# Systematic literature review of healthcare services for the elderly: trends, challenges, and application scenarios

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## Article Info

## ABSTRACT

In recent years, healthcare for the elderly has received attention from researchers worldwide in the context of global aging. This paper provides a comprehensive overview of healthcare services for older people from 2019 to 2023, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology to screen published papers in the Web of Science database, and identifies three different application scenarios for healthcare services for older people after analyzing the research objectives of the selected papers. This study examined the common health problems and needs of older adults, and the key parameters used to assess healthcare services for this population. This review also explores how healthcare providers can promote healthy aging and prevent age-related diseases in older patients. This study further evaluates the background and application areas of the papers and explains the methodology of the main ideas proposed in the studies. The review concludes with an analysis of the main trends and challenges that are likely to emerge in healthcare services for older people.

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## 1. INTRODUCTION

The definition of health is formulated by World Health Organization (WHO) in 1947 as a state of complete physical, mental, and social well-being, not just the absence of illness or infirmity [1]. More than 50 years later, Health has been defined as a state associated with freedom from illness, disease, and debilitating conditions, which also includes those associated with quality of life and positive well-being [2]. With this change in the definition of health, health has shifted over the last decade towards healthcare services rather than disease services [3].

Healthcare services can also be considered as healthcare delivery services, nested within the healthcare system, which in turn is nested within the health system [4]. Indeed, healthcare services are intangible and cannot be touched, felt, seen, measured, or administered directly in the same way as other products or services [5]. On the other hand, healthcare services are characterized by their real-time nature, which dictates that the process of their production and consumption appear and disappear simultaneously, rather than storing them for later uses [6]. Based on the above characteristics of healthcare services, it was determined that traditional methods do not apply to their associated treatments.

Healthcare service for the elderly is a complex concept that encompasses physical, mental, and social well-being and is influenced by a range of internal and external factors [7]. Healthcare services refer to the provision of medical treatment, care, and support to the elderly who are experiencing health issues or seeking

to maintain good health [8]. Some examples of elderly healthcare services include routine medical check-ups, treatment for illnesses and injuries, surgery, rehabilitation and therapy services, mental health counseling, preventive care, health education, and the management of chronic health conditions [9]. The goal of elderly healthcare services is to promote and maintain the health and well-being of individuals, prevent and treat illness and injury, and improve the quality of life of patients and their families [10]. Depending on their condition, older adults require more healthcare and specialist care, which may put pressure on the healthcare system [11].

With the global slowdown in population growth rates across the board, there is a growing conflict between the acute shortage of healthcare resources and the increasing number of older adults [12]. To address this problem, it is necessary to provide increasingly personalized healthcare services for the elderly [13]. One of the global issues to be addressed is how to provide timely healthcare for the elderly while reducing healthcare costs [14]. As the population ages, the need for healthcare services tailored to the needs of older adults has increased. This demographic change has preempted several challenges in providing effective care and support to the elderly population.

While there has been much research into various aspects of care for older adults, there is still a need for more research on how to improve quality of life [15]. One area that requires further attention is the integration of new technologies available in healthcare services for the elderly [13]. As technology advances, there are opportunities to increase accessibility and quality of care for senior citizens. However, research on the effectiveness of these technologies in improving health outcomes in older patients [16]. The role of caregivers in providing healthcare services to older adults is another area that requires further research. Caregivers play a key role in supporting the mental and physical needs of elderly individuals. However, research on the impact of caregiver interventions on patient outcomes is limited [17]. Finally, there is a need to incorporate mental health treatments into primary healthcare research on older adults [13]. Depression and anxiety disorders are common among older adults; however, according to previous research, mental health services for this group are often severely underserved [18]. It is necessary to investigate how to improve accessibility to mental health treatments and the effects of these services on the overall health outcomes of older people.

An aging population and customer expectations have greatly diversified today's demand for healthcare services for the elderly, putting a lot of pressure on healthcare services for the elderly in many countries [19]. From a social equity perspective, everyone, especially older adults, should have access to healthcare services equally, but it is challenging to achieve this level of equity due to economic and geographic issues [20]. Older adults generally have poorer health than the rest of the population, higher rates of multiple diseases and chronic diseases, and their demand for healthcare services is increasing [7]. In addition, medical costs have been recorded for the elderly much higher than for other age groups. Therefore, to effectively reduce medical expenses while meeting the healthcare needs of different populations, it is necessary to conduct in-depth research and discuss healthcare services for the elderly.

The goal of this study was to present a comprehensive analysis of elderly healthcare services. Even though older people are an important application scenario in healthcare services, in surveying existing research in this area, we found no complete or detailed review. Therefore, these gaps and deficiencies were the impetus for this study. In summary, this study offers a thorough examination of the current state of healthcare services for the elderly and discusses future trends.

The following are the significant contributions of this study: i) review of current problems in healthcare services for the elderly; ii) preparing a systematic review of existing approaches to healthcare services for the elderly; iii) a brief overview of important application scenarios for future research on elderly healthcare services.

The rest of this paper is structured as follows. The existing literature is presented in Section 2, and Section 3 explains the study's methodology. Section 4 summarizes the findings of this study. The findings of this study are presented in Section 5, along with recommendations for future research.

## 2.  RELATED WORKS

Xie [21] examined user characteristics in Chinese geriatric healthcare services and proposed a novel method for identifying and creating specific user groups in mobile healthcare services. Menghi [22] provided a variety of customized services and optimized the reuse of local resources. Caliskan [23] aimed to identify young GPs' attitudes toward older people using the UCLA Geriatrics Attitude Scale (UCLA-GAS). An aged healthcare service system is composed of a two-echelon EHS supply chain (EHSSC) [24]. The problem of how the elderly service provider (ESP) and the elderly service integrator (ESI) make decisions and engage in cooperation and competitiveness has been addressed using a game-theoretic approach [25]. To assess the accessibility of urban primary health care services and to aid policymakers in better resource allocation in the reorganization of existing welfare systems, this study aimed to bridge the gap between practical and scientific

[20]. It discovered that data from policymakers, the customization and operations of the nursing facility, the availability of healthcare providers who speak the MiG language, and the organizing of care facilities into a mix of elderly members from majority and minority all had an impact on the preparation, initiation, and maintenance of specific to nursing homes [26].

The shortcoming is that the upper-level design and general preparation are still mostly at the pilot stage. It proposes to investigate how to engage in social work in smart ECSS to improve the quality of services based on the primary basis to address these difficulties [27]. A two-part model based on the modified Andersen Behaviour Model (ABM) was created to analyze the variables of health service utilization among the poor elderly [7]. The care practices utilized by healthcare personnel in services to draft wills for older people with dementia in their daily lives and the final stage of decision-making support have been described in detail [28]. Zhou [29] analyzed scenarios and patterns for the application of cyberspace in medicine, including hospital oversight, diagnosis, forecasting, prevention, progression delay, rehabilitation, assisted living, fellowship, supervision, and other mental health domains. In 2019, an extensive household-based investigation was conducted in rural riverfront settlements on the left riverbank [30]. According to the Mini Nutritional Assessment tests, nearly half (49.7%, n=161) of the included elderly patients were undernourished or threatened by malnutrition [31]. Wang [32] developed an analysis model of parameters influencing the usage of wireless healthcare apps by older adults by combining a scientific acceptance method, security incentive theory, and imagined risk concept. The authors focused on variables related to drug adherence in elderly individuals in a qualitative investigation [33]. The R&D group utilized clinical studies to create a prototype of remote healthcare "SMART" to improve the psychological well-being of older people with COVID-19. This was done to close the service gap between the supply and demand sides of telehealth, investigate the proof-based method to combine care, address difficulties with aged policies, and lay the groundwork for the development of data-driven and community-based telemedicine. To establish Evidence-Based Medicine (EBM), Cheng [34] investigated the mechanisms of psychological disease preparedness, involving the collection, integration, and synergy of health parameters linking the three health service pipelines of response, intervention, and social variables.

Population aging has brought a series of problems including social, economic, psychological, medical, and so on. The provision of healthcare to older populations is closely related to factors such as age-related physical changes, chronic diseases, and anatomical and physiological changes [35]. The current situation highlights the importance of healthcare services for the elderly, which have not only curative but also preventive and hygienic purposes and are oriented toward medical assistance for the elderly population [36]. Existing literature reviews tend to focus on universal healthcare services [37]–[39], with little focus on the specific needs of older populations. The reason for this phenomenon may be that the needs of the elderly are more scattered, including but not limited to physical, mental, economic, social, and other aspects [40], [41]. Healthcare services for the elderly require a more comprehensive and in-depth review than the rest of the population to identify trends, challenges, and application scenarios that are unique to them.

## 3. RESEARCH METHOD

Based on the available literature, a variety of approaches to systematic literature reviews (SLRs) are recommended, such as traditional SLR, rapid evidence assessment (REA), meta-analysis, scoping review, realist review, and umbrella review [42]–[47]. For better analysis of elderly healthcare services, SLR was performed using PRISMA (the preferred reporting item for systematic reviews and meta-analyses) in this section. PRISMA provides a comprehensive checklist to assess the quality and completeness of reporting in systematic reviews and meta-analyses [48]. PRISMA is widely recognized and recognized by leading journals and other organizations as a tool to improve the quality of systematic reviews and meta-analysis reports [49]. It involves a systematic and structured approach to searching, selecting, analyzing, and synthesizing relevant research to answer a research question or solve a specific question.

The SLR approach was used in this section to review the existing literature on healthcare services for older adults. To comprehensively explore the relevant research, the research methodology is shown in Figure 1.

### 3.1. Systematic literature review

A systematic search, screening, evaluation, and integration of existing research literature are known as a systematic literature review (SLR), and it is a technique used to identify, analyze, and synthesize all pertinent studies on a particular topic or significant trend [50], [51]. SLR allows for an in-depth understanding of the nature of the research questions, identifies the strengths and weaknesses of existing research, and provides directions and recommendations for future research by screening and integrating a large body of related literature [52]. With a clear research question, a transparent search strategy, and a rigorous approach to literature screening, evaluation, and integration, SLR can reduce subjectivity and bias and improve the

credibility and persuasiveness of research [53]. By systematically integrating and analyzing existing research findings, SLR can avoid duplication of research, and waste of resources, and improve research efficiency and effectiveness [54]. Despite the widespread use of healthcare services for older adults, there is currently no systematic research in this area. Therefore, the objective of this study was to systematically investigate and analyze the latest methods in the area of health care services for the elderly.
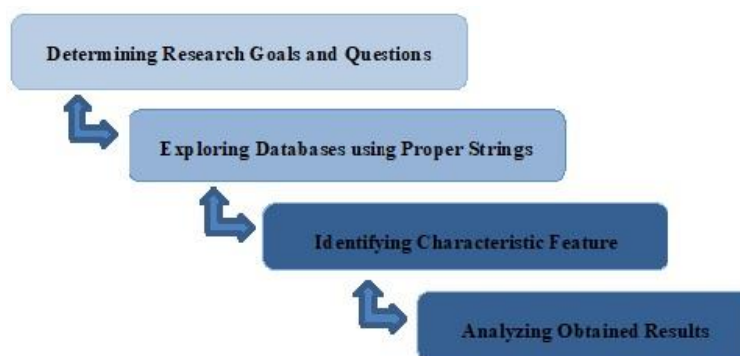


Figure 1. Selected research methodology

## 3.2. Question formalization

To better structure the SLR methodology, we present a series of foundational research issues that have guided the development of this study approach. For research-related review articles, we used three main research questions that are discussed in subsequent chapters on the adopted techniques. Question 1: What are the common health problems and needs of older adults? Question 2: What are the key parameters for assessing healthcare services for older adults?

## 3.3. Search strategy

Web of Science, one of the top scientific literature retrieval systems, was chosen as the search database for this study, with data from more than 14,000 scientific journals and conference proceedings from over 100 countries and regions worldwide [55]. The Web of Science includes a wide range of literature, including not only common types of literature, such as journals and conference papers, but also patents, technical reports, and books. It covers an extensive scope of topics, including scientific disciplines, academics, and social sciences, and provides powerful search capabilities, allowing one to search by author, title, and keywords, with results that can be further filtered and sorted [56].

A further search of the Web of Science database was performed to select relevant, high-quality studies. An exhaustive literature review was carried out in the Web of Science database following PRISMA guidelines, using the search keywords (("e-Health" OR "Healthcare" OR "Health") AND ("elderly") AND ("Services")).

## 3.4. Question formalization

To select good-quality literature for analysis, we selected only academic journal papers on healthcare services for older people, excluding other forms of research such as notes, surveys, working reports, book chapters, Ph.D. and Master's theses, and review papers. We surveyed in April 2023 and used the well-established report of the first-choice for systematic review and meta-analysis (PRISMA) declaration. The main steps based on the PRISMA statement are outlined in the next section as presented in Figure 2.

A full-text review of all the research papers was carefully completed to select those that were appropriate for revision and specifically addressed healthcare services for older adults. Table 1 summarizes the criteria of inclusion and exclusion used to include relevant papers and remove irrelevant papers. Based on these characteristics, 23 articles were selected for further analysis.
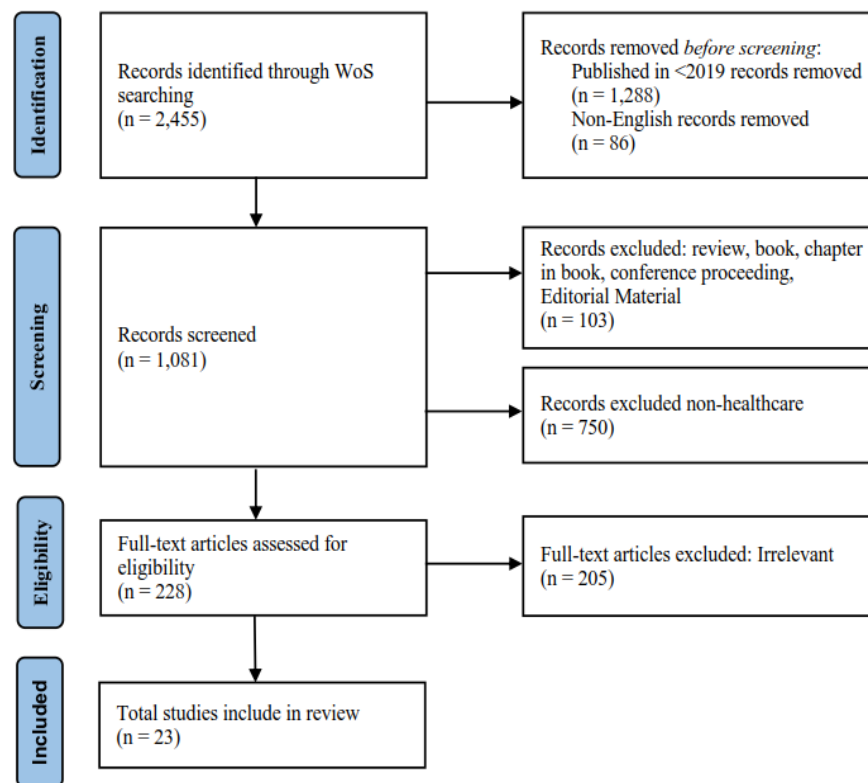
Figure 2. The PRISMA flow chart

Table 1. Criterion of inclusion and exclusion

| Criterion | Inclusion | Exclusion |
|---|---|---|
| Literature type | Journal (research articles) | Conference proceedings, journals(review), books, chapters in a book, book series |
| Language | English | Non-English |
| Timeline | Between 2019 to 2023 | <2019 |
| Subject area | Healthcare relationship | Non-healthcare |

## 4. REVIEW OF SELECTED PAPERS

### 4.1. Affecting factors on healthcare services

Previous research has focused on tracking the demand for different social care and healthcare services, building and operating urban elderly centers, identifying substitutes for hospital stays, instructing physicians and incorporating them into the healthcare industry, developing supportive and nursing services, performing functioning casework, and maintaining greater autonomy over the availability and quality of healthcare and social care [35]. This study highlights the need for a thoughtful and proactive approach to the outstanding service rates and costs of mental healthcare in the next generation and a comprehensive analysis of population data to estimate the utilization and costs of a variety of care and health services by gender and age, which can inform policy or practice in the healthcare sector [57]. The proposed secure and trusted healthcare monitoring (STHM) architecture uses blockchain technology and software-defined network (SDN) communication to provide a reliable and efficient healthcare monitoring system for protecting healthcare monitoring systems and patient privacy [58]. Based on the fact that the prevalence of mobile medical facilities among the elderly is still low, this study suggests a confidence transfer framework to examine the original trust-building procedure of mobile healthcare services for elderly users [59]. The findings showed a major connection between offline healthcare service trust and mHealth service trust, which in turn influences mHealth service intention. This study suggests that similar patterns can be expected for trends in care use due to interactions in other countries that face similar challenges owing to an aging society [60]. Their proposed fall detection framework, FallDeF5, uses a 5G-based deep gated recurrent unit (DGRU) network that can be further improved and integrated with existing healthcare systems to provide timely and effective assistance to older people at risk of falling [61]. The standard of life and functional level of the elderly in Europe are generally acceptable, but some problems such as mental and physical disorders, sociodemographic factors, and aging are linked to low rates of both LoF

and QoL [62]. This study offers a paradigm for modeling diabetes, heart disease, and dementia. The importance of considering the impact of lifestyle interventions on dementia also highlights their impact on diabetes and cardiovascular diseases when assessing their joint effects [63].

### 4.2. Non-contact monitoring equipment

The roadblock of information-physical contact and integration in healthcare services for the elderly can be accomplished with the help of a digital twin, which strongly supports cloud-based healthcare services for the elderly [64]. The proposed system model uses deep convolutional neural networks and an IoT framework to predict falls accurately in real-time, and it can improve the efficiency of data transmission and dataset analysis [65]. They also proposed future research directions, such as exploring the use of wearable devices for health monitoring and enhancing fall-detection algorithms' precision. The suggested system includes a smart low-cost solution for monitoring the elderly with multiple unique features, a fitness bracelet containing multiple sensors with Bluetooth connectivity, instantaneous anomaly identification and communication mechanisms, an emergency doctor call, reassurance for the elderly, and three-way tracking [66]. Using wearable sensors, edge computing, and streaming data processing to identify falls immediately and send alerts to healthcare providers, the system's continuous patient tracking framework for fall detection is effective, efficient, and applicable to different healthcare environments [67]. A location-based search system for mobile healthcare facilities for the elderly uses smartphone based on global positioning system (GPS-based) location information and a mobile push system to help the elderly find nearby medical centers or clinics to meet their needs [68]. The proposed multimedia system for monitoring older adults in their residences has the chance to enhance their quality of life by providing online medical monitoring and quick detection of important events [69]. This method uses three environmental assistance organizations and an emergency response to detect abnormal health conditions in the home environment of older adults. The proposed approach of using a covariance matrix from multiple wearable sensors for fall detection showed promising results for performance improvement over unique sensor-based technologies [70]. Overall, this study makes a valuable contribution to the field of fall detection and highlights the potential benefits of implementing such solutions in the healthcare environment.

### 4.3. Utilizing assistive technology and tools

Mobile health systems have greatly facilitated the work of healthcare professionals in identifying, tracking, and interacting with the elderly. It is crucial to disseminate knowledge about geriatric healthcare and e-health to raise the standards of elderly healthcare [71]. The proposed model for fall detection in artificial intelligence, edge computing, fog computing, and IoT technologies overcomes the limitations prevalent in data storage, acceleration, and monitoring [65]. Specifically, the system model uses a deep convolutional neural network and an IoT framework to predict falls with high accuracy. This study proposes a smart healthcare architecture for aural eldercare using the internet of medical things (IoMT) [72]. These technologies improve healthcare for older people by providing real-time tracking of human behavior and remote health. The authors developed a hybrid deep learning algorithm for real-time online fall recognition, trained offline using a publicly available dataset named MobiAct [73]. The test results demonstrate that the suggested system can identify falls and non-falls more precisely than cutting-edge methods. This paper discusses the use of text mining, artificial intelligence (AI), and cloud computing techniques in the development of an adaptable medical decision-making system for the care planning of chronically ill patients in nursing homes [74]. The suggested system is an interpretable blockchain-based eHealth system that has the benefits of minimal hardware consumption, substantial protection level, and steady performance [75]. However, further research is required to improve the system's blockchain network to support more patients and doctors. The iRestroom system is designed as a multisensory place with connected devices, where carriers of elderly people can access interactive materials and services in their daily activities [76]. The system incorporates IoT, sensors, smart systems, and machine learning technologies to track the health of elderly individuals living alone and to avoid accidents such as falls. They proposed a virtual reality-based system called BiomacVR, which has been applied to home physical training for post-stroke patients, allowing the use of depth sensors to accurately analyze human posture and movement during rehabilitation exercises [77].

### 5. CONCLUSION

This review offers a thorough overview of healthcare services for older adults, as well as previous studies in this area. Using the PRISMA process methodology, we conducted an in-depth analysis of the Web of Science databases for journal articles published within the previous five years, resulting in the selection of 23 papers. Based on the analysis above, we identified the three most common scenarios for elderly healthcare services. First, we summarized the factors that influence the quality of healthcare services for older people:

monitoring user needs, estimating utilization, accounting for costs, building trust mechanisms, protecting individual privacy, allocating healthcare resources, collecting feedback on use, and personalizing services. Current research is limited to a few of these factors and there is a lack of a common platform or framework for integrating and balancing these factors. Second, to expand the application scenarios of health monitoring for older people, various monitoring equipment, especially non-contact monitoring equipment, are increasingly being used in the daily elderly healthcare system. However, there is very little literature on real-time monitoring or crisis warnings for older adults and more studies are needed in this area. Third, a variety of existing systems and frameworks utilizing assistive technologies and tools, together with novel technologies (e.g., edge computing, the IoMT, fog computing, hybrid deep learning, blockchain, and virtual reality) are being used in healthcare services for older people.

To extend healthcare services to a wider range of application scenarios for older people, future research should consider emerging trends and unresolved issues such as healthcare resource optimization, online consultation, patient population analysis, clinical trial design, medical insurance claims, and drug development. Several research directions should be pursued in the future for elderly healthcare services. First, further empirical research is required to evaluate the effectiveness and efficiency of these services for improving patient prognosis, reducing costs, and improving access to care. Second, there is a need to investigate ethical and legal issues associated with cloud-based healthcare services, particularly regarding the security and privacy of patient data. Third, previous studies pay mainly attention to the analysis of physical health factors of the elderly, while research on the mental health of the elderly has not been fully developed or systematic. Improved mental health is essential for enhancing older people's quality of life, especially for those with chronic diseases. Therefore, future studies should focus on maintaining and improving mental health in older adults.

However, this study had several limitations. First, this article was only initially researched using the following keywords: "healthcare services, elderly healthcare, and elderly health." Second, this study was limited to the Web of Science online database, which may not comprehensively cover the literature on this subject. In addition, many other publishers and journals were not covered, which could provide content for more comprehensive coverage of healthcare services for older adults. Finally, this review did not include journals written in a non-English language, although some studies on healthcare services for older people are being conducted and published in other languages.

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