for both the caregiver and the person with dementia.

Similarly, Scheerbaum P. et al. [24] described a fully digital study protocol for an RCT aimed at evaluating the effectiveness of Computerized Cognitive Training (CCT) tools and online group nutritional counseling for people with mild cognitive impairment.

Individualized and basic computerized cognitive training tools are used, both delivered via software designed to improve the cognitive abilities of participants. The software uses machine learning algorithms to adjust the difficulty of the games based on the individual user's performance. Online group nutritional counseling is also provided: the intervention involves biweekly 1.5-hour online group sessions, focusing on a whole-food, plant-based diet or a healthy diet according to the guidelines of the German Nutrition Society.

The IoT technologies used in the protocol include video conferences, telephone interviews, and online questionnaires.

3.3. Monitoring and Management

Monitoring and management were investigated in five studies (50%) [20–23,27].

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Eskin et al. [20] described a "Smart Nutritional Assessment System" designed to help people with dementia monitor their diet effectively from home.

The technologies used are based on a "Computer Vision" system that uses food recognition and portion estimation algorithms to analyze images of meals. A photographic dataset of common foods is used to train the algorithms, with a webcam placed above the plate to capture the meal's image. The system begins with plate segmentation and then focuses on food recognition. A method based on the color and shape of the plate is used, after which food recognition occurs. Different types of features, such as color, texture, and shape, are explored to describe the food in the image, and different classifiers (logistic regression, artificial neural networks, and support vector machines) are used to determine the food category. The information is stored in an image dataset to train and evaluate the algorithms. The system achieved an 87.2% accuracy in food recognition using the dataset created for the project.

Fletcher et al. [21] analyzed a Markov chain model to identify changes in the daily activity patterns of people living with dementia. This model is used to analyze kitchen activity data and identify stable behavior patterns, aiming to detect any anomalies. The study used home monitoring data collected from 73 households with at least one member experiencing cognitive impairment, using Internet of Things (IoT) technologies. The sensors included a passive infrared motion sensor, a refrigerator door sensor, and smart plugs for appliances (kettle and oven).

The study presents three case studies that demonstrate how the Markov chain model can detect changes in behavior in people with dementia. Malnutrition and dehydration are strongly associated with cognitive and functional deterioration in people with dementia. The study highlights the importance of detecting changes in daily activity patterns through home monitoring via IoT technologies, which can monitor and quantify behavior patterns. The Markov chain model effectively identified behavior changes using home monitoring data.

The randomized controlled trial by Sakakibara et al. [22] described the use of a telemedicine coaching program called "Stroke Coach" to improve self-management for secondary prevention after stroke. The study collected data from 126 participants diagnosed with stroke. These patients were followed by a telemedicine coaching program that included individual teleconsultation sessions with a specialized coach. The study used the SmartDiet questionnaire to monitor the nutritional aspect, including daily fat consumption, medication adherence, and body composition. The Stroke Coach system led to significant improvements in quality of life and glucose control (HbA1c) compared to the control group, suggesting its effectiveness in the nutritional management of patients post-stroke.

The study project by Casaccia et al. [23] presents the similar project, RESILIEN-T, which aims to develop a modular Information Communication Technology (ICT) system to help people with early cognitive impairment self-manage their health. The project involves wearable sensors (smartwatches), home monitoring systems, and tablets for communication and data management. While specific results were not presented, the system architecture and technological approaches were described. The system offers three versions—Basic, Plus, and Home—focused on self-management of health. The Basic version includes basic nutrition services, providing users with content and nutritional suggestions via an app.

Rimmer et al. [27] examined the effect of a 9-month, telephone-based remote weight monitoring and management program for people with physical disabilities using a web-based system called "Personalized Online Weight and Exercise Response System" (POWERS). One hundred two participants with physical disabilities (e.g., spinal cord injury, multiple sclerosis, spina bifida, cerebral palsy, stroke, or lupus) were enrolled and randomized into one of three conditions: exercise alone (POWERS), exercise plus nutrition (POWERSplus), and control. The POWERSplus group received an identical intervention to the POWERS group but with added nutritional support. Post-intervention differences in body weight were found between groups. The POWERSplus group demonstrated greater weight reduction compared to the control group. The study suggests that a low-cost telephone intervention supported by a web-based remote coaching tool may be an effective strategy for helping overweight adults with physical disabilities maintain or reduce their body weight while adhering to an adequate nutritional regimen.

3.4. Intervention

English et al. [28] presented the protocol for a pilot randomized controlled trial to evaluate the feasibility, safety, and potential efficacy of a 6-month physical activity and/or diet (PA and/or DIET) intervention delivered via telemedicine for people who have had a stroke. The project will enroll 80 adults who have experienced a stroke, live at home with internet access, and can perform physical activity. The trial will deliver PA and/or DIET interventions via telemedicine, using video calls to provide support and instruction. Parameters will be monitored using an activPAL device (for physical activity), a blood pressure monitor, and a glucose monitor. Nutrition will be managed through telemedicine support, including education, resources, and advice from an accredited dietitian on adherence to the AusMed (Mediterranean-style) diet. Although results are not yet published, the study emphasizes the importance of physical activity and a quality diet in secondary stroke prevention.

The recent systematic review by Neves et al. [27] focused on the various methods and technologies used for food intake detection. The article analyzes 30 studies that employed different technologies, such as cameras, inertial sensors, acoustic sensors, electrogastrography, and piezoelectric sensors, to detect food intake in patients with conditions like diabetes, functional dyspepsia, and cognitive impairment. The number of participants varied from study to study, ranging from a minimum of 6 to a maximum of 100. The review highlights that there is still no standard method for food intake detection, though methods based on deep learning and neural networks are the most commonly used.

Cameras are the most frequently used sensors for food recognition and classification, but the system still requires user participation to take pictures of the food. Acoustic sensors present challenges in terms of positioning and sensitivity. While integrating multiple sensors could improve the accuracy of food intake detection, further research is needed to enhance accuracy, feasibility, and acceptability for people with cognitive impairment.

The qualitative study by Kosh et al. [26] explored the design requirements for smart kitchens tailored to people with cognitive disabilities. The study involved 12 people with cognitive disabilities, along with 4 employees and volunteers who supervise residents, participating in interviews. Participants were between 30 and 49 years old. The study highlights the potential of using interactive technologies to support common kitchen activities in assisted living facilities. These technologies could reduce the workload of volunteers and allow residents to learn cooking skills more independently, thereby improving their nutritional status.

4. Discussion

This scoping review examined current technologies used to manage and care for the nutritional needs of individuals post-stroke or with cognitive impairment. The use of technology encompassed three domains: (1) monitoring and management, (2) intervention, and (3) education. Nutritional monitoring and assessment are essential components of the nutritional process, allowing for the detection and treatment of poor nutritional status, as well as understanding the effectiveness of interventions [29].

The most prominent area of technology use was software applications (50% of the studies) [20–23,27], designed to monitor and manage nutritional status. Casaccia et al. [23] explored the use of ICT technologies through wearable sensors (smartwatches), communication and data management systems, and home monitoring devices. Similarly, Fletcher et al. [21] and Sakakibara et al. [22] emphasized the key role of telemedicine in managing nutritional aspects for individuals with cognitive impairment.

Telemedicine has certainly emerged as one of the most versatile and well-researched tools in the last decade, particularly for remote hospital management. A recent satisfaction survey revealed a high rate of satisfaction, with over 95% of patients reporting positive experiences [30].

In populations such as post-stroke and cognitively impaired individuals, the specificity of nutritional needs requires personalized nutritional management. The greatest challenge is to keep the dietary plan consistently accessible to the user, while monitoring and educating them through

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specific interfaces and programs, often supported by IoT technologies [31]. These tools provide personalized nutritional assistance by qualified healthcare professionals [32].

Cutting-edge approaches for automated food intake recording utilize image recognition to assess food and portion sizes, often using phone cameras [33,34]. Data are typically collected in cloud databases, where they are processed and stored, as demonstrated in a study by Eskin et al. [20], which aimed to help individuals with dementia monitor their diet effectively from home. This approach is supported by a systematic review by Neves et al. [25] and recent studies on the topic [35,36]. These systems enable meal plans to be accessible anywhere and act as a data collection mechanism for recording macronutrients, micronutrients, and hydration levels [31].

The reviewed applications recognize the specific needs of post-stroke patients and the importance of personalized recommendations to improve nutritional outcomes. However, there is an increasing need for standardized application interfaces to improve usability and personalize content [37].

Nutrition education plays a key role for post-stroke patients. The most commonly used IoT tools for education are video conferencing and digital communication platforms. These systems employ various learning media, including apps, web-based platforms, game-based learning, and online tools [38]. Amella K. et al. [19] demonstrated the effectiveness of a telemedicine-based nutritional training program, which led to weight maintenance or gain in individuals with dementia and improved quality of life for caregivers. This was achieved through online counseling, as also described by Schherbaum et al. [24], who developed a program of CCT and online group nutritional counseling for individuals with mild cognitive impairment.

The included studies reflect a growing interest in the use of the IoT, such as fitness trackers and sensors, to support post-stroke patients. IoT technology enables the continuous collection of health data and the reporting of results in general chronic care [39–41]. This review highlights applications focused on the nutritional aspect, demonstrating that the integration of nutrition and technology can effectively support patients with cognitive impairment.

The development of such projects requires close collaboration between different professionals; nurses, doctors and engineers collaborate to create shared knowledge and it is very important to manage collaborations according to precise protocols, as described in a recent study [42]. In the development phases the software systems standardization is an essential first step, especially for monitoring, nutritional planning, and education, through simple and accessible platforms.

4.1. Strengths and Limitations

It should be noted that while this review provides an overview of current applications of the Internet of Things in the management, monitoring, and nutritional education of patients post-stroke or with cognitive impairment, it has some limitations. Variability in study designs, heterogeneous patient samples, and differences in outcomes make it difficult to establish definitive recommendations. Additionally, the lack of standardization in the use of IoT technologies and the varied experimental approaches may impact the interpretation of the data. The unique challenges posed by the specific study population add an extra layer of complexity to the overall management strategy. This review is intended as a starting point for future research and trials, which should aim to address these limitations through the adoption of standardized IoT tools and a focused approach to populations with these specific diagnoses.

5. Conclusions

The nutritional management of patients post-stroke or with cognitive impairment, when done remotely through the use of IoT technologies, remains a significant health challenge and is still underdeveloped. Nutritional monitoring, therapeutic interventions, and education require a highly personalized approach, involving targeted education, standardized treatment protocols, and a deep understanding of the interactions between technology and users. Our findings illustrate how the Internet of Things is transforming nutritional counseling and remote education processes, helping to reduce the risk of malnutrition in complex patients with cognitive impairment.

Currently, there is no standardized approach, as evidenced by the heterogeneity of the results. This indicates the need for further research and experimental designs with a more rigorous and consistent focus, to consolidate current knowledge and provide a solid foundation for future clinical interventions. The integration of IoT-based strategies into existing care models could represent a significant step forward in optimizing clinical outcomes for patients post-stroke or with cognitive impairment.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org, Table S1: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist; Table S2: Search Strategy.

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