



Telemedicine for Monitoring Nutritional Intake in Malnourished Community-Dwelling Elderly: A Scoping Review of Clinical Trials

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ABSTRACT

Malnutrition is a part of the geriatric giant and a major concern among community-dwelling elderly individuals. Improper intervention of this problem can have detrimental effects on the elderly. Monitoring nutritional intake plays a vital role in managing malnutrition. Telemedicine has been widely applied for managing chronic diseases and gained prominence during the COVID-19 pandemic as a remote health monitoring method. This scoping review aims to identify the advantages and limitations of implementing telemedicine for addressing malnutrition in community-dwelling elderly. This study reviewed the literature obtained through a systematic search of PubMed and Science Direct databases, supplemented by manual searches based on specific inclusion criteria. Two randomized controlled trials (RCTs) assessing the application of telemedicine for malnutrition were identified. The forms of telemedicine used were telecare and set-top boxes on television. The interventions included nutritional monitoring and specific interventions for each patient. However, high patient dropout rates indicated low patient compliance. Nevertheless, the application of telemedicine demonstrated improved patient compliance with nutritional intake guidelines. Limitations of telemedicine implementation included low motivation, technological constraints, and physiological constraints. Telemedicine may be used as a tool for monitoring nutritional intake among malnourished geriatric populations

Keywords: elderly, malnutrition, telemedicine

ABSTRAK

Malnutrisi merupakan bagian dari geriatric giant dan masalah utama pada pasien lansia di komunitas. Penanganan yang tidak adekuat menimbulkan dampak buruk. Pemantauan asupan gizi menjadi penting dilakukan dalam menangani kasus malnutrisi. Telemedisin telah banyak diterapkan pada penanganan kasus penyakit kronik. Pada masa pandemi, telemedisin menjadi metode pemantauan kesehatan yang banyak digunakan. Untuk mengidentifikasi kelebihan dan keterbatasan dari penerapan telemedisin pada kasus malnutrisi di populasi yang memiliki keterbatasan mobilitas seperti lansia. Studi ini meninjau literatur yang diperoleh dari pencarian sistematis dari database Pubmed dan ScienceDirect. Artikel pendukung diperoleh dari pencarian manual dengan kriteria

inklusi tertentu. Terdapat 2 studi randomized controlled trial (RCT) yang menilai penerapan telemedisin untuk malnutrisi. Bentuk telemedisin yang digunakan berupa ala telecare dan set top box pada televisi. Intervensi berupa pemantauan asupan gizi dan intervensi spesifik untuk setiap pasien. Angka dropout pasien tinggi menandakan kepatuhan pasien yang rendah. Penerapan telemedisin meningkatkan kepatuhan pasien pada pedoman asupan gizi. Keterbatasan penerapan telemedisin berupa motivasi rendah, kendala teknologi dan kendala fisiologis. Telemedisin berpotensi sebagai alat pemantau asupan gizi pada populasi lansia yang mengalami malnutrisi.

Kata Kunci: lansia, malnutrisi, telemedisin

INTRODUCTION

Malnutrition refers to an imbalanced nutritional intake, either excessive intake (obesity) or insufficient intake (underweight or wasting). Malnutrition is common, but some groups are more vulnerable, such as people with low socioeconomic status, the elderly, those with acute or chronic illnesses, and pregnant women.¹ In elderly patients, malnutrition is one of the geriatric giants that necessitates comprehensive treatment. Failure to address malnutrition can lead to decreased immune function, increased risk of infection, muscle and bone weakness, decreased quality of life, and increased morbidity and mortality (Figure 1).²⁻⁷

Generally, the term “geriatric patients” refers to elderly patients. They

are associated with a higher degree of weakness and are more likely to have chronic diseases.⁸ Various factors predispose elderly patients to higher risks of malnutrition. Decreased food intake can be due to decreased ability to smell and taste, difficulty in chewing or swallowing, impaired nutrient absorption, cognitive decline, psychological conditions such as loneliness and depression, and the side effects of drugs.⁸ This decrease in food intake can also be influenced by external factors such as difficulty in food preparation, food quality, and dining atmosphere.⁸ In addition, certain socio-demographic factors such as gender (female patients), marital status (unmarried patients), living alone, low education level, unemployment, and lifestyles (smoking and alcohol consumption) have been associated with a higher risk of malnutrition.⁹

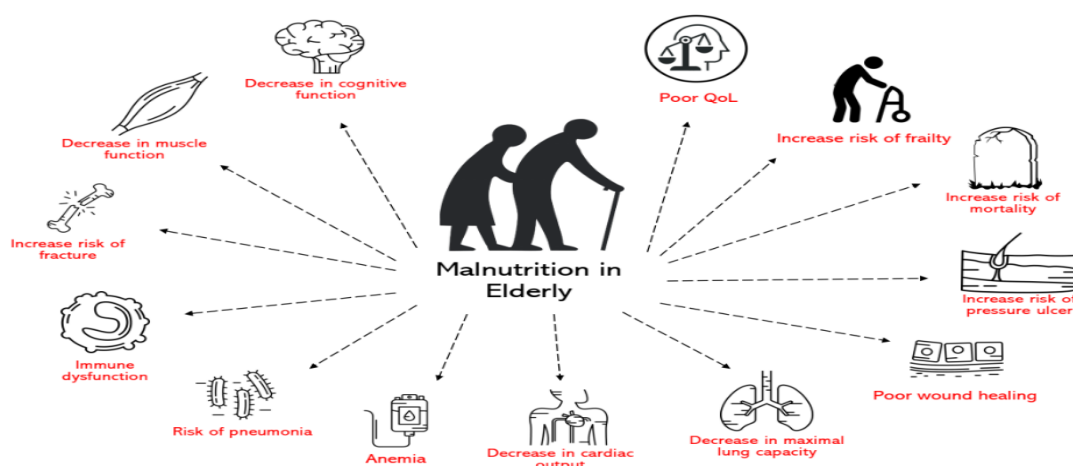


Figure 1. Effect of Malnutrition on the Elderly Population²⁻⁴

The prevalence of malnutrition among elderly patients reaches 50%, but it varies significantly depending on the demographic factors, the conditions of healthcare settings, and the screening tools used to assess nutritional status.⁸ Another study states a relatively low prevalence of malnutrition in the elderly (6-11%), but higher rates are observed among the elderly receiving treatment in hospitals or care centers (32-64%). In Europe and Asia, the prevalence of malnutrition in the elderly varies from 12% to 84%.⁷ Various studies on malnutrition in the elderly population in Indonesia show that 1 out of 2 elderly people is undernourished or overweight.⁹ When considering the residential background, malnutrition prevalence is quite low (1-15%) in the elderly living at home in European and North American populations compared to aged care facilities (25-60%) or in hospitals (35-65 %).¹⁰ A study conducted by Kaiser et al. regarding malnutrition conditions in various residential backgrounds in Mataram, West Nusa Tenggara, Indonesia found 30 - 90% of malnutrition cases or at risk of malnutrition among the elderly living in hospitals, nursing homes, communities, and rehabilitation centers.¹¹ In addition, a study in Iran showed that the prevalence of malnutrition was 9.2% among elderly patients living at home and 21.6% in nursing homes.⁷ Despite the abundance of available data and the dangers of malnutrition in the elderly, addressing this problem has not yet been established as a necessity in elderly care.⁷

Therefore, to detect risks and prevent malnutrition in the elderly, it is important to carry out nutritional screening and monitoring.¹² The process of providing nutritional care to the elderly follows a systematic approach. Through nutritional treatment, healthcare workers are expected to detect

the risk of malnutrition and conduct personalized management for the patient. Nutritional treatment consists of (1) nutritional screening and risk detection using validated screening tools, (2) nutritional assessment by assessing phenotypic criteria (weight loss, low body mass index, and decreased muscle mass) and etiological factors (decreased food intake or the presence of certain diseases which could cause eating difficulties), (3) making a diagnosis based on meeting at least one phenotypic and etiological criterion, and (4) determining of case severity based on the phenotypic criteria. The process of nutritional care requires assistance from both healthcare workers and the patient's caregiver.¹²

In recent years, home telemonitoring has been extensively studied and has shown promising results.¹³ Telemedicine technology has been applied in the field of nutrition to monitor the nutritional intake of elderly patients at home.¹⁴ This literature review aims to identify the advantages and limitations of utilizing telemedicine for the treatment of malnutrition in elderly patients in the community.

METHOD

A literature review was made by means of a detailed and systematic literature review (PRISMA Guideline) on the topic of the potential of telemedicine for monitoring the nutritional intake of malnourished community-dwelling elderly.¹⁵ The main article used for this literature review was obtained from the search results conducted on PubMed and ScienceDirect international journal databases. Additional supporting articles were obtained from manual searches performed by the authors (BI, MI, AM). The inclusion criteria for the main article literature search included fully accessible articles, studies employing clinical trial or pilot study designs, articles written in English, and publications within the period of 2011-2021 (Figure 2).

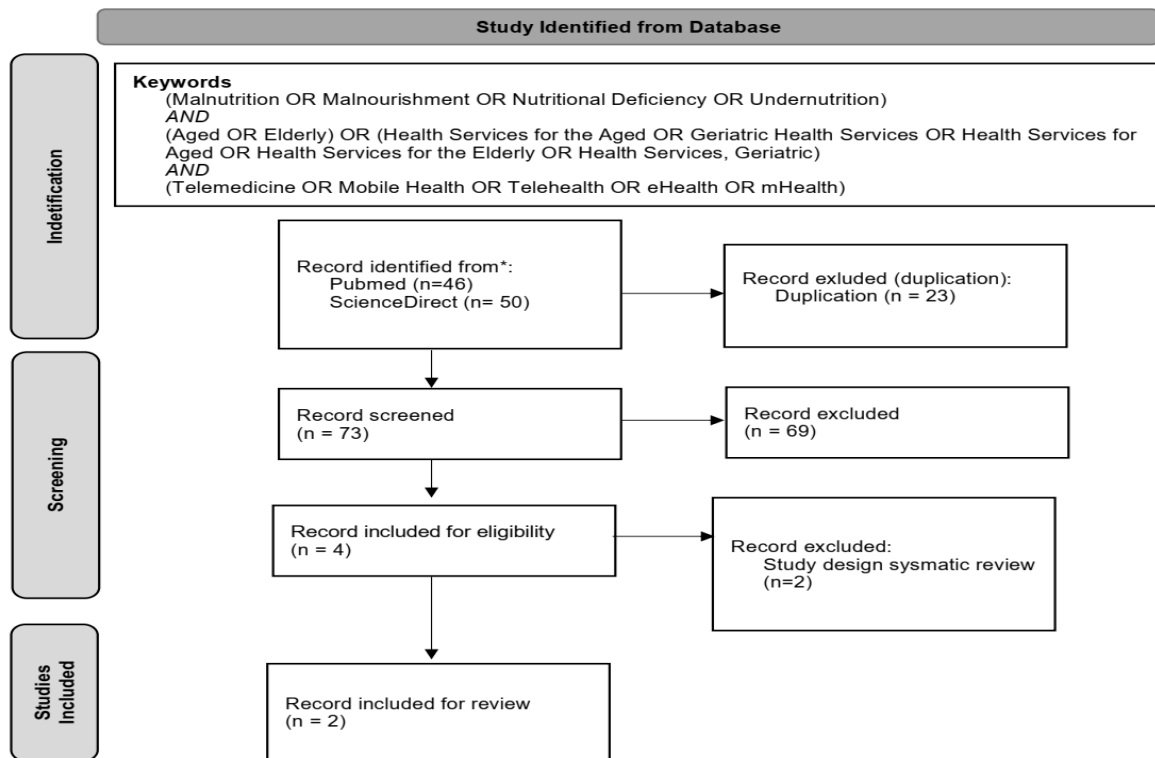


Figure 2. Literature Selection Flow

RESULT

Two randomized controlled trials (RCTs) were identified and met the search criteria. The studies conducted by Kraft et al. and Van Doorn-Van Atten et al. investigated the use of telemedicine for monitoring the nutritional status of elderly patients living in communities who were at risk of malnutrition.^{16,17}

DISCUSSION

Telemedicine Application

Telemedicine varies across the literature reviewed. The study by Kraft M *et al.* used a monitoring system consisting of telecare scales and monitors developed by Vitaphone GmbH, Mannheim, Germany. Participants were required to measure their weight every day and answer questions from the telecare monitor. The system did not only display the questions on the screen but also read the questions

aloud. Prior to the start of the study period, participants were taught how to use the monitor. This system would provide a real-time message to the healthcare workers if participants experienced weight loss, discontinuation of oral supplement consumption, deterioration in physical condition, or any other conditions that required participants to contact the healthcare workers. Healthcare workers would then provide intervention in accordance with the situation.¹⁶

In contrast, another study by Van Doorn-Van Atten *et al.* used a different form of telemedicine. Participants received a set-top box that would add channels to the television owned by each participant. This television channel contained food menus, messages about nutrition, results of nutritional status measurements, and advice on food intake and physical activity. The telemedicine included both uniform messages for all participants as well as

specifically tailored messages depending on each patient's condition. Whenever an alarming condition was detected, the healthcare providers would receive notifications and proceed with providing intervention to the patient. In addition, patients were required to measure their weight and count the number of steps taken per month. They were provided with a standardized weighing scale and instructions to measure the weight correctly. Questionnaires such as the Dutch Healthy Diet Food Frequency Questionnaire (DHD-FFQ), Simplified Nutritional Appetite Questionnaire (SNAQ), and Mini Nutritional Assessment Short Form (MNA-SF) were also completed by participants at the beginning of the intervention and again after two months.¹⁷ The different forms of telemedicine utilized in these studies highlight the flexibility of technology, allowing for adaptation to the specific needs and cultural context of different populations.

Effectivity

The effectiveness of telemedicine can be evaluated based on the participants' compliance with carrying out technology-based monitoring. The study by Kraft M *et al.* showed a decrease in the number of participants, with only one participant remaining for the final assessment out of the initial 13 participants in the intervention group. Eight participants discontinued prematurely, resulting in a higher attrition rate compared to the control group, which had four participants remaining out of the initial 13. The main reasons for discontinuation among the five participants who initially participated but dropped out were declining physical and psychological health requiring treatment (two participants), difficulties in using the technology (one participant), and feeling burdened by the study (one participant).

Consequently, only one participant completed the study.¹⁶ This finding was similar to the study by Van Doorn-Van Atten *et al.* with an initial sample of 20 elderly participants, nine participants stopped participating due to mental and psychological health decline and difficulties in using the telemedicine technology applied in the study.^{16,17}

The main similarity between the two studies is that they used relatively complex technology. In the second study, the use of telemedicine took advantage of the participants' existing television devices, which was expected to increase participants' understanding of accessing telemedicine. However, almost half of the participants still discontinued their participation. This number was smaller than the study by Kraft M *et al.*, which used special technology and saw a majority of participants discontinuing.^{16,17}

When evaluating the effectiveness of telemedicine in improving the nutritional status of participants, it is important to consider the following aspects. The two main sources of this literature review were pilot studies with the same objective, to see the potential role of telemedicine in addressing malnutrition in elderly patients. Nonetheless, a study by Van Doorn-Van Atten *et al.* found a significant increase in participant adherence to nutritional intake according to guidelines, particularly in terms of consumption of fish, fiber, protein, and vitamin D. However, these findings still require further research with a larger sample size.¹⁷ On the other hand, the study by Kraft M *et al.* obtained results that were not significantly different between the intervention and control groups. Although still inconclusive, telemedicine still shows some potential in its applicability and benefits.^{16,17}

Advantage and Limitation

The application of telemedicine offers a number of advantages (Figure 3). First, it eliminates the need for patients to

come to healthcare facilities. This is beneficial especially for elderly patients in the community and the presence of movement restrictions due to the pandemic (at the time of writing this study). The application of telemedicine and remote consultation in cases of chronic illness or patients with malnutrition can reduce medical costs while still providing affordable healthcare services.^{16,18,19} Secondly, telemedicine facilitates routine monitoring, allowing patients to monitor their health status (in this case, nutritional condition) without the direct presence of a healthcare worker. This type of routine monitoring has been implemented in the management of heart failure.²⁰

However, several limitations were identified from this literature analysis. One limitation is the need for patients to familiarize themselves with

the technology used. This is challenging, especially for elderly patients with low digital literacy.^{16,17} Another study has also shown that elderly patients were not ready to fully engage in video conference-based telemedicine.²¹ Low motivation of the patient and/or caregiver also proves to be a limitation. Low motivation arises from the notion that nutritional supplements are not important or that patients and caretakers feel that the patients are in good health, and the difficulty of elderly patients to receive information regarding their nutritional problems.^{16,22,23} In the study by Kraft *et al.* and Van Doorn-Van Atten *et al.* some physiological barriers were reported, including (1) limitations in consuming the recommended foods, (2) discomfort in taking supplements, which prompted patients to discontinue monitoring, and logistical problems such as the unavailability of supplements.^{14,16,17}

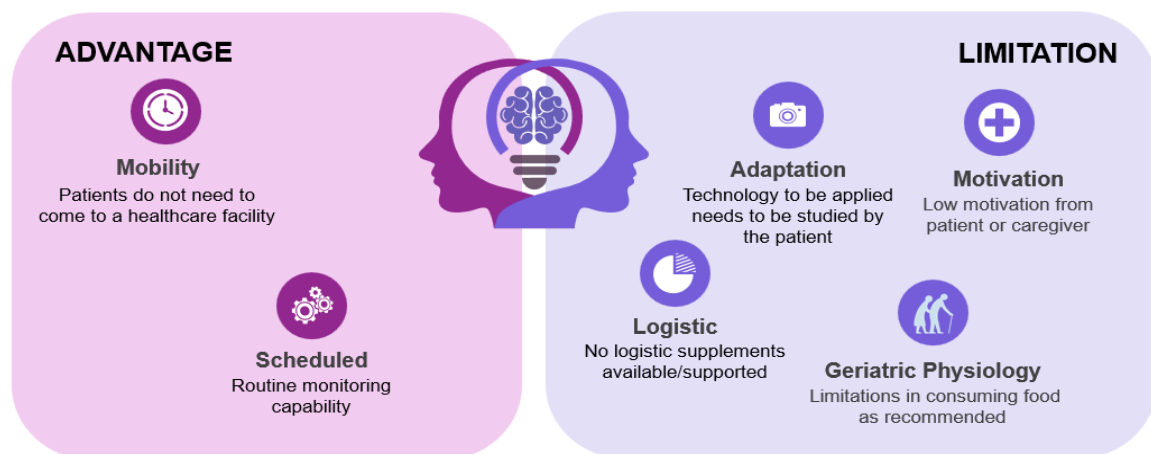


Figure 3. Strengths and Limitations of the Application of Telemedicine Identified from the Literature^{16–20}

CONCLUSION

Malnutrition remains a major problem faced by elderly patients, and monitoring their nutritional intake is one crucial step to improving nutritional status. This literature review highlighted

two RCT studies that showed the potential of telemedicine to monitor the nutritional intake of elderly patients in the community. Telemedicine offers advantages, including reducing the need for high mobility and facilitating routine monitoring of nutritional

status. Meanwhile, the challenges identified were low patient motivation, limited knowledge and ability to adapt to technology, physiological constraints, and logistical constraints. Considering the benefits of telemedicine, the development of telemedicine that can overcome these challenges should be addressed.

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