

Nurse-Delivered Telehealth in Home-Based Palliative Care: Integrative Systematic Review

Cong Ma, Yifan Fang, Hui Zhang, Ying Zheng, Ying Zhang, Wanchen Zhao, Ge Yan, Yaixin Zeng, Yanwu Zhang, Xiaohong Ning, Zhimeng Jia, Na Guo

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Abstract

Background: Telehealth technologies can enhance patients' and their families' access to high-quality resources in home-based palliative care. Nurses are deeply involved in delivering telehealth home-based palliative care. However, no previous integrative systematic reviews have synthesized evidence on nurses' role, effectiveness, facilitators and barriers to the implementation of nurse-delivered telehealth home-based palliative care.

Objective: Guided by the updated Consolidated Framework for Implementation Research (CFIR) 2022, this integrative systematic review aims to identify the role of nurses, evaluate the effectiveness of telehealth intervention delivered by nurses or a multi-professional team, and identify the facilitators and barriers in the implementation of telehealth in home-based palliative care.

Methods: This integrative systematic review was conducted using Joanna Briggs Institute (JBI) Methodological Guidance and in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. We systematically searched articles published from January 1 2014 to May 2024 in PubMed, Embase, Web of Science, CINAHL, and Cochrane Library. We included English, peer-reviewed, original qualitative, quantitative, and mixed methods studies that centered on nurse-delivered telehealth in home-based palliative care. We used a mixed-method appraisal tool to assess the quality of the included articles. Three authors independently assessed eligibility, extracted data, and assessed the quality of articles.

Results: This integrative systematic review identified 4819 unique articles, including 32 papers from 25 studies. The role of nurses in telehealth home-based palliative care involves palliative care nurse, community nurse, nurse coordinator, nurse coach or nurse navigator, and nurse case manager. Telehealth home-based palliative care could improve the patients' quality of life and reduce health service utilization, and telehealth technologies were well-received by patients, their family caregivers, and healthcare providers. Guided by the CFIR 2022, facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care were identified to 6 implementation levels and 13 constructs: national and local health (policies, laws, financing, culture, local attitudes, and critical incidents), organizations and institutions (partnerships, connections, structural characteristics, compatibility, and available resources), multi-professional team (communications), healthcare providers (capability and motivation), family and home (engaging), and homebound patient (engaging). The key facilitators included the COVID-19

pandemic, a structured and integrated telehealth system, and so on. The barriers included technical problems, insufficiently trained healthcare providers, and so on.

Conclusions: Nurses play a central role in implementing telehealth home-based palliative care through interprofessional coordination. Professional palliative care training builds nurses' professional identity. Telehealth improves quality of life and reduces healthcare utilization. A blended model combining initial in-person assessments with telehealth follow-ups and individualized follow-up frequencies is advocated. Cost-effective low-tech modalities (e.g., telephone consultations) show optimal scalability. Key recommendations include: integrating telehealth systems, nurses' role identification and competency training in telehealth and palliative care, and homebound patients and family caregivers' engagement. Clinical Trial: PROSPERO CRD42024541038.

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Original Manuscript

Review

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Abstract

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Conclusions: Nurses play a central role in implementing telehealth home-based palliative care through interprofessional coordination. Professional palliative care training builds nurses' professional identity. Telehealth improves quality of life and reduces healthcare utilization. A blended model combining initial in-person assessments with telehealth follow-ups and individualized follow-up frequencies is advocated. Cost-effective low-tech modalities (e.g., telephone consultations) show optimal scalability. Key recommendations include: integrating telehealth systems, nurses' role identification and competency training in telehealth and palliative care, and homebound patients and family caregivers' engagement.

Trial Registration: PROSPERO CRD42024541038.

Keywords: nurse; homecare services; palliative care; systematic review; telehealth; telemedicine; technology; implementation science

Introduction

Many patients with severe health-related conditions and their families prefer to receive care and pass away at home [1]. To satisfy patients' preference to stay at home, home-based palliative care service has been developed, which has been shown to increase the likelihood of dying at home [2]. Home-based palliative care is a form of palliative care provided by informal caregivers (such as family members) and a trained multi-professional team of doctors, nurses, social workers, and others in patients' homes [3]. Compared to inpatient or acute palliative care services, home-based palliative care is more appropriate for patients with low to moderate symptom burdens and provides continuity of care for homebound individuals [4]. When patients experience an exacerbation of their health condition, they are often admitted to hospice or hospital for care, which is against patients' preference for dying at home [5]. Home-based palliative care services of high quality can fulfill the preference for place of care or death of patients with severe symptom burdens. However, the further development of home-based palliative care faces several barriers, including the uneven distribution of medical resources, a shortage of specialized human resources in palliative care, and inadequate knowledge of home-based palliative care among family caregivers [6]. Consequently, there remains considerable potential for enhancing and expanding these services.

Telehealth technologies have the potential to significantly enhance access to high-quality palliative care resources for both patients and their families and reduce unscheduled hospitalization in the final life of patients [7]. Telehealth interventions for family caregivers that mainly consist of caregiver education, strategies for symptom management, psychological and spiritual support, and enhancing communication between caregivers and healthcare providers have the potential to improve the care capability of family caregivers, the quality of life for patients, and their caregivers, and effective communication, and alleviate the caregiver burden [8]. They were largely delivered by nurses and multi-professional teams [8], which indicates that nurses have central roles in implementing telehealth home-based palliative care for patients and family caregivers [9–11]. Previous literature reviews regarding the use of telehealth technologies for home-based palliative care have primarily concentrated on the use of video consultation [12], the interventions for family caregivers [8], as well as the experiences and perspectives of patients, informal caregivers, and healthcare providers [13–16]. However, how nurses participate in telehealth home-based palliative care remains unclear.

In our systematic review, we aim to further our understanding of nurse-delivered telehealth home-based palliative care. Our research questions are as follows: (1) what is the role of nurses in telehealth home-based palliative care? (2) what is the effectiveness of telehealth interventions delivered by nurses or a multi-professional team in home-based palliative care? (3) what are the facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care? By synthesizing existing evidence and experiences on nurse-delivered telehealth home-based palliative care, this integrative systematic review aims to provide a comprehensive understanding of the role of nurses, the effectiveness of the intervention, and the multi-level facilitators and barriers to the implementation of telehealth home-based palliative care, which could inform future policy development, research, and clinical practice.

Methods

Design

We conducted this integrative systematic review using Joanna Briggs Institute (JBI) Methodological Guidance [17] and in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [18]. This type of systematic review allows quantitative and qualitative data resources to be extracted and synthesized.

Registration

This integrative systematic review has been registered on PROSPERO (CRD42024541038).

Search strategy

We developed a detailed search strategy informed by previous literature [12,19–21] and refined by a research librarian (ZYW) (Appendix 1). We included literature from PubMed, Embase, Web of Science, CINAHL, and Cochrane Library from January 1 2014 to May 2024. We also manually searched reference lists of included studies.

Inclusion and Exclusion

Inclusion and exclusion criteria were formulated in accordance with the SPIDER framework [22]. (Table 1) English, peer-reviewed, original qualitative, quantitative, and mixed-methods studies that were published from January 1 2014 to May 2024 and focused on nurse-delivered telehealth in

home-based palliative care were included.

The target population included: adult patients (aged 18 years and older) in serious health-related suffering, regardless of diagnosis, as well as their families, caregivers, and healthcare providers, according to the redefinition of palliative care put forward by the International Association for Hospice and Palliative Care [23]. The phenomenon of interest included telehealth home-based palliative care that was delivered by nurses or a nurse-delivered multi-professional team.

Patients were excluded if they had an active suicidal ideation. Additionally, protocol proposals, pilot studies, and feasibility studies were excluded. Telehealth technologies only used to collect data were excluded.

Table 1. Eligibility criteria (based on SPIDER framework).

SPIDER framework	Inclusion	Exclusion
S-Sample	Adult patients (aged 18 years and older) in a palliative care trajectory, regardless of diagnosis, and their family, caregivers, and healthcare providers, were included according to the redefinition of palliative care put forward by the International Association for Hospice and Palliative Care [23].	Patients with active suicidal ideation.
PI-Phenomenon of Interest	Telehealth home-based palliative care delivered by nurses or a nurse-delivered multi-professional team were included.	Telehealth technologies are only used to collect data.
D-Design	Empirical studies.	Protocol proposals, pilot studies, and feasibility studies.
E-Evaluation	Quality of life, depression, anxiety, satisfaction, medical resource use, experiences, attitudes, views, etc.	Not Applicable
R-Research type	Qualitative, quantitative, and mixed-methods research.	Not Applicable

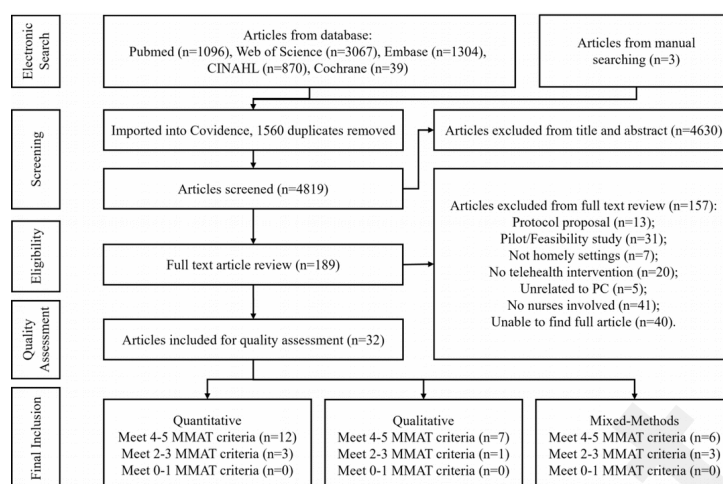
Study Selection and Search Outcomes

We identified 4818 unique articles (Figure 1). The titles and abstracts were screened in the first round, and the full texts were screened in the second round. Each round was screened by two researchers (MC & ZH) independently and other researchers (ZY & ZYX) were consulted to reach a consensus. EndNote 21.2 and Covidence were used to manage references.

Quality Assessment

The methodological quality of the studies was assessed independently by three researchers (MC, FYF & ZWC) using the Mixed Methods Appraisal Tool (MMAT) [24], and another researcher (ZYX) was consulted to reach a consensus. The MMAT is a critical appraisal tool designed for the quality assessment of integrative systematic reviews, which uses five criteria to score each study [24]. The development team of the MMAT did not advise calculating an overall score from the ratings of each criterion, or excluding studies based solely on low methodological quality [24]. To better address the research questions of this review, we included all studies and provided a more detailed presentation of these studies.

Figure 1. PRISMA flow diagram of systematic literature review.



Data Extraction

The entities to extract were identified by research questions of interest regardless of the type of study, which included: the characteristics of articles (author, year, country, program name, aim, main findings, quality assessment), and the study design (methodology, setting, sample, outcome, measurement). As for intervention studies, elements of intervention (team, training, contents, telehealth technologies, total time, dose, and frequency) were also extracted. The role of nurses was also extracted in this step. Two researchers extracted the entities and a third researcher checked the accuracy of the data (MC, FYF & ZWC). Researchers contacted the original authors to obtain information that was not available in the literature by email or ResearchGate. Data were captured across multiple Microsoft Excel spreadsheets.

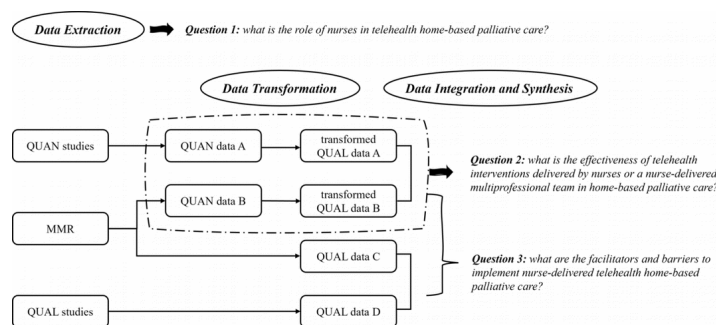
Data Transformation, Integration, and Synthesis

Guided by JBI Methodological Guidance [17], we applied a convergent synthesis approach to integrate quantitative and qualitative data. The quantitative synthesis and the qualitative synthesis occur simultaneously (Figure 2).

First, the role of nurses was summarized based on data extraction. Second, the quantitative data from both the quantitative study and the quantitative component of mixed-methods research were transformed into qualitative data. The transformed quantitative data and qualitative data were synthesized to examine the effects of telehealth home-based palliative care. Third, the qualitative data (i.e. results section) from the qualitative study and the qualitative component of mixed-methods research, along with the transformed quantitative data, were imported into NVivo 14.

Guided by the updated Consolidated Framework for Implementation Research (CFIR) 2022 [25], the qualitative data and transformed quantitative data were synthesized to identify the facilitators and barriers of the implementation of telehealth home-based palliative care. The results of qualitative studies included three elements: author-defined themes, author's description of themes, and primary data [26]. Adopting a hybrid deductive-inductive approach, we synthesized qualitative data at 3 phrases: (1) we initially used the themes identified by the authors to code the primary qualitative data, (2) thereby we extracted secondary themes under the corresponding constructs of the CFIR 2022, (3) we then categorized these secondary themes into different levels.

Figure 2. Flow diagram of data extraction, transformation, integration, and synthesis.



Results

Overall Characteristics of the Included Studies

The electronic search was accomplished on 14 May 2024. We included a total of 32 articles, encompassing 25 original studies (Appendix 2). Overall, the quality of the included studies was quite satisfactory. 25 articles met 4-5 MMAT criteria, and 7 articles met 2-3 MMAT criteria. We provided a more detailed presentation of these studies' quality assessment (Appendix 3).

We included eleven quantitative studies: randomized clinical trial (n=4) [27–31], cross-sectional study (n=2) [32,33], retrospective study (n=4) [34–37], and prospective study (n=1) [38]. Seven qualitative studies were included: semi-structured interviews (n=5) [39–43]; focus-group interviews and individual semi-structured interviews (n=1) [44]; field notes of an autobiographical diary, participant observations, and semi-structured interviews (n=1) [45,46]. In addition, there were seven studies with the design of mixed-methods research: convergent parallel design (n=3) [47–49], explanatory sequential design (n=1) [50], multi-phases design (n=1) [7,51,52], and embedded design (n=2) [53–57].

The included studies were conducted in the United States (n=11), the Netherlands (n=3), Canada (n=1), Denmark (n=1), Switzerland (n=1), Germany (n=1), Norway (n=1), UK (n=1), Italy (n=1), Lebanon (n=1), Iran (n=1), China (n=1), and India (n=1). Telehealth technologies used in these studies mainly included telephone (n=8), phone- or web-based application (n=5), video consultation (n=3), and a combination of phone call and video consultation (n=4). The main used telehealth devices were telephones, tablets, and laptops. The most common settings delivered telehealth home-based palliative care included: patients' homes (n=8); outpatient clinics, such as palliative care clinic, specialist clinic, and community-based clinic (n=5); hospice and palliative care service organizations, such as hospice agency (n=3); homecare service organization (n=2); emergency medical services agency (n=1).

The topics of qualitative studies mainly focused on the experiences and perspectives of patients (n=1), family caregivers (n=3), and healthcare providers (nurse-involved, n=3) in telehealth home-based palliative care, as well as the needs of healthcare professionals (n=1), and the integration of palliative care services during the COVID-19 pandemic (n=1). There was also significant variability in the study population: homebound patients (n=5); family caregivers (n=5); healthcare providers (n=9), such as palliative care team and community homecare team; and other stakeholders (n=2), such as health policy makers, administrators, university faculty members and researchers, and spiritual care providers.

Role of Nurses in Telehealth Home-based Palliative Care

According to the professional levels, the nurses involved in these included studies encompassed

Advanced Practice Nurse (APN, n=1), Nurse Practitioner (NP, n=3), and Registered Nurse (RN, n=6). They could be categorized into two types based on specialization: one being palliative care nurse (n=7) or hospice nurse (n=2), and the other being home care nurse (n=5) or community nurse (n=1). They undertook the responsibilities associated the role of nurse coach (n=3), nurse navigator (n=1), nurse case manager (n=2), and nurse coordinator (n=4). The responsibilities of nurses also involved: palliative care consultation (n=7), following up (n=5), symptom/medication management (n=4), home care (n=3), 24/7 phone call services (n=3), remote monitoring (n=1), and emotional/educational/technological/information support (n=4).

Effectiveness of Nurse-delivered Telehealth Home-based Palliative Care

In general, studies could be divided into two categories based on the expected survival period of patients: one is hospice and palliative care for patients at the end of life [27,29–31,54], and the other is early palliative care for patients whose expected survival period was from several months to several years [52,55]. The outcomes of included studies mainly focused on: (1) telehealth readiness, acceptability, utilization, and satisfaction; (2) patients' and families' outcomes, such as quality of life, mood (depression and anxiety), symptoms burden (pain), survival, mortality, caregiver burden, and knowledge (pain misconceptions); (3) health service utilization, such as hospitalization, emergency department visits, and referrals to palliative care.

Telehealth technologies were well-received by patients, family caregivers, and healthcare providers [50,57]. The influential factors of the willingness to use telehealth technologies included: (1) for patients and family caregivers: age and prior use [53]; (2) for healthcare providers: telehealth readiness, outcome expectancy, and social influence [32,33]. What homebound patients and their families most wanted telehealth assistance with are symptom management, coordinating care, information support, and scheduling [34,36], which could be provided by palliative care nurses [49].

Overall, it was reported that the quality of life had significantly improved for patients with advanced chronic non-communicable diseases, such as COPD, HF, and ILD [27,31]. Telehealth home-based palliative care has the potential to help reduce patients' and family caregivers' misconceptions about pain [53]. However, weekly teleconsultations for home-dwelling advanced cancer patients led to worse symptom scores [29]. It had not reached a consensus that telehealth home-based palliative care could reduce the depression and anxiety of patients. Early telehealth home-based palliative care was associated with lower depression in patients [7]. ADAPT intervention also significantly reduced the depression and anxiety of patients after 6 months [31], while there were no significant differences in anxiety and depression between the ENABLE CHF-PC intervention group and the controlled group after the 16-week intervention [27,28]. In early palliative care, it was reported that ENABLE III intervention group patients' 1-year survival was improved compared with the delayed group [55].

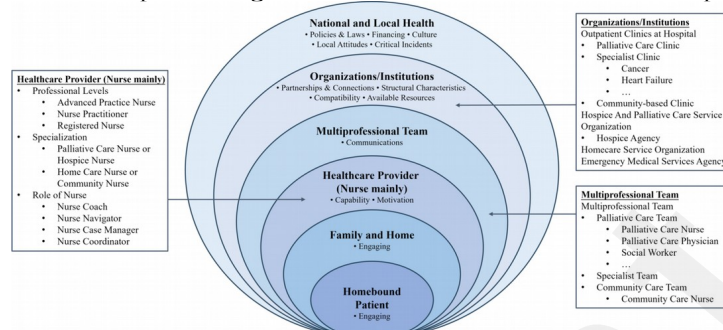
The health service utilization such as emergency department visits was significant. It was reported that the Mobile Integrated Hospice Healthcare (MIHH) project reduced hospice emergency department visits from 80.3% to 24.8% [37]. Early telehealth home-based palliative care is associated with fewer hospitalizations and more time at home in the final 6 months of life [7]. The Gold Line project handled 4533 calls and 572 video consultations with 39% resolved without referrals [48].

Facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care

Guided by CFIR 2022, the qualitative data and the transformed quantitative data were integrated and

synthesized to identify the facilitators and barriers in 6 implementation levels and 13 constructs for implementing nurse-delivered telehealth home-based palliative care (as detailed in Figure 3 and Table 2).

Figure 3. A multilevel framework of implementing nurse-delivered telehealth home-based palliative care.



National and Local Health Systems: Disparities Between High-resource and Low-resource Regions

Globally, critical incidents significantly impact the development of telehealth. For instance, the isolation policies during the COVID-19 pandemic greatly facilitated the development of home-based palliative care delivered via telehealth [32–34,40,41]. Overall, the implementation of nurse-delivered telehealth home-based palliative care is profoundly influenced by the disparities in national and local health systems between high-income and middle- to low-income settings. For example, in high-income countries and regions such as the United States and Canada, laws grant prescription authority to NPs, enabling nurses to participate in patient medication management [37]. The inclusion of telehealth technologies in health insurance also supports the advancement of home-based palliative care through telehealth. In contrast, in middle- to low-income countries and regions like Iran, laws concerning nurse home visit safety, information security, and the use of home-based analgesic medications are yet to be fully established, which hinders the progress of telehealth home-based palliative care [40,42,49]. Moreover, ethical concerns regarding telehealth technologies also present barriers [42].

Organizational and Institutional Systems: Systemic Fragmentation in Telehealth Service Delivery

Home-based palliative care involves various levels and types of healthcare organizations and institutions, and adequate connections and coordination among these can enhance the efficiency of palliative care services and improve the experience for stakeholders [55]. According to CFIR 2022, structural characteristics, which include physical infrastructure, information technology infrastructure, and work infrastructure, are persistent general characteristics that enable sustainable implementation [25]. However, in the studies included in this review, these structural characteristics often present as barriers. Such barriers include fragmented telehealth systems [36,39,42], poor transition care from hospital to home [40], interrupted documentation recording [36,42,54], and widely reported technical problems [32,45,47,51,52]. In terms of general staffing levels, the technical maintenance personnel to promptly address technical issues in healthcare institutions and patients' homes [45], as well as reasonable staffing of healthcare providers [40], can enhance the development of nurse-delivered home-based palliative care. Notably, with the extensive development of telehealth technologies in recent years, many healthcare institutions are undergoing informatization. When telehealth home-based palliative care is compatible with current workflow practices, it facilitates the implementation [36].

Table 2. Identified multilevel facilitators and barriers to implementation of telehealth home-based palliative care based on

the CFIR 2022.

Construct of CFIR	Facilitators	Barriers
National and local health Policies & Laws	Prescriptive authority for nurses [37,40]	Lack of legal guarantee for home visits, information security, and narcotic medications [40,42,49]
Financing		Lack of reimbursement and payment mechanism [7,36,37,40,41,49]
Culture		Cultural stigma attached to opioid use [40]
Local attitudes		Ethical consideration of telehealth technologies [42]
Critical incidents	Impact of COVID-19 pandemic [32–34,40,41]	
Organizations/Institutions Partnerships & Connections	Connections and coordination among different organizations [55]	
Structural characteristics		
• Physical infrastructure	A structured and integrated telehealth system [36,39,42]	Poor transitional care from hospital to home [40]
• Information technology infrastructure	Stable internet coverage (i.e. Wi-Fi) [42,53]	Lack of integrative documentation recording [36,42,54]
• Work infrastructure	Technical maintenance personnel [45] Reasonable healthcare providers staffing [40]	Technical problems [32,45,47,51,52]
Compatibility	Compatibility with current workflow [36]	
Available resources	Appropriate location and infrastructure to set up electronic platform [39]	
Multi-professional team Communications	Communications among multi-professional teams [40,41]	
Healthcare provider (nurse mainly) Capability	Higher level of telehealth readiness and innovation self-efficacy [33] Trained and qualified in palliative care [39,55]	
Motivation		Fear of death and anxiety [43]
Family and home Engaging		
• Innovation deliverers	Reliable family caregivers [39]	
• Innovation recipients		Poor financial condition [44]
Homebound patient Engaging		Privacy and information safety concerns [39]
• Innovation recipients		High age and severe illnesses [42] Poor telehealth experiences [32,49,50]

Multi-professional Team and Healthcare Providers: Effective Coordination and Versatile Nurses

In the studies included in this review, home-based palliative care services involve palliative care teams from various medical institutions related to referrals, nursing teams that provide phone call services, and teams that offer homecare services. When multidisciplinary teams from different healthcare institutions collaborate to serve patients and their families at home, effective communications among different teams and healthcare providers are the most significant facilitators in the cooperation between the palliative care and home care teams. Effective communication ensures seamless coordination and continuity of care, enabling all parties involved to understand the patient's needs and preferences, share medical information accurately, and adjust care plans as necessary. This collaboration is essential for providing comprehensive support that addresses both

the physical and psychosocial needs of patients and their families within the home setting.

The role of healthcare providers, particularly nurses, is pivotal in the success of telehealth home-based palliative care. Facilitators in this area highlight the importance of having versatile nurses competent in telehealth technologies and palliative care practices, including a higher level of telehealth readiness and innovation self-efficacy. Trained and qualified healthcare providers who possess these competencies are better equipped to handle the demands of remote patient management. On the other hand, fear of death and anxiety among healthcare providers represent notable barriers that can affect their willingness and ability to deliver end-of-life care effectively.

Family and Patients: Family Caregivers of Both Deliverers and Recipients and Conflicted Homebound Patients

Family caregivers play an integral role in supporting both the delivery and receipt of telehealth home-based palliative care services. Reliable family caregivers contribute positively by assisting patients in managing their care and navigating the technology required for remote consultations. However, barriers such as the poor financial condition of families may limit access to necessary resources and support, such as a lack of stable Wi-Fi coverage at home, or a lack of electronic devices, which impacts the quality of telehealth care received by the homebound patient. This level underscores the necessity of considering the socioeconomic context of family units when planning and delivering telehealth palliative care services.

The main factor influencing the acceptance of telehealth home-based palliative care delivered by nurse-delivered healthcare providers for homebound patients is the consideration of telehealth technologies, such as privacy and information safety concern. In addition, patients with high age, severe illnesses, and poor experience in telehealth had less engagement in telehealth home-based palliative care.

Discussion

Principal Results

By synthesizing quantitative and qualitative data, this integrative systematic review identified the role of nurses in telehealth home-based palliative care, examined the effect of nurse-delivered telehealth home-based palliative care roughly, and synthesized the multilevel factors to implementing nurse-delivered telehealth home-based palliative care. Building on these findings, we have conducted a comprehensive analysis to formulate evidence-based recommendations for future implementation.

Role Clarification and Competency Development in Nursing Practice

To the best of our knowledge, this is the first review of existing evidence on the role of nurses in telehealth home-based palliative care. Nurses play central and diverse roles in telehealth home-based palliative care, such as palliative care nurses and community nurses. A previous qualitative study has focused on the role of palliative care registered nurses in hospital settings [58]. Moreover, with the development of telehealth technologies, the places of palliative care services have extended to the home setting, and the role of nurses has consequently changed. This presents new challenges for future nursing practice.

The role of versatile nurses helps mitigate the shortage of human resources in palliative care. For instance, NPs who have prescribing authority can take responsibility for medication management, which greatly alleviates the pressure caused by the shortage of palliative care physicians [41]. In

terms of coordination and patient case management, nurses partially assume the responsibilities of medical social workers [34]. When patients and their families encountered technical problems, community nurses could provide technological support [44]. Nurses' responsibilities partially overlap with those of physicians, medical social workers, and technical personnel, and research suggests that ambiguous professional boundaries may increase the complexity of nursing practice and create role ambiguity, which may influence nurses' own professional identity [59]. In the Individuals Domain of CFIR 2022, the Capability, Opportunity, Motivation - Behavior (COM-B) system and role-specific theories are utilized to construct the Characteristics Subdomain, which underscores the impact of nurses' role identity on the implementation of telehealth home-based palliative care [25]. According to the COM-B and the Theoretical Domains Framework (TDF), nurses' professional identity mediates service implementation through motivational pathways, which in turn affects the implementation of such services [60]. Role ambiguity could be a barrier for nurses to implement palliative care, which is related to the lack of clear role definitions, lack of education and training, communication problems, and other factors [59]. However, in multi-professional teamwork, the role of versatile nurses makes them a crucial bridge for equal interprofessional communication and coordination [61]. Moreover, in telehealth home-based palliative care, the nurses' work involves a variety of aspects such as symptom assessment and monitoring, medication management, case management, emotional and informational support, and follow-up, which is the foundation of the holistic care that nurses provide to their patients. This also sets higher expectations for nurses' professional growth in palliative care, communication and coordination, and telehealth technology.

In addition, when facing dying patients, nurses' fear of death and anxiety could lead to negative emotional experiences that may hinder their motivation to care for patients. After receiving professional palliative care training, improvements in the capability of empathy, communication skills, and self-care techniques could help nurses reflect on and negotiate conflicts within their roles [44]. This contributes to the establishment of a professional identity as a palliative care nurse [62]. According to COM-B, nurses competent in palliative care, telehealth readiness, and innovative self-efficacy are more actively involved in the implementation of telehealth home-based palliative care [39,55].

Moreover, to increase the professional identification of nurses in the palliative care team, it is suggested that nurse training strategies should be developed for nurses at different professional levels based on patient needs, nurse individual interests, and the current state of palliative care staffing in healthcare institutions. For senior and highly educated nurses, specialized training in palliative care should be conducted, and efforts should be made to obtain prescriptive authority for nurses to meet the needs of homebound patients with severe health conditions. They can also provide guidance to community nurses through telehealth technologies. For community nurses, palliative care should be integrated into the philosophy of primary nursing curriculums to address the increasingly urgent needs of homebound patients. They can guide homebound patients and family caregivers through telehealth technologies to improve their involvement and also provide homecare services when needed. For nurses, the development of empathy and communication skills is more important than the mere mastery of nursing skills [63]. Therefore, it is necessary to continuously enhance their palliative care practice competence. Telehealth has been gradually integrated into daily healthcare, and there also should be a continuous improvement in nurses' readiness and competence in telehealth. It is recommended that nurses be trained in the use of telehealth equipment and in the ability to deal with technical problems.

Effectiveness of Nurse-delivered Telehealth Home-based Palliative Care

Among the included studies, the outcome indicators most commonly used to assess the effectiveness were patients' quality of life, mood, symptom burden (e.g., pain), survival, mortality, and caregivers' burden, as well as medical resource use (e.g., emergency room visits, hospital days, death location, etc.) Acceptability, utilization, and satisfaction of patients, families, and healthcare providers with the use of telehealth technology were also important indicators in the implementation. In addition, there are quantitative indicators of the implementation process, such as the number of communications of goals of care, the number of referrals to hospice, and the completion of advance directives. The assessment indicators included in this review were overall symptom burden and quality of life, with attention to specific symptoms focused on pain, but less on symptoms such as dyspnea, dysphagia, and constipation.

Overall, the quality of life for patients with advanced chronic non-communicable diseases improved significantly [27]. In early palliative care, there was no significant difference in the quality of life and caregiver burden between the ENABLE III intervention group and the delayed group, probably because the intervention was too early in the process and the burden on the patient, the caregiver was not severe and there was little room for improvement [55]. There has been no consensus on whether telehealth home-based palliative care can reduce depression and anxiety in patients. The ADAPT intervention significantly reduced depression and anxiety in patients after 6 months, whereas there was no significant difference between the ENABLE CHF-PC intervention group and the control group in terms of anxiety and depression after 16 weeks of intervention, which may be related to inconsistency in the timing of the assessments [27,31]. It is suggested that ongoing follow-up be needed to understand the long-term effects of these interventions for patients and families. Weekly teleconsultations for patients with advanced cancer at home resulted in the worst scores, and daily assessment of pain was related to the worst pain intensity in the intervention group [29,54]. It is possible that over-concern may psychologically increase the burden on the patient, and therefore interventions and follow-ups should not be too often, and the needs of the patient should be taken into account. Telehealth home-based palliative care has the potential to help reduce patients' and family caregivers' misconceptions about pain, suggesting that informal support and patient education for patients, and family members is important [54]. It could be an effective strategy for coping with opinion stigmas. Studies demonstrated that health service utilization is reduced. Emergency Department visits were reduced from 80.3% to 24.8% over three years in a project [37], and earlier home-based palliative care was associated with fewer hospitalizations and more time at home in the final 6 months of life [7].

The measurement tools used in the included studies were inconsistent, making it difficult to directly compare results between studies. Therefore, the optimal strategy for nurse-delivered telehealth home-based palliative care intervention has not been confirmed. Quality of life measurement tools include tools for general (Patient-Reported Outcomes Measurement Information System, PROMIS) [52], for palliative care (e.g., Functional Assessment of Chronic Illness Therapy Palliative Care, FACIT-Pal) [55], and for specialty (e.g., Kansas City Cardiomyopathy Questionnaire-12, KCCQ-12) [31]. Some studies evaluated patients' symptoms burden to reflect their level of quality of life (e.g., Edmonton Symptom Assessment System, ESAS) [52]. Measurement tools for mood include the Center for Epidemiologic Studies Depression Scale (CESD) [56], Patient Health Questionnaire-8 (PHQ-8), and Generalized Anxiety Disorder-7 (GAD-7) [31], which in general focuses on anxiety and depression. The acceptability and utilization of telehealth technology are also difficult to compare directly. For example, the Computer Acceptability Scale (CAS) was used to assess specific items such as the level of computer glare, adequacy of lighting, use of the touch screen, screen colors, etc., quantitatively assessing how suitable and satisfactory the participant finds the use of the computer technology [53].

To get richer information, some studies used interviews to understand the experience of patients, family members, and healthcare providers and the usability of telehealth technology [45]. In addition, some quantitative indicators that have not been tested for reliability were used, such as the Likert 11-point scale to measure satisfaction [50], while some researchers used self-developed questionnaires [38]. Medical resource utilization is often easily accessible from electronic health records.

Both intervention and follow-up should not be too frequent to avoid increasing the psychological burden on patients and families, and the actual needs of patients should be considered [54]. Long-term follow-up is recommended to understand the long-term impact of the intervention and program implementation on patients, their families, and even healthcare professionals. In addition, a large number of patients and family caregivers required out-of-hours home-based palliative care services, which represented an advantage of telehealth over traditional medical models [48], indicating the need for more flexible scheduling and palliative care nurse staffing [64]. Furthermore, patients' passing away was used as the data shedding indicator in included studies [31], but the population of hospice and palliative care studies is often patients in end-of-life, for whom passing away is an inevitable thing, and it is also a stage we are concerned about. We should also be concerned about the quality of dying and death for patients, and the family's grief after the patients' passing away. In terms of measurement indicators, it is recommended that each country and region develop culturally tailored and standardized assessment tools that can be integrated into the palliative care quality improvement system and electronic health records of the local healthcare system. For example, with the impact of Confucianism, China emphasizes a family-oriented culture, and palliative care services are family-centered [65]. The palliative care evaluation system in China could consider assessing the impact of telehealth home-based palliative care on family caregivers.

Recommendations for Accessibility of High-quality Telehealth Home-based Palliative Care

During the COVID-19 pandemic, many countries encouraged the development of telehealth. In the post-pandemic era, integrating telehealth into the healthcare system facilitates the continuous provision of palliative care services to homebound patients [66]. The economic development, medical resources, internet infrastructure, and public awareness vary from country to country, leading to differences in development levels in palliative care and telehealth worldwide [11,67]. For instance, most of the included studies were conducted in developed countries such as North America and Northern Europe, and larger lower- to middle-income countries like China, Iran, and India are also gradually conducting related research in nurse-delivered home-based palliative care, but there is a scarcity of studies from South-East Asia, South America, and African countries.

Regions with limited palliative care resources stand to benefit most from telehealth interventions. High-resource regions can leverage telehealth to mentor low-resource areas through video consultations, thereby expanding access to high-quality palliative care [68]. This suggests that countries worldwide, especially those with lower- to middle- incomes, should increase investment in telehealth systems. Such investments should be accompanied by supportive political, legal, and economic measures, including establishing telehealth practice qualifications for healthcare providers, implementing stringent mechanisms for the protection of medical information and patient privacy, and perfecting payment and reimbursement systems for telehealth home-based palliative care [11]. Telehealth systems should be integrated into existing healthcare systems, ensuring digital medical documentation systems and the continuity of transitional care [40,42]. Regarding specific telehealth devices, VR and remote monitoring devices have high requirements for infrastructure, which may in turn increase the financial burden on healthcare institutions and patients [11]. Therefore, low-tech

telehealth modalities (e.g., telephone consultations, and video conferencing) seem to be the most cost-effective, affordable, and scalable measures. Additionally, palliative care professionals with digital literacy and telehealth readiness play a key role as providers of telehealth home-based palliative care, and a comprehensive telehealth training system is a crucial factor in promoting the implementation [33].

There is ethical support and criticism for telehealth. The accessibility and equity of high-quality palliative care resources can be promoted through telehealth. However, the lack of physical contact also led to some criticism that telehealth is lack of humanity. Therefore, telehealth technologies can only be used as a supplement to in-person care services [41]. A blended model of home-based palliative care is needed, which includes an initial in-person assessment and subsequent follow-up. In regions with limited medical resources, palliative care teams can remotely train healthcare providers and family caregivers (including community nurses, family members, etc.) to personally care for patients. Research indicates that telehealth home-based palliative care could promote the active involvement of family members. This facilitates direct communication and helps in building trust relationships among patients, family members, and nurses [46]. In regions with limited palliative care resources, there is a shortage of community nurses with palliative care qualifications, and family members are the primary caregivers of homebound patients [3]. Therefore, actively engaged home caregivers can more efficiently collaborate with nurses to care for patients at home and assist in patient assessment and monitoring. For families who are geographically separated from patients, telehealth could facilitate their equal involvement in patients' progression of disease and care decisions, thus helping to avoid "The Daughter from California syndrome" [69].

For patients and their family caregivers, factors such as old age, severe illness, and negative previous experiences could reduce their acceptance of telehealth home-based palliative care [42]. It is suggested that the design of telehealth devices and applications should take into account the needs of these patients and family caregivers, to avoid contributing to the digital divide and exacerbating healthcare disparities [70]. Based on patient feedback, clear and sufficient information, easy-understanding language, and aging-friendly design of interface are the facilitators of telehealth technologies [49,53,57]. Concerns from patients and their families regarding privacy and information security also necessitate robust telehealth systems and legal safeguards [39].

Limitations

The evidence quality of quantitative studies and mix-methods research included in this review was questioned because of reduced sample size and power [44,49,50,55,56], higher data attrition [27,29], selection bias [29,31,42], and recall bias [29]. The reliance on self-reported data [57] and the blinding failure of randomized clinical trials [45] further limited the credibility of included studies. Heterogeneity in outcome measures limiting comparability. Moreover, the lack of racial and ethnic diversity limited the generalizability of the study [55,57]. There are also potential biases from including only English studies, which might affect the comprehensiveness. As for qualitative studies and the qualitative component of mixed-methods research, many studies included in this review were not conducted in a specific methodology, but a qualitative data collection, some of which used semi-structured interviews to collect qualitative data did not provide question outlines [39]. The methodology of qualitative data collection and content analysis was not robust, leading to insufficient interpretation of the latent content, which limited the trustworthiness of these qualitative studies. Therefore, multi-center, larger-sample, and rigorous quality-controlled interventional studies are needed to evaluate the effectiveness and determine the optimal intervention of nurse-delivered telehealth home-based palliative care. Simultaneously, it is suggested that qualitative study and mixed-methods research should further concern the methodological quality to provide the

understanding with trustworthiness in nurse-delivered telehealth home-based palliative care.

Conclusions

Nurses play a central role in the implementation of telehealth home-based palliative care. Nurses serve as crucial bridges facilitating equal interprofessional communication and coordination. Professional palliative care training could help nurses reflect on and negotiate conflicts within their roles, which contributes to the establishment of a professional identity as palliative care nurses.

Telehealth home-based palliative care could improve the patients' quality of life and reduce health service utilization, and telehealth technologies were well-received by patients, their family caregivers, and healthcare providers. However, excessive attention from the nurses may relate to the patients' symptom burden. Thus, the frequency of follow-up should be determined based on the patients' needs. Long-term follow-up of patients and their families should be maintained to examine the long-term effects of the intervention. Additionally, because of ethical considerations, a blended model of home-based palliative care is needed, which includes an initial in-person assessment and virtual follow-up. Low-tech telehealth modalities (e.g., telephone consultations, and video conferencing) seem to be the most cost-effective, affordable, and scalable measures.

Guided by the CFIR 2022, we identify facilitators and barriers in 6 implementation levels and 13 constructs for implementing nurse-delivered telehealth home-based palliative care. Key recommendations involve constructing integrative telehealth systems in home-based palliative care, developing nurse training to clarify nurses' roles and increase nurses' competency, and actively involving family caregivers and homebound patients in telehealth home-based palliative care.

To increase nurses' professional identity, nurse training strategies should be developed and promoted to increase nurses' competence in home-based palliative care and telehealth technologies. Further multi-center, large-sample RCT studies are needed to provide evidence for the optimal intervention for telehealth home-based palliative care. Furthermore, the implementation theoretical framework should be used to develop telehealth home-based palliative care implementation programs that are appropriate for local health systems.

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Conflicts of Interest

None declared.

Abbreviations

APN: Advanced Practice Nurse

CFIR: Consolidated Framework for Implementation Research

COM-B: Capability, Opportunity, Motivation - Behavior

JB: Joanna Briggs Institute

MIHH: Mobile Integrated Hospice Healthcare

MMAT: Mixed Methods Appraisal Tool

NP: Nurse Practitioner

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis

RCT: Randomized Controlled Trial

TDF: Theoretical Domains Framework

Multimedia Appendix 1

The search strategy of PubMed.

Multimedia Appendix 2

Characteristics of the included studies.

Multimedia Appendix 3

Assessment of methodological quality of the included studies using Mixed Methods Appraisal Tool.

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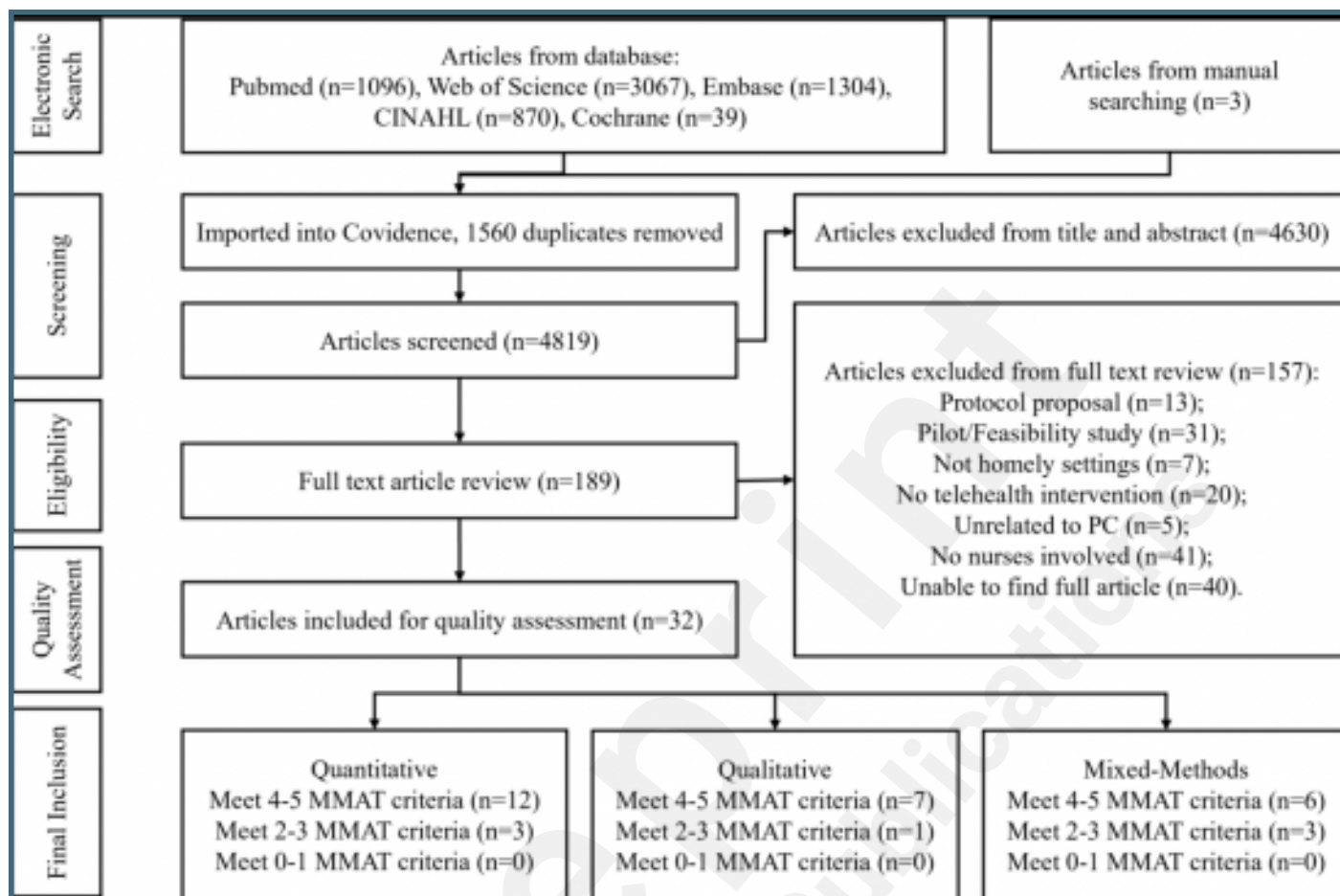
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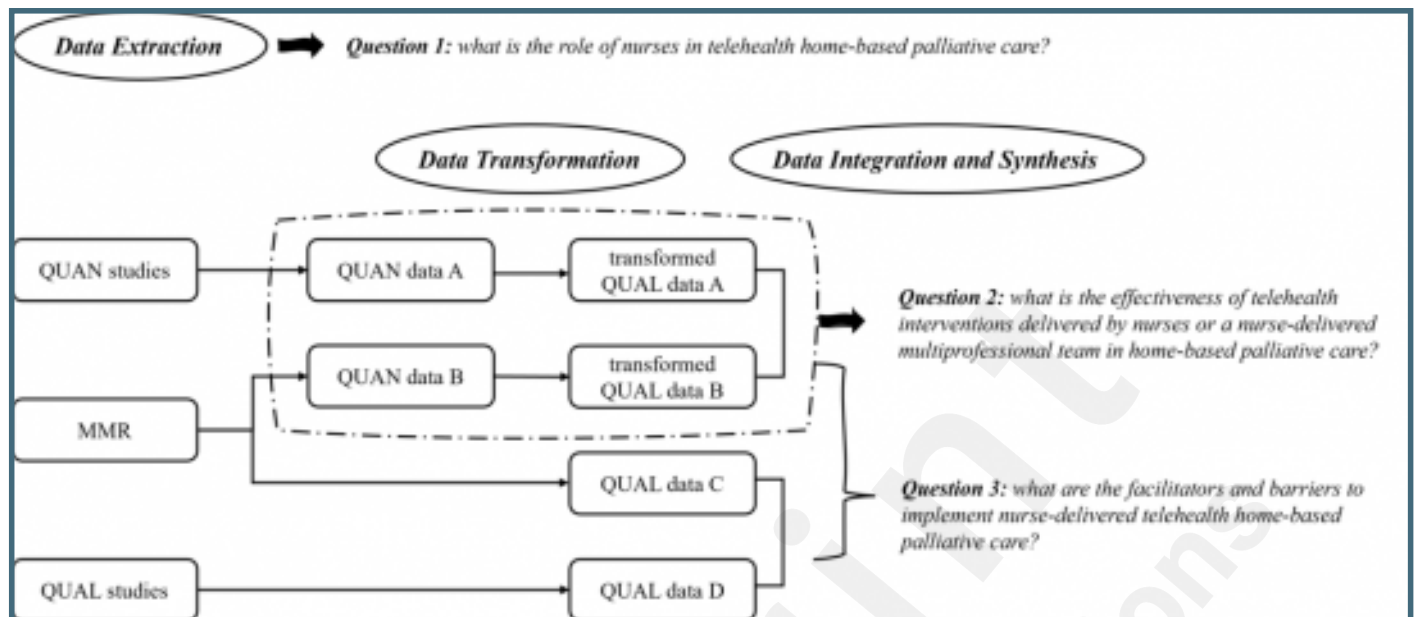
Supplementary Files

Figures

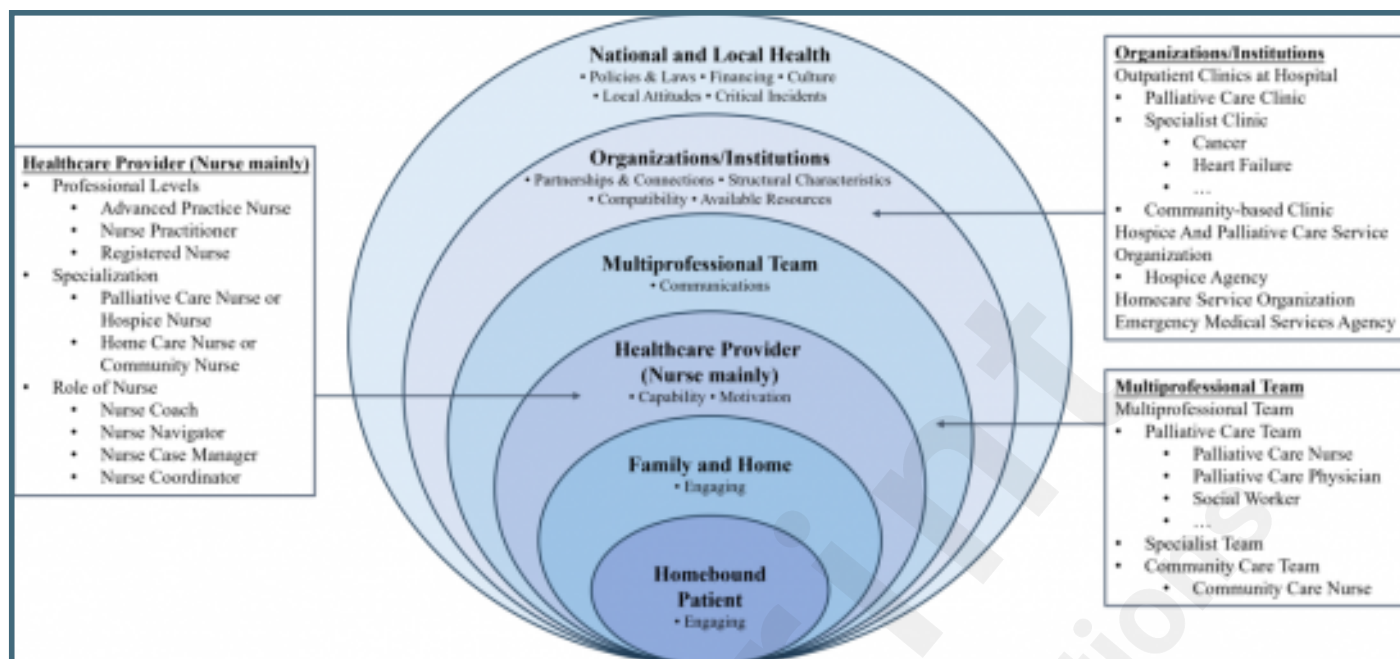
PRISMA flow diagram of systematic literature review.



Flow diagram of data extraction, transformation, integration, and synthesis.



A multilevel framework of implementing nurse-delivered telehealth home-based palliative care.



Multimedia Appendixes

The search strategy of PubMed.

URL: <http://asset.jmir.pub/assets/db12592a046bec85a1e5f1481119caff.doc>

Characteristics of the included studies.

URL: <http://asset.jmir.pub/assets/72a926ddd2688fec212e1667936454d5.docx>

Assessment of methodological quality of the included studies using Mixed Methods Appraisal Tool.

URL: <http://asset.jmir.pub/assets/23c5c2063dc035c960dc04ff6a8de2a0.docx>

