

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

Submitted to: Journal of Medical Internet Research
on: February 24, 2025

Disclaimer: © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

Table of Contents

Original Manuscript..... 5

Supplementary Files..... 30

 Figures 31

 Figure 1..... 32

 Figure 2..... 33

 Figure 3..... 34

 Multimedia Appendixes 35

 Multimedia Appendix 1..... 36

 Multimedia Appendix 2..... 36

 Multimedia Appendix 3..... 36

 Multimedia Appendix 4..... 36

Nurse-delivered telehealth in home-based palliative care: Integrative Systematic Review

Cong Ma^{1*}; Yifan Fang¹; Hui Zhang²; Ying Zheng³; Ying Zhang⁴; Wanchen Zhao²; Ge Yan⁵; Yaoxin Zeng³; Yanwu Zhang⁴; Xiaohong Ning³; Zhimeng Jia^{6, 7} MD; Na Guo^{2*}

¹ School of Nursing Chinese Academy of Medical Sciences & Peking Union Medical College Beijing CN

² Department of Nursing Peking Union Medical College Hospital Chinese Academy of Medical Sciences & Peking Union Medical College Beijing CN

³ Palliative Medicine Center Peking Union Medical College Hospital Chinese Academy of Medical Sciences & Peking Union Medical College Beijing CN

⁴ Institute of Medical Information (IMI) & Medical Library Chinese Academy of Medical Sciences & Peking Union Medical College Beijing CN

⁵ School of Population Medicine and Public Health Chinese Academy of Medical Sciences & Peking Union Medical College Beijing CN

⁶ Temmy Latner Centre for Palliative Care Mount Sinai Hospital Toronto CA

⁷ Department of Family and Community Medicine University of Toronto Toronto CA

*these authors contributed equally

Corresponding Author:

Na Guo

Department of Nursing

Peking Union Medical College Hospital

Chinese Academy of Medical Sciences & Peking Union Medical College

No.1 Shuaifuyuan, Dongcheng District, Beijing

Beijing

CN

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.

(JMIR Preprints 24/02/2025:73024)

DOI: <https://doi.org/10.2196/preprints.73024>

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**

Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain visible to all users.

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in a JMIR publication, my full manuscript will be made available to all users.

No. Please do not make my accepted manuscript PDF available to anyone.

Original Manuscript

Review

Nurse-delivered telehealth in home-based palliative care: Integrative Systematic Review

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' roles, facilitators, and barriers to implementing nurse-delivered telehealth home-based palliative care.

Objective: This integrative systematic review aims to provide a comprehensive understanding of the roles of nurses, and the multi-level facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care, which could inform future policy development, research, and clinical practice.

Methods: This integrative systematic review was conducted using Joanna Briggs Institute (JBI) Methodological Guidance. We followed the 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. The entities to extract were identified by research questions of interest regardless of the type of study. We applied a convergent synthesis approach to integrate quantitative and qualitative data. Guided by the updated Consolidated Framework for Implementation Research (CFIR) 2.0, we synthesized the facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care.

Results: This integrative systematic review identified 4819 unique articles, including 34 papers encompassing 29 unique primary research. Innovations were mainly delivered by nurses (n=8), and nurse-involved multi-professional teams (n=18). The roles of nurses in telehealth home-based palliative care involve palliative care nurses, community nurses, nurse coordinators, nurse coaches or nurse navigators, and nurse case managers. Guided by the CFIR 2.0, facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care were identified to 6 implementation levels and 20 constructs. The key facilitators included the COVID-19 pandemic, cost avoidance to the healthcare system, engagement of patients and their family caregivers, and so on. The barriers included a lack of reimbursement and payment mechanisms, technical problems, insufficiently trained healthcare providers, and so on.

Conclusions: This integrative systematic review synthesizes evidence on nurses' evolving roles in telehealth home-based palliative care, and identifies multilevel facilitators and barriers to nurse-delivered home-based palliative care implementation. With the empowerment of telehealth technologies, nurses could establish a stronger professional identity and develop leadership in home-based palliative care. Nurses should leverage influence to promote nursing practice, clinical management, and policy support in the implementation of telehealth home-based palliative care.

Trial Registration: PROSPERO CRD42024541038.

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

Introduction

Many palliative care patients 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 and underscores the urgent need to deliver high-quality home-based palliative care [5]. However, the further development of home-based palliative care faces challenges, including the uneven distribution of medical resources, a shortage of specialized human resources in palliative care, and inadequate preparedness of home-based palliative care among family caregivers [6]. With the development of telehealth technology, telehealth offers a transformative solution to these barriers, which shows considerable potential to enhance and expand these services in home-based palliative care.

According to the United States Department of Health and Human Services (HHS), telehealth allows healthcare providers (such as nurses, physicians, etc.) to provide health services for patients and their caregivers when they are not in the same location [7]. The implementation of telehealth had extremely rapid development during the COVID-19 pandemic. In 2020, the Centers for Medicare and Medicaid Services (CMS) in the United States approved seven types of telehealth (such as live video, remote patient monitoring, audio-only visits, and case-based teleconferencing) [8,9]. Studies suggest that nurse-delivered telehealth can significantly enhance access to high-quality palliative care resources for patients, empower family caregivers, and reduce unscheduled hospitalization in the final life of patients [10].

As the primary providers of home-based palliative care, nurses play a unique role in implementing telehealth technologies into patients' symptom management, emotional support, remote monitoring, health education, and transitional care [8,9,11,12]. Previous literature reviews regarding the use of telehealth technologies for home-based palliative care have primarily concentrated on the use of video consultation [13], the interventions for family caregivers [8], as well as the experiences and perspectives of patients, informal caregivers, and healthcare providers [14–17]. While there is a scoping review summarizes three main types of nurse-led palliative care models in limited-resource regions, it has not systematically explored the contextual factors to implement nurse-delivered telehealth home-based palliative care [18]. In conclusion, the roles of nurses in delivering telehealth home-based palliative care and the facilitators and barriers of nurse-delivered telehealth home-based palliative care remain unclear. Therefore, we aim to further our understanding of nurse-delivered telehealth home-based palliative care in this integrative systematic review. To the best of our knowledge, this is the first review of existing evidence on the roles of nurses and the influence factors in nurse-delivered telehealth home-based palliative care implementation.

Nurse-delivered care mainly included two approaches: (1) nurses deliver care as members of a multi-professional team; (2) nurses take responsibility for the leadership roles, beyond care delivery, with support from a multi-professional team as needed [19]. Nurse-delivered telehealth home-based palliative care involves multiple components including who delivers (nurses, as leaders or members

of a multi-professional team), the intervention (home-based palliative care), where (patients are at home settings, nurses are from any settings), to whom (patients and their family caregivers), and how (telehealth technologies, such as video consultation and telemonitoring) adapted from Brereton et al. [20]. We use “innovation” to refer to the nurse-delivered telehealth home-based palliative care interventions and implementations [21].

Our research questions are as follows: (1) what are the roles of nurses in telehealth home-based palliative care? (2) 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 roles of nurses, and the multi-level facilitators and barriers to the implementation of nurse-delivered 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 [22] and following Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [23] (Appendix 1). This type of systematic review allows quantitative and qualitative data resources to be extracted and synthesized [24]. The term integrative systematic review is often used interchangeably with mixed studies review [25]. Integrative systematic reviews have the potential to contribute to nursing theory development, informing research, practice, and policy initiatives [24].

Registration

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

Search Strategy

We developed a detailed search strategy informed by previous literature [8,13,26,27] and refined by a research librarian (ZYW) (Appendix 2). There are 3 main parts in the search strategy: (1) terms related to “palliative care”, including the clinical content of palliative care, such as symptom management, spiritual support, grief support, etc.; (2) terms related to “telehealth”; (3) terms related to “nursing”. The terms in each part are linked with “OR”, and the terms among the 3 parts are linked with “AND”. 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 following the SPIDER framework, as detailed in Table 1 [28]. English, peer-reviewed, primary qualitative, quantitative, and mixed-methods studies that focused on nurse-delivered telehealth in home-based palliative care were included. Given the rapid advancements in telehealth technologies, studies conducted too early may have limited relevance to technological contemporaneity and clinical applicability of findings. Therefore, we restricted our literature search to studies published within the past decade (from January 1 2014 to May 2024).

The target population included: adult patients (aged 18 years and older) receiving palliative care, as well as their families, caregivers, and healthcare providers (mainly nurses), according to the

International Association for Hospice and Palliative Care (IAHPC) [29]. The phenomenon of interest included telehealth home-based palliative care delivered by nurses.

Patients were excluded if they had an active suicidal ideation. Additionally, protocol proposals were excluded because it is difficult to assess influence factors before implementation in the real world. Telehealth technologies only used to collect data were excluded because the application of telehealth technologies did not refer to intervention or implementation.

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

SPIDER framework	Inclusion	Exclusion
S-Sample	Adult patients (aged 18 years and older) receiving palliative care, their families, caregivers, and healthcare providers (mainly nurses) were included.	Patients with active suicidal ideation.
PI-Phenomenon of Interest	Telehealth home-based palliative care delivered by nurses was included.	Telehealth technologies are only used to collect data.
D-Design	Qualitative, quantitative, and mixed-methods research.	Protocol proposals.
E-Evaluation	Quality of life, symptom burden, depression, anxiety, medical resource use, satisfaction, feasibility, acceptability, experiences, attitudes, views, etc.	Not Applicable.
R-Research type	Empirical studies.	Not Applicable.

Study Selection

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. Any discrepancies were resolved by consensus among the two researchers and the senior researchers (ZY & ZYX). EndNote 21.2 and the web-based program “Covidence” were used to manage references. Covidence facilitated references screening.

Quality Assessment

The methodological quality of the studies was assessed independently by three researchers (MC, FYF & ZWC) using the Mixed Methods Appraisal Tool (MMAT) (version 2018) [30]. Any discrepancies were resolved by consensus between the two researchers and the other senior researcher (ZYX). The MMAT is a critical appraisal tool designed for the quality assessment of systematic mixed studies reviews and integrative systematic reviews, which uses five criteria to score each study [30]. 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 [30].

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, publication year, country, program name, aim, main findings, quality assessment), and the study design of primary research (methodology, setting, sample, outcome, measurement). We also extracted the innovations' elements (why, what, who delivered, to whom, how, where, when and how much, and how well) according to Template for Intervention Description and Replication (TIDieR) [31]. Two researchers extracted the entities and a third researcher checked the accuracy of the data (MC, FYF & ZWC). Researchers contacted the corresponding authors to obtain information that was not available in the literature by email or ResearchGate. Data were captured across multiple Microsoft Excel spreadsheets. The roles of nurses in delivering telehealth home-based palliative care are synthesized according to extracted data.

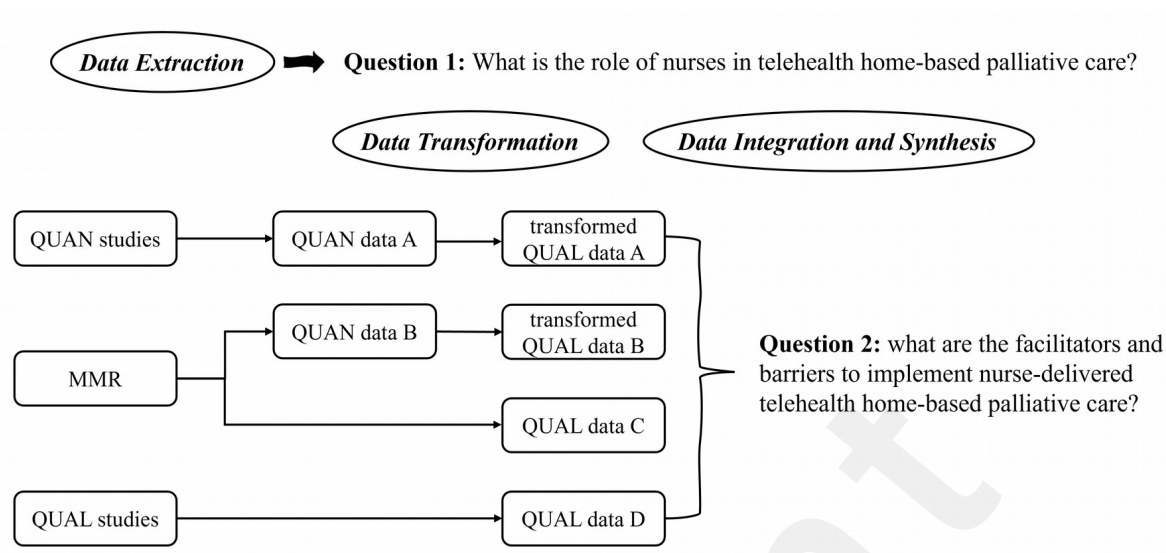
Data Transformation, Integration, and Synthesis

Guided by JBI Methodological Guidance, we applied a convergent synthesis approach to integrate quantitative and qualitative data, which involves transforming data into a mutually compatible format [22]. We also applied qualitizing, one of the data transformation methods to convert quantitative data into themes, categories, typologies, or narratives [22]. Qualitizing involves extracting data from quantitative studies and translating or converting it into textual descriptions to allow integration with qualitative data [22]. The transformed quantitative data and qualitative data are assembled simultaneously.

First, the quantitative data from both the quantitative study and the mixed-methods research were transformed into qualitative data in the form of a narrative summary [22]. Second, the qualitative data (i.e. results section) from the qualitative study and the mixed-methods research, along with the transformed quantitative data, were imported into NVivo 14. Third, guided by the updated Consolidated Framework for Implementation Research (CFIR) 2.0, the facilitators and barriers to implementing nurse-delivered telehealth home-based palliative care were synthesized. The flow diagram is detailed in Figure 1. 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 2.0, (3) we then categorized these secondary themes into different levels. The results of qualitative studies included three elements: author-defined themes, author's description of themes, and primary data [32].

CFIR is one of the most commonly used determinant frameworks to assess contextual factors that influence implementation in the real world [21], which is appropriate for exploring the interesting questions of this review. CFIR 2.0 contains 48 constructs and 19 subconstructs across 5 domains (innovation domain, outer setting domain, inner setting domain, individuals domain, and implementation process domain), with the individuals domain including two subdomains (roles subdomain and characteristics subdomain) [21]. The characteristics subdomain is based on the COM-B system or role-specific theories [21], which could document the characteristics applicable to the roles of nurses in telehealth home-based palliative care.

Figure 1. Flow diagram of data extraction, transformation, integration, and synthesis.

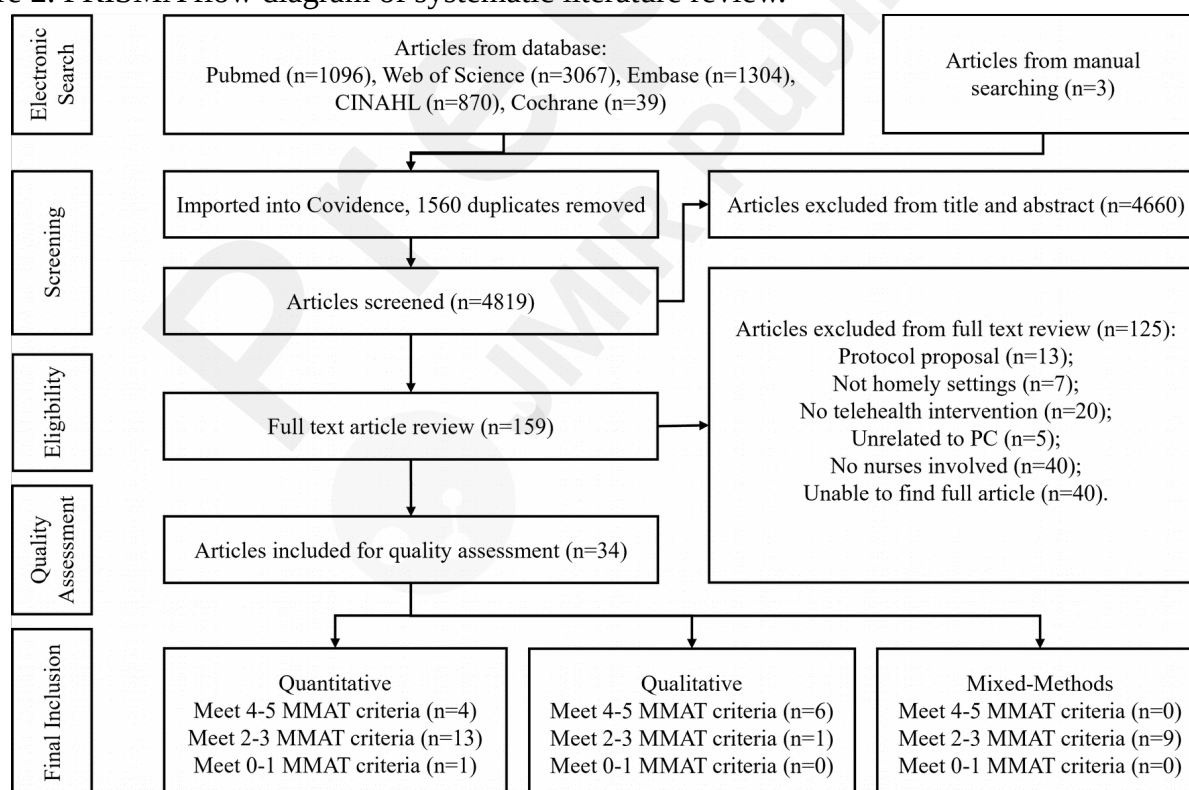


Results

Overall Characteristics of the Included Studies

The electronic search was accomplished on 14 May 2024. We identified 4819 unique articles, and 1560 duplicates were removed on Covidence because they were repeated in different databases (Figure 2). We included a total of 34 articles, encompassing 29 unique primary research (Appendix 3). The main items of included studies were detailed in Table 2.

Figure 2. PRISMA flow diagram of systematic literature review.



The included studies were conducted in the United States (n=11) [33–49], the Netherlands (n=3) [50–52], Canada (n=3) [53–55], Italy (n=2) [56,57], Iran (n=2) [58,59], Australia (n=1) [60], Denmark (n=1) [61,62], Switzerland (n=1) [63], Norway (n=1) [64], UK (n=1) [65], China [66], Lebanon (n=1) [67], and India (n=1) [68].

We included six qualitative studies: qualitative description (n=5) [45,53,59,64,67]; and phenomenological methodology (n=1) [61,62]. Seventeen qualitative studies were included: randomized clinical trials (n=8) [33,34,36–39,44,46,49,51,57,58]; non-randomized clinical trials (n=3) [40,56,57]; cross-sectional studies (n=2) [52,66]; a prospective study (n=1) [68]. In addition, there were nine studies with the design of mixed-methods research: convergent parallel design (n=5) [47,55,60,63,65]; explanatory sequential design (n=3) [42,43,50,54]; multi-phases design (n=1) [48].

Table 2. Interested items of innovations of included studies.

Item of interest	Innovations (N=29)
Innovation Deliverer	Nurses (n=8): • A nurse (n=3) [45,46,58]; • Nursing teams (n=5) [48–50,57,65]. Nurses and multi-professional teams (n=18): • Nurses and physicians (n=10): a nurse and a PC^a physician (n=3) [33,34,36,37,42,43]; a nurse or physician (n=2) [51,67]; pc/hospice nurses and physicians (n=4) [38,39,47,54,56,69]; pc nurses and specialist teams (n=1) [40]. • Nurses, physicians, and other healthcare providers (n=5): social workers [44,64,68], physical therapists [61,62,64], occupational therapists [64], and pc coordinators [53,64]. • Homecare nurses and a pc team (nurses and physicians) (n=4) [55,59,60,63].
Innovation Recipient	Patients (n=13) [44,46,49–51,54,56–58,60,63,64,68,69]; Family caregivers (n=2) [40,67]; Patients and family caregivers (n=11) [33,34,36–39,42,43,45,47,48,53,55,61,62,65].
Innovation	Model of care: • Telehealth only (n=21) [38–40,42–51,53,54,56–58,60–65,69]; • Initial in-person consultation and telehealth (n=3) [33,34,36,37,67]; • Simultaneous telehealth and in-person care (n=2) [55,68]. Telehealth technologies: • Telephone (n=11) [33,34,36,37,40,44,46,48,49,56,57,67,68]; • Phone- or web-based application (n=5) [38,39,47,50,54,58,69]; • Video consultation (n=7) [42,43,51,52,55,60–63]; • Phone call and video consultation (n=1) [65]; • Not explicitly stated (n=5) [45,53,59,64,66].
Setting and institution	Patients and their family caregivers receive services in home setting; nurses (and multi-professional teams) are from various settings and institutions: • Outpatient clinics (n=8) [33,34,36,37,40,44,46,48,51,58], such as palliative care clinics, specialist clinics, and

	community outreach clinics; • Hospice and palliative care organizations (n=7) [38,39,45,47,53,63,64,67], such as hospice agencies, palliative care service centers; • Specialist departments of hospitals/institutes (n=4) [56,57,61,62,68]; • Community organizations (n=3) [54,60,65,69]; • Homecare service organizations (n=1) [50]; • Emergency medical service organization (n=1) [49]; • Local healthcare system (n=2) [42,43,55]. There are 3 included studies conducted in rural settings [33,34,55,60].
Outcome and measurement	Clinical outcomes: • Patients: QOL^b (FACIT-Pal^c [33,36,58], KCCQ^d [36,44,58], FACT-G^e [44,49], CCQ^f [44], EORTC QLQ-C15-PAL^g [50], PROMIS-10^h [43]); symptom impact (QUAL-Eⁱ [33], ESAS^j [43,49,51]); mood (CES-D^k [33], HADS^l [36,51,58], PHQ^m [44,46], GADⁿ [44,46]); 1-year survival [33]; all-cause mortality [44]; global health [36]; pain [36,38]; loneliness (UCLA-3^o [49]); activation (PAM^p) [50]; Palliative Care Outcomes Collaboration (PCOC^q) [60]. • Family caregivers: QOL (CQOL-C^r [34], BCOS^s [37]); mood (CES-D [34], HADS [37]); caregiver burden (MBCB^t [34,37], ZBI^u [43]); caregiver preparedness (PCS^v [43], PROMIS-10 [43]); global health [37]; pain misconceptions [38]. • Nurses: telehealth readiness (TRAT-C^w [66]); innovative self-efficacy (ISES-C^x [66]). Medical resources use: hospital/intensive care unit days [33,36]; emergency department visits [33,36,54,58]; hospitalizations [36]; chemotherapy in last 14 days [33]; death location [33]; days at home in the last 6 months of life [43]; referrals to PC [46]. Implementation outcomes: usability, feasibility, and acceptability of telehealth [39,48,54,57,58,60]; satisfaction of telehealth [50,57,60,68]; quality of conversation [39]; audiovisual quality [55]; completion of advance directives [39]; comfort level [47]. Experiences and perspectives (interviews): • Patients (n=9) [45,50,53,55,56,59,62,65,69]; • Family caregivers (n=9) [40,45,53,55,59,62,65,67,69]; • Nurses and other healthcare providers (n=10) [42,47,53,55,59,61,63,64,67,69].

^aPC: palliative care; ^bQOL: quality of life; ^cFACIT-Pal: Functional Assessment of Chronic Illness Therapy Palliative Care; ^dKCCQ: Kansas City Cardiomyopathy Questionnaire; ^eFACT-G: Functional Assessment of Chronic Illness Therapy-General; ^fCCQ: Clinical COPD Questionnaire; ^gEORTC QLQ-C15-PAL: European Organization for the Research and Treatment of Cancer Quality-of-Life Questionnaire Core 15-Palliative; ^hPROMIS: Patient-Reported Outcomes Measurement Information System; ⁱQUAL-E: Quality of Life at End of Life; ^jESAS: Edmonton

Symptom Assessment System; ^kCES-D: Center for Epidemiologic Studies-Depression scale; ^lHADS: Hospital Anxiety and Depression Scale; ^mPHQ-8: Patient Health Questionnaire-8; ⁿGAD-7: Generalized Anxiety Disorder-7; ^oUCLA-3: Three-Item UCLA Loneliness Scale; ^pPAM: Patient Activation Measure; ^qPCOC: Palliative Care Outcomes Collaboration; ^rCQOL-C: Caregiver QOL Scale–Cancer; ^sBCOS: Bakas Caregiver Outcomes Scale; ^tMBCB: Montgomery-Borgatta Caregiver Burden scale; ^uZBI: Zarit Burden Interview; ^vPCS: Preparedness for Caregiving Scale; ^wTRAT-C: Telehealth Readiness Assessment Tools; ^xISES-C: Innovative Self-Efficacy Scale.

Outcomes of Quality Assessment

10 articles met 4-5 MMAT criteria; 23 articles met 2-3 MMAT criteria; and 1 article met 0-1 MMAT criteria. A more detailed presentation of these studies' quality assessment is in Appendix 4.

Most of the included qualitative studies applied qualitative description to explore the targeted question, rather than applying a specific methodology [45,53,64,67]. The most common comments were that insufficient reports on interview guide design, such as question lists [64,67]. There was a study collecting data applying both individual interviews and focus groups, without reporting the integration of qualitative data [64].

The main quality comments of included RCTs focused on the random allocation method, blind methods, sample size, and intervention adherence. Some of the included RCTs did not explicitly report random allocation methods [43,46] and allocation concealment measures [38,49,58]. Some studies applied a non-blinded method [51] or a single-blinded method [33,38], risking performance bias and detection bias. Outcome assessors were blinded in some RCTs, but participants and intervention providers were not [36,37]. Some RCTs did not describe blind methods [34,44,46], limiting research transparency. Some RCTs reported a reduced sample size [33], high attrition [51], and early termination [43], affecting the accuracy of the study and reliability. Some RCTs reported low adherence [36,38] or did not report complete adherence data [34,46,49]. The most common comments on nRCTs were no adjustment for confounders in analysis and no adherence data [40,56,57]. As for the quantitative descriptive study, the sampling method did not be described [39].

Most of the MMRs did not explicitly describe integration strategies and presented quantitative data and qualitative data separately [42,50,54,55,60,63,65]. There also a study did not address potential discrepancies between qualitative and quantitative findings [48].

Roles of Nurses in Telehealth Home-based Palliative Care

As the main delivers of telehealth home-based palliative care services delivery, nurses take various responsibilities, which are categorized into professional level, and specialization level. According to the professional levels, the nurses involved in these included studies were all Registered Nurses (RN). On this basis, there were also Advanced Practice Nurses (APNs, n=2) [33,34,45], Nurse Practitioner (NPs, n=3) [47,51,53], and Clinical Nurse Specialist (CNS, n=1) [55]. Nurses could be categorized into three types based on specialization: palliative care nurse (n=12) [40,45,48,51,53–56,60–64,68] or hospice nurse (n=2) [38,39,47]; home care nurse (n=5) [42,43,50,55,63,68] or community nurse (n=2) [60,61]; and specialist nurse (n=2) [57,64]. They undertook the responsibilities associated with the role of nurse coach (n=4) [33,34,36,37,46,48], nurse case manager (n=3) [42,43,56,57], and nurse coordinator (n=1) [64].

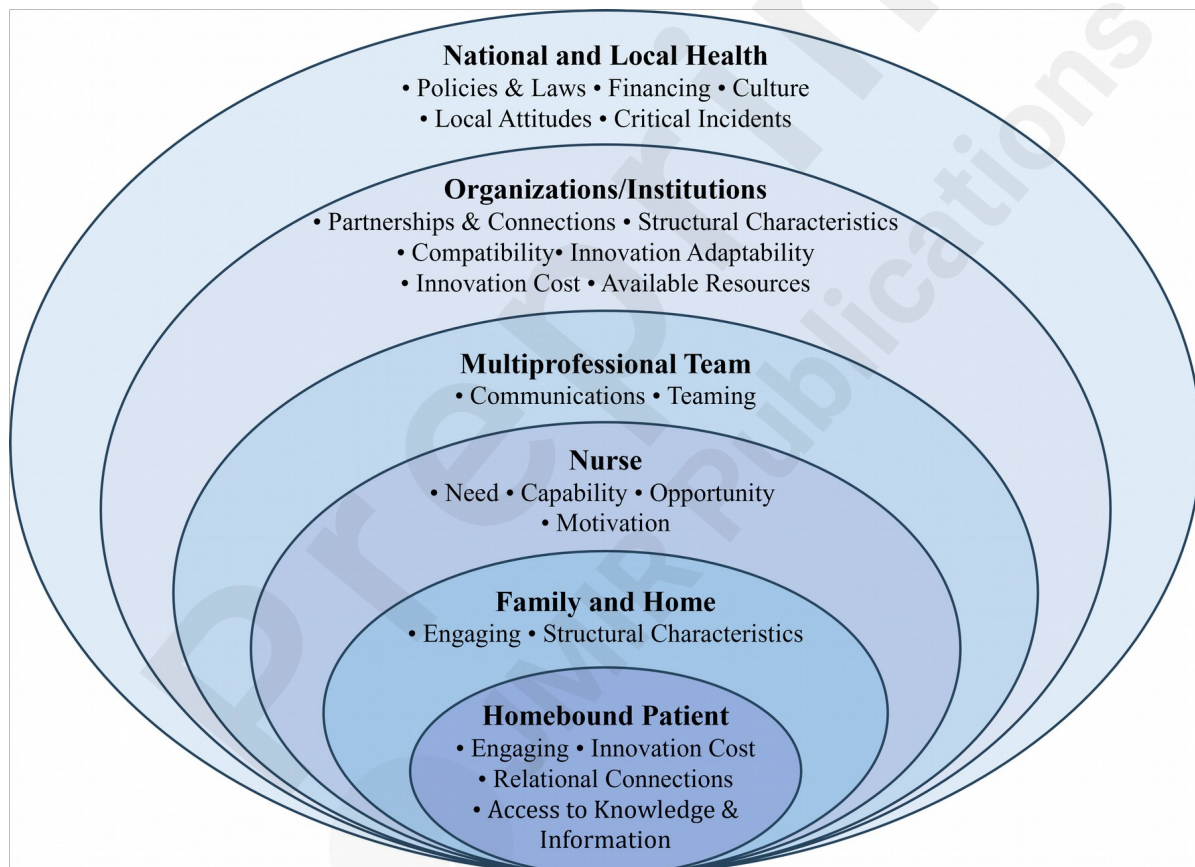
The contents of nurse-delivered telehealth home-based palliative care services involved: assessment and screening (n=7) [33,34,36,37,40,46,48,53,55], palliative care consultation (n=13)

[33,34,36,37,47,51,53,55,56,58,60–63,65,67], nursing coaching session (n=5) [33,34,36,37,44,46,48], regularly follow-up (n=7) [33,34,36–39,44,53,58,64], coordinating medical resources (n=12) [33,34,36,37,40,44,45,49,51,54,56,60,63,68], 24/7 services (n=2) [47,67], remote monitoring (n=4) [38,39,54,57,64], educational support (n=3) [40,49,50], technological support (n=5) [42,43,55,57,60,64], and home care (n=5) [42,43,50,55,63,68].

Facilitators and Barriers to Implementing Nurse-delivered Telehealth Home-based Palliative Care

Guided by CFIR 2.0, the qualitative data and the transformed quantitative data were integrated and synthesized to identify the facilitators and barriers in 6 implementation levels and 20 constructs for implementing nurse-delivered telehealth home-based palliative care as detailed in Figure 3 and Table 3.

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 [52,53,56,59,66]. 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. In contrast, in middle- to low-income countries and regions like Iran, laws concerning nurse home visit safety are

yet to be fully established, which hinders the progress of telehealth home-based palliative care [59,63]. Financing is also an important factor affecting the development of telehealth home-based palliative care. The lack of inclusion of homecare services in the health insurance system [59] or the fact that telehealth home-based palliative care services are not as well supported as in-person care services [53] are barriers. Moreover, due to ethical dilemmas in virtual care and insufficient awareness of the public, local negative attitudes also present barriers [45,59,70].

Organizational and Institutional Systems: Inadequate Integrative Telehealth Service Delivery

At the organization and institution level, the most significant challenges are the partnerships and connections between different organizations. Barriers include inadequate integrative telehealth system and documentation system [64], and poor transitional care from hospital to home [59]. Of the Structural characteristics, information technology infrastructure such as unreliable internet coverage [60] and technical problems [71], and work infrastructure such as insufficient nurse staffing are the barriers to implementing telehealth home-based palliative care. However, community nurses working with patients to solve technical problems alleviated some of these difficulties [61]. The lack of a location to set up telehealth infrastructure also hinders nurses from providing home-based palliative care services via telehealth technologies [63]. The compatibility with current workflow [61], adaptability to various settings [47], and cost avoidance to the healthcare system [54] are the facilitators to implement nurse-delivered telehealth home-based palliative care services.

Table 3. Identified multilevel facilitators and barriers to implementation of telehealth home-based palliative care based on the CFIR 2.0.

Construct of CFIR	Facilitators (F) and barriers (B)	Quotes
1. National and local health level		
1.1. Policies & Laws	B: Lack of prescriptive authority for nurses	In our healthcare system (Iran), nurse prescribing is not legal...Therefore they cannot prescribe at home and manage symptoms of cancer patients [59].
	B: Lack of legal guarantee for home visits	Since the visit takes place at home in an informal place for caring, it can pose risks to the family and healthcare providers [59].
1.2. Financing	B: Lack of reimbursement and payment mechanism	There is no health insurance for coverage of home healthcare services in our healthcare system (Iran) [59]. Ontario palliative fee-for-service billing codes provided significantly less compensation for virtual palliative care than in-person care in the home, thus incentivizing in-person visits [53].
1.3. Culture	B: Culture building	In the public sight, there is no difference between care and treatment, and the hospital is the right place for both; a change in this mindset requires culture-building [59].
1.4. Local attitudes	B: Ethical dilemmas in virtual care	There are things that hospice nurse could see on a one-on-one basis that they may not see on a screen [45].
	B: Insufficient	Public awareness about palliative care and home

	awareness of the public	care is not enough [59].
1.5. Critical incidents	F: Impact of COVID-19 pandemic	They used AVA often during COVID to help keep families connected when visiting was prohibited [47].
2. Organizations and institutions level		
2.1 Partnerships & Connections	B: Lack of integration across telehealth systems and documentation systems B: Poor transitional care from hospital to home	The most prominent challenge in implementing the RHC was the lack of integration across different healthcare systems and services in the documentation concerning the patient's treatment and care [64]. Poor transfer of care from the hospital to home care centers...Can be an obstacle to safe transfer from hospital to home [59].
2.2 Structural characteristics		
· Information technology infrastructure	B: Limited reliable internet coverage	Some caregivers thought that rural network connectivity was unreliable which may represent a barrier to fully deploying telehealth in areas with less reliable network coverage [60].
	B: Technical problems	Due to the Low internet speed in Iran, we had an internet issue with most of the platforms, like kicking out of the room because of bad connection or not having a good and clear voice and video [71].
· Work infrastructure	F: Technical maintenance personnel B: Insufficient nurse staffing	The community nurses solved the technical problems together with the patient [61]. Unfortunately, they (nurses) are not involved in the care at home and community in our society [59].
2.3 Compatibility	F: Compatibility with current workflow	The nurses use of technological devices like tablets is common in the community nurses' daily clinical practice [61].
2.4 Innovation adaptability	F: Adapting to various settings	Thirty-one (77.5%) participants did not have difficulty adjusting to AVA in the patient's home, and 18 (51.4%) did not have difficulty adjusting to AVA in extended care facilities [47].
2.5 Innovation cost	F: Cost avoidance to the healthcare system	Those clinicians agreed that with RELIEF, each patient was able to be managed in the home, and not only were emergency department visits prevented, but at least one admission to hospital was avoided in each case [54].
2.6 Available resources	B: Lack of location to set up infrastructure	In my home care institutions, there would be no quiet computer workstations available [63].
3. Multi-professional team level		
3.1 Communications	F: Communications between healthcare providers	The HCPs agreed that digital care conferences could increase understanding...and improve coordination and communication between

3.2 Teaming	F: Cooperations of nurses	professionals [63]. The use of video consultations allowed the community nurses and the SPC team nurse to co-operate on an inter-professional level and supplement each other [61].
4. Nurse level		
4.1 Need	F: Self-worth recognition	I feel it has great value that I am sitting there [61].
	F: Psychosocial support	Telehealth made me feel very supported during my home visits [60].
	F: Professional development needs	I think I would've felt safer with courses or training before we jumped into it [RHC in palliative care] [64].
4.2 Capability	F: A higher level of telehealth readiness and innovation self-efficacy	The total score of TRAT-C was 65.31 ± 9.09 (range from 20 to 85), which indicated that Chinese palliative care specialist nurses had a moderate level of readiness to provide the telehealth services to patients [66].
	F: Trained and qualified in palliative care	Most providers felt that support using telemedicine can only be provided safely by health providers who have extensive experience in palliative care [67].
4.3 Opportunity	F: Nurse leadership recognition in multi-professional teams	The nurses preferred to have a nurse lead the conference (71.4%). The physicians also revealed a preference for a nurse leader (57.2%) [63].
4.4 Motivation	F: Work efficiency improvement	Using video visits increases my productivity (nurses: 3.0 [1.3]); using video visits makes it easier to do my job (nurses: 3.2 [1.3]) [42].
	B: Fear of death and anxiety	Most of the HCPs expressed their feelings of fear and insecurity regarding cancer and death. One informant believed that this was closely connected to the general perception of cancer as representing death, and to the hcps' personal experiences and attitudes toward death [64].
	B: Additional scheduling burden	Physicians and nurses noted that video visits place an additional burden on nurses, who set up and facilitate video visits during their home visits. Scheduling is an ever-present challenge [42].
	B: Dissatisfied and concerned about exclusively virtual care	Providers described being uncomfortable and dissatisfied with providing exclusively virtual care to patients and their families since they were not able to conduct comprehensive patient assessments virtually and consequently felt they were not providing high-quality care [53].
	B: Limited ability to form connections with patients	Virtual palliative care limited their ability to form personal connections with patients and their caregivers [53].
5. Family and home level		
5.1. Engaging		

· Innovation deliverers	F: Reliable family caregivers	It is always helpful to have a caregiver at home who is reliable and communicates well with the medical team [67].
· Innovation recipients	F: Equitable involvement of family	The relatives could join the video consultations on equal terms with the patients and their involvement was initiated through the App development [61].
5.2. Structural characteristics		
· Physical infrastructure	B: None available device	Six patients were excluded due to a lack of electronic skills, and no tablets were available in time [61].
6. Homebound patient level		
6.1. Engaging		
· Innovation recipients	F: Technical assistance	It's okay if we have technical assistance [45].
	F: Existential value of telehealth services	The service reduced their fear of abandonment, sense of isolation, and uncertainty and could have improved the patient's sense of control [57].
	B: Lack of telehealth competency	Six patients were excluded due to a lack of electronic skills, and no tablets were available in time [61]. Patients and caregivers who reported never using computers had the lowest CAS scores [39].
	B: High age and heavy symptom burden	Some participants found the use of the technology during the telehealth visit to provide a disjointed experience and felt their age decreased their comfort of using telehealth [45]. I don't think the tablet will help me later on as I'm getting worse. At that time, it will be the community nurses who take over because I will have more physical needs. Some things cannot be taken care of on a tablet [62].
	B: Privacy and information safety concerns	I think in some ways the separation, there was an element of control because what we wanted was privacy, so bringing somebody else [in] then would be an invasion of your privacy [65].
6.2. Innovation cost	F: Time and cost savings	Many participants found the telehealth visit to be more efficient and convenient for them personally, requiring less energy spent getting dressed, traveling to the provider's office, and waiting for the appointment [45].
	B: Long timing in telehealth visits	The longer you look at a computer screen or a phone screen, you get tired [45].
6.3. Relational connections	F: Trust-based nurse-patient relationship	When adequate trust is established with a care provider, struggles with technology are more tolerable [45]. They (the patients) pay attention and I feel that we build a trustworthy relationship [61].

6.4. Access to Knowledge & Information	F: Patient education	Over time, patients and carers got to know the nurses and developed rapport and trust [65]. 30 (70.0%) participants suggested patient education (videos, instruction sheets) would be helpful [47].
--	----------------------	---

Multi-professional Team and Healthcare Providers: Effective Coordination and Teaming

At the level of a multi-professional team, communications between healthcare providers [63] and the cooperation of nurses [61] are the most important factors in implementing nurse-delivered telehealth home-based palliative care. 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. Telehealth such as video conferences could increase understanding and cooperation between multi-professional physicians and nurses. 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 [61,63].

Nurses: Positive Professional Identity and Continuous Professional Development

Nurses have a need for self-worth recognition [61], psychosocial support [60], and professional development [64]. A good telehealth home-based palliative care system can meet the needs of nurses. Nurses with higher levels of telehealth readiness, innovation self-efficacy, and training in palliative care have the capability to deliver telehealth home-based palliative care [66,67]. Telehealth home-based palliative care also provides nurses with opportunities to develop nurse leadership in multi-professional teams [63]. On the construct of motivation, telehealth technologies improve the work efficiency of nurses, which could be the facilitator to implement home-based palliative care [42]. However, the fear of death and anxiety [64], additional scheduling burden [42], dissatisfaction with exclusively virtual care [53], and concerns about the limited ability to form connections with patients [53] reduce their willingness to deliver telehealth home-based palliative care.

Family and Home: Family Caregivers of Both Deliverers and Recipients

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 [67]. Equal involvement in video conferencing also facilitates family engagement [61]. However, the lack of physical infrastructure in home settings limits the engagement of family caregivers and patients [61]. This level underscores the necessity of considering the socioeconomic context of family units when planning and delivering telehealth home-based palliative care services.

Homebound Patient: Conflicted Patients and Personalized Patient Needs

At the level of the homebound patient, privacy concerns [65], lack of telehealth competency [39,61], high age [45], and heavy symptom burden [62] are the main barriers to reducing the patients' engagement. Technical assistance [45] and the existential value of telehealth [57] play a role in promoting the engagement of patients. Telehealth home-based palliative care services could save some patients' time and cost to travel to the hospital [45]. However, long timing in

telehealth visits make some patients uncomfortable [45]. Patients and nurses could build trust-based relationships via telehealth technologies [61,65]. The relational connection between patients and nurses, and patient education enhance the acceptability of care [47].

Discussion

By synthesizing quantitative and qualitative data, this integrative systematic review identified the roles of nurses in telehealth home-based palliative care, and synthesized the multilevel factors to implement 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.

With the development of telehealth technologies, the places of palliative care services have extended to the home setting, and the roles of nurses have consequently changed [72]. This presents new challenges for future nursing competencies and practice. Due to the shortage of specialized palliative care staffing in home-based palliative care, we find that nurses' responsibilities partially overlap with those of physicians, medical social workers, and technical personnel. Research suggests that ambiguous professional boundaries may increase the complexity of nursing practice and create role ambiguity, which may influence nurses' own professional identity [73]. However, with telehealth-enabled empowerment, nurses could actively rebuild a stronger professional identity through fluid role boundaries [74], and facilitate communications and cooperation with multi-professional teams [61,63]. With a firm professional identity, the nurses still can develop new roles even if the existing role collapses [75]. Similarly, a systematic review and meta-analysis found that developing the intrinsic motivation of nurses such as professional identity development could improve nurses' job satisfaction effectively, which could reduce turnover of nurses [76].

The formation of nurses' professional identity is a continuous process that occurs throughout nurses' careers from nursing students' education to continuing education [75]. It is suggested that palliative care training should be integrated into nurse education, including nursing students, primary care nurses, and specialist palliative care nurses [77]. A survey has shown that nursing students' professional identity is related to death anxiety, and palliative care education could help them relieve death fear and develop a higher professional identity [78]. It is consistent with our findings that 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 [64]. In addition to palliative care competence, we find that telehealth competence is also important for nurses to deliver telehealth home-based palliative care. One of the included studies indicated that the degree of innovation self-efficacy of palliative care nurses significantly affects their telehealth readiness, and nurses with higher levels of innovation self-efficacy and telehealth readiness have a stronger willingness and motivation to apply telehealth technologies in home-based palliative care [66]. The telehealth competence of nurses also includes the ability to evaluate patients' needs and willingness to use telehealth services, use telehealth devices and applications, solve technical problems, interact with patients, and improve their competence constantly [72]. A comprehensive telehealth training system should be established for palliative care specialist nurses [66,79].

Although nurses make up the largest group of healthcare providers in many countries and regions [80], there is a point of review that the nursing discipline has insufficiently communicated nurses as influential leaders [81]. We find that palliative care nurses are recognized and given the chance to lead the delivery of telehealth home-based palliative care in both nursing teams and multi-professional teams [82]. The professional identity of palliative care nurses is further established in

interpersonal communication and teaming among professional healthcare providers [75,82]. We find that nurses are deeply involved in all aspects of telehealth home-based palliative care implementation. In some countries and regions with low resources, nurses could advocate for nurses' prescriptive authority at the policy and legal level, to improve the accessibility of medication management for patients in telehealth home-based palliative care [18]. With the transformative development of telehealth technologies, nurses could create nurse-led implementation solutions and influence actions via telehealth in multi-level settings, including nursing practice, academic research, clinical management, policy promotion, and public health in home-based palliative care [81,83]. Moreover, nurses could lead the development of nursing education, standard of care, clinical guidance, implementation manual, quality control, and evaluation systems for the application of telehealth technologies in home-based palliative care services to improve patient safety [19,84]. As telehealth delivers, nurses also provide valuable contributions to the interdisciplinary cooperation of nursing and telehealth [85].

The core of palliative care is consistent with the orientation of the nurse-led model of care, which is to deliver patient-centered holistic care [19]. The professional identity of nurses is also established in the trust-based nurse-patient relationship [75]. Telehealth technologies transform the nurse-patient interaction [72]. Some nurses are concerned that virtual palliative care limits their ability to form personal connections with patients and their caregivers, due to lack of physical contact and incomplete assessment [53]. It also reflects an ethical criticism that telehealth home-based palliative care lacks humanity [70]. However, our review finds that from the perspectives of patients, telehealth seems to have the potential to promote the building of trust-based nurse-patient relationships [61,65]. First, nurse-delivered care could relieve patients' symptom burden and improve their quality of life, indicating that the professional competence of nurses in palliative care could increase patient trust [15]. Second, homebound patients could seek timely assistance from nurses through telehealth technologies when they encounter acute symptoms, which relieves patients' existential anxiety, thus promoting their trust in nurses [57]. Third, with the emotional and technical support of nurses, patients are empowered with self-efficacy in telehealth [45]. Moreover, nurses also empower the patients to engage in self-care and enable their family caregivers to be equally involved in home care through health education [18]. In conclusion, with the transformation of the nurse-patient relationship, nurses need competence in interacting with patients by using telehealth technologies [72].

This study explores facilitators and barriers influencing nurse-delivered telehealth home-based palliative care services from an implementation science framework, without evaluating intervention effectiveness. The included studies employed multidimensional outcome measures, encompassing clinical outcomes, healthcare resource utilization, implementation outcomes, and experiences (patients, caregivers, nurses, and other stakeholders). Among these, QOL and mood emerged as the most frequently assessed outcomes for patients and family caregivers. Future studies could employ systematic review and meta-analysis to examine the effectiveness of innovations.

Limitations

Heterogeneity in outcome measures limiting comparability. Moreover, the lack of racial and ethnic diversity limited the generalizability of the study. There are also potential biases from including only English studies, which might affect the comprehensiveness.

Conclusions

This integrative systematic review synthesizes evidence on nurses' evolving roles in telehealth home-based palliative care, and identifies multilevel facilitators and barriers to nurse-delivered home-based

palliative care implementation. With the empowerment of telehealth technologies, nurses could establish a stronger professional identity and develop leadership in home-based palliative care. Systematic palliative care and telehealth education and training is critical across the nurses' professional development, which facilitates to build nurses' competence in home-based palliative care and develop trust-based nurse-patient relationship. Nurses are supposed to leverage influence to promote nursing practice, clinical management, and policy support in the implementation of telehealth home-based palliative care.

Author Contributions

Cong Ma: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing

Yifan Fang: Data curation, Formal analysis, Writing – original draft

Hui Zhang: Data curation, Formal analysis, Writing – original draft

Ying Zheng: Conceptualization, Data curation, Writing – original draft

Ying Zhang: Funding acquisition, Methodology

Wanchen Zhao: Data curation, Formal analysis

Ge Yan: Methodology, Visualization

Yaixin Zeng: Data curation, Formal analysis

Yanwu Zhang: Methodology

Xiaohong Ning: Methodology, Resources

Zhimeng Jia: Conceptualization, Formal analysis, Methodology, Resources, Visualization

Na Guo: Conceptualization, Funding acquisition, Project administration, Supervision

Acknowledgments

Funding was provided by the European Education and Culture Executive Agency (EACEA) under the Erasmus+ programme (grant 101128424), and the Fundamental Research Funds for the Central Universities (grant 3332023163).

Conflicts of Interest

None declared.

Abbreviations

APN: Advanced Practice Nurse

CFIR: Consolidated Framework for Implementation Research

COM-B: Capability, Opportunity, Motivation - Behavior

JBI: 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

PRISMA 2020 checklist of this integrative systematic review.

Multimedia Appendix 2

The search strategy of PubMed, Web of Science, and Embase.

Multimedia Appendix 3

Characteristics of the included studies based on TIDieR checklist.

Multimedia Appendix 4

Assessment of methodological quality of the included studies using Mixed Methods Appraisal Tool (version 2018).

References

1. Pinto S, Lopes S, de Sousa AB, et al. Patient and family preferences about place of end-of-life care and death: an umbrella review. *J Pain Symptom Manage* 2024;S0885-3924(24)00016-2. doi:10.1016/j.jpainsymman.2024.01.014
2. Shepperd S, Gonçalves-Bradley DC, Straus SE, et al. Hospital at home: home-based end-of-life care. *Cochrane Database Syst Rev* 2021;2021(7):CD009231. doi:10.1002/14651858.CD009231.pub3
3. Goswami S. Home based palliative care. In: Cascella M, John Stones M, editors. *Suggestions for addressing clinical and non-clinical issues in palliative care*. London: IntechOpen; 2021. ISBN: 978-1-83969-986-4. doi:10.5772/intechopen.77344
4. Hui D, Bruera E. Models of palliative care delivery for patients with cancer. *J Clin Oncol* 2020;38(9):852-865. doi:10.1200/JCO.18.02123
5. Ali M, Capel M, Jones G, et al. The importance of identifying preferred place of death. *BMJ Support Palliat Care* 2019;9(1):84-91. doi:10.1136/bmjspcare-2015-000878
6. Roberts B, Robertson M, Ojukwu EI, et al. Home based palliative care: known benefits and future directions. *Curr Geriatr Rep* 2021;10(4):141-147. doi:10.1007/s13670-021-00372-8
7. U.S. Department of Health and Human Services (Telehealth.HHS.gov). Getting started with telehealth. Available from: <https://telehealth.hhs.gov/providers/getting-started> [Accessed 11 April 2025].
8. Walton L, Courtright K, Demiris G, et al. Telehealth palliative care in nursing homes: a scoping review. *J Am Med Dir Assoc* 2023;24(3):356-367.e2. doi:10.1016/j.jamda.2023.01.004
9. Hamadi HY, Zhao M, Haley DR, et al. Medicare and telehealth: the impact of COVID-19 pandemic. *J Eval Clin Pract* 2022;28(1):43-48. doi:10.1111/jep.13634
10. Wang SE, Liu ILA, Lee JS, et al. End-of-life care in patients exposed to home-based palliative care vs hospice only. *J Am Geriatr Soc* 2019;67(6):1226-1233. doi:10.1111/jgs.15844
11. Ye J, He L, Beestrum M. Implications for implementation and adoption of telehealth in developing countries: a systematic review of China's practices and experiences. *NPJ Digit Med* 2023;6(1):174. doi:10.1038/s41746-023-00908-6
12. Alshakhs S, Park T, McDarby M, et al. Interventions for Family Caregivers of Patients Receiving Palliative/Hospice Care at Home: A Scoping Review. *J Palliat Med*. 2024;27(1):112-127. doi:10.1089/jpm.2023.0160
13. Jess M, Timm H, Dieperink KB. Video consultations in palliative care: A systematic integrative review. *Palliat Med*. 2019;33(8):942-958. doi:10.1177/0269216319854938
14. Steindal SA, Nes AAG, Godskesen TE, et al. Advantages and challenges of using telehealth for home-based palliative care: systematic mixed studies review. *J Med Internet Res* 2023;25:e43684. doi:10.2196/43684
15. Lundereng ED, Nes AAG, Holmen H, et al. Health care professionals' experiences and perspectives on using telehealth for home-based palliative care: scoping review. *J Med Internet Res* 2023;25(1):e43429. doi:10.2196/43429
16. Schuessler N, Glarcher M. Caregivers' perspectives on ethical challenges and patient safety

- in tele-palliative care: an integrative review. *J Hosp Palliat Nurs* 2024;26(1):E1-E12. doi:10.1097/NJH.0000000000000986
17. Steindal SA, Nes AAG, Godskesen TE, et al. Patients' experiences of telehealth in palliative home care: scoping review. *J Med Internet Res* 2020;22(5):e16218. doi:10.2196/16218
 18. Bassah N, Vaughn L, Santos Salas A. Nurse-led adult palliative care models in low- and middle-income countries: a scoping review. *J Adv Nurs* 2023;79(11):4112-4126. doi:10.1111/jan.15646
 19. Clarke J, Davis K, Douglas J, et al. Defining nurse-led models of care: contemporary approaches to nursing. *Int Nurs Rev* 2025;72(1):e13076. doi:10.1111/inr.13076
 20. Brereton L, Clark J, Ingleton C, et al. What do we know about different models of providing palliative care? Findings from a systematic review of reviews. *Palliat Med* 2017;31(9):781-797. doi:10.1177/0269216317701890
 21. Damschroder LJ, Reardon CM, Widerquist MAO, et al. The updated Consolidated Framework for Implementation Research based on user feedback. *Implement Sci* 2022;17(1):75. doi:10.1186/s13012-022-01245-0
 22. Stern C, Lizarondo L, Carrier J, et al. Methodological guidance for the conduct of mixed methods systematic reviews. *JBIM Evid Implement* 2021;19(2):120-129. doi:10.1097/XEB.0000000000000282
 23. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi:10.1136/bmj.n71
 24. Whitemore R, Knafl K. The integrative review: updated methodology. *J Adv Nurs* 2005;52(5):546-553. doi:10.1111/j.1365-2648.2005.03621.x
 25. Pluye P, Gagnon MP, Griffiths F, et al. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. *Int J Nurs Stud* 2009;46(4):529-546. doi:10.1016/j.ijnurstu.2009.01.009
 26. Groom LL, McCarthy MM, Stimpfel AW, et al. Telemedicine and telehealth in nursing homes: an integrative review. *J Am Med Dir Assoc* 2021;22(9):1784-1801.e7. doi:10.1016/j.jamda.2021.02.037
 27. Mathews JJ, Chow R, Wennberg E, Lau J, Hannon B, Zimmermann C. Telehealth palliative care interventions for patients with advanced cancer: a scoping review. *Support Care Cancer*. 2023;31(8):451. Published 2023 Jul 8. doi:10.1007/s00520-023-07907-z
 28. Cooke A, Smith D, Booth A. Beyond PICO: the SPIDER tool for qualitative evidence synthesis. *Qual Health Res* 2012;22(10):1435-1443. doi:10.1177/1049732312452938
 29. Radbruch L, De Lima L, Knäul F, et al. Redefining palliative care—a new consensus-based definition. *J Pain Symptom Manage* 2020;60(4):754-764. doi:10.1016/j.jpainsymman.2020.04.027
 30. MMAT_2018_criteria-manual_2018-08-01_ENG.pdf. Accessed December 12, 2023. http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf
 31. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*. 2014;348:g1687. Published 2014 Mar 7. doi:10.1136/bmj.g1687
 32. Jia Z, Leiter RE, Yeh IM, et al. Toward culturally tailored advance care planning for the Chinese diaspora: an integrative systematic review. *J Palliat Med* 2020;23(12):1662-1677. doi:10.1089/jpm.2020.0330
 33. Bakitas MA, Tosteson TD, Li Z, et al. Early versus delayed initiation of concurrent palliative oncology care: patient outcomes in the ENABLE III randomized controlled trial. *J Clin Oncol* 2015;33(13):1438-1445. doi:10.1200/JCO.2014.58.6362
 34. Dionne-Odom JN, Azuero A, Lyons KD, et al. Benefits of early versus delayed palliative care

- to informal family caregivers of patients with advanced cancer: outcomes from the ENABLE III randomized controlled trial. *J Clin Oncol* 2015;33(13):1446-1452. doi:10.1200/JCO.2014.58.7824
35. Bakitas M, Dionne-Odom JN, Jackson L, et al. "There were more decisions and more options than just yes or no": evaluating a decision aid for advanced cancer patients and their family caregivers. *Palliat Support Care* 2017;15(1):44-56. doi:10.1017/S1478951516000596
36. Bakitas MA, Dionne-Odom JN, Ejem DB, et al. Effect of an early palliative care telehealth intervention vs usual care on patients with heart failure: the ENABLE CHF-PC randomized clinical trial. *JAMA Intern Med* 2020;180(9):1203-1213. doi:10.1001/jamainternmed.2020.2861
37. Dionne-Odom JN, Ejem DB, Wells R, et al. Effects of a telehealth early palliative care intervention for family caregivers of persons with advanced heart failure: the ENABLE CHF-PC randomized clinical trial. *JAMA Netw Open* 2020;3(4):e202583. doi:10.1001/jamanetworkopen.2020.2583
38. Wilkie DJ, Yao Y, Ezenwa MO, et al. A stepped-wedge randomized controlled trial: effects of eHealth interventions for pain control among adults with cancer in hospice. *J Pain Symptom Manage* 2020;59(3):626-636. doi:10.1016/j.jpainsymman.2019.10.028
39. Schoppee TM, Dyal BW, Scarton L, et al. Patients and caregivers rate the PAINReportIt wireless internet-enabled tablet as a method for reporting pain during end-of-life cancer care. *Cancer Nurs* 2020;43(5):419-424. doi:10.1097/NCC.0000000000000743
40. Dionne-Odom JN, Williams GR, Warren PP, et al. Implementing a clinic-based telehealth support service (FamilyStrong) for family caregivers of individuals with grade IV brain tumors. *J Palliat Med* 2021;24(3):347-353. doi:10.1089/jpm.2020.0178
41. Breyre A, Taigman M, Salvucci A, et al. Effect of a mobile integrated hospice healthcare program on emergency medical services transport to the emergency department. *Prehosp Emerg Care* 2022;26(3):364-369. doi:10.1080/10903127.2021.1900474
42. Osuji TA, Macias M, McMullen C, et al. Clinician perspectives on implementing video visits in home-based palliative care. *Palliat Med Rep* 2020;1(1):221-226. doi:10.1089/pmr.2020.0074
43. Nguyen HQ, McMullen C, Haupt EC, et al. Findings and lessons learnt from early termination of a pragmatic comparative effectiveness trial of video consultations in home-based palliative care. *BMJ Support Palliat Care*. Published online October 13, 2020. doi:10.1136/bmjspcare-2020-002553
44. Bekelman DB, Feser W, Morgan B, et al. Nurse and Social Worker Palliative Telecare Team and Quality of Life in Patients With COPD, Heart Failure, or Interstitial Lung Disease: The ADAPT Randomized Clinical Trial [published correction appears in *JAMA*. 2025 Mar 26. doi: 10.1001/jama.2025.3767.]. *JAMA*. 2024;331(3):212-223. doi:10.1001/jama.2023.24035
45. Bethel C, Towers V, Crist JD, et al. A guide for intentional home telehealth assessment: patient and caregiver perceptions. *CIN Comput Inform Nurs* 2021;39(12):943-947. doi:10.1097/CIN.0000000000000779
46. Doorenbos AZ, Levy WC, Curtis JR, et al. An intervention to enhance goals-of-care communication between heart failure patients and heart failure providers. *J Pain Symptom Manage* 2016;52(3):353-360. doi:10.1016/j.jpainsymman.2016.03.018
47. Cameron P. Hospice staff comfort with telehospice. *Home Healthc Now* 2021;39(6):344-350. doi:10.1097/NHH.0000000000001019
48. Iyer AS, Wells RD, Dionne-Odom JN, et al. Project EPIC (Early Palliative Care in COPD): a formative and summative evaluation of the EPIC telehealth intervention. *J Pain Symptom Manage* 2023;65(4):335-347.e3. doi:10.1016/j.jpainsymman.2022.11.024
49. Schmucker AM, Flannery M, Cho J, et al. Data from emergency medicine palliative care access (EMPallA): a randomized controlled trial comparing the effectiveness of specialty

- outpatient versus telephonic palliative care of older adults with advanced illness presenting to the emergency department. *BMC Emerg Med* 2021;21(1):83. doi:10.1186/s12873-021-00478-4
50. De Veer AJE, Slev VN, Pasman HR, et al. Assessment of a structured self-management support intervention by nurses for patients with incurable cancer. *Oncol Nurs Forum* 2020;47(3):305-317. doi:10.1188/20.ONF.305-317
 51. Hoek PD, Schers HJ, Bronkhorst EM, et al. The effect of weekly specialist palliative care teleconsultations in patients with advanced cancer—a randomized clinical trial. *BMC Med* 2017;15(1):119. doi:10.1186/s12916-017-0866-9
 52. Evering RMH, Postel MG, van Os-Medendorp H, et al. Intention of healthcare providers to use video-communication in terminal care: a cross-sectional study. *BMC Palliat Care* 2022;21(1):213. doi:10.1186/s12904-022-01100-5
 53. Vincent D, Peixoto C, Quinn KL, et al. Virtual home-based palliative care during COVID-19: a qualitative exploration of the patient, caregiver, and healthcare provider experience. *Palliat Med* 2022;36(9):1374-1388. doi:10.1177/02692163221116251
 54. Bhargava R, Keating B, Isenberg SR, et al. RELIEF: a digital health tool for the remote self-reporting of symptoms in patients with cancer to address palliative care needs and minimize emergency department visits. *Curr Oncol* 2021;28(6):4273-4280. doi:10.3390/curroncol28060363
 55. Read Paul L, Salmon C, Sinnarajah A, Spice R. Web-based videoconferencing for rural palliative care consultation with elderly patients at home. *Support Care Cancer*. 2019;27(9):3321-3330. doi:10.1007/s00520-018-4580-8
 56. Valenti V, Rossi R, Scarpi E, et al. Nurse-led telephone follow-up for early palliative care patients with advanced cancer. *J Clin Nurs* 2023;32(11-12):2846-2853. doi:10.1111/jocn.16403
 57. Vitacca M, Comini L, Tabaglio E, et al. Tele-assisted palliative homecare for advanced chronic obstructive pulmonary disease: a feasibility study. *J Palliat Med* 2019;22(2):173-178. doi:10.1089/jpm.2018.0321
 58. Mirshahi A, Bakitas M, Khoshavi M, et al. The impact of an integrated early palliative care telehealth intervention on the quality of life of heart failure patients: a randomized controlled feasibility study. *BMC Palliat Care* 2024;23(1):22. doi:10.1186/s12904-024-01348-z
 59. Alizadeh Z, Rohani C, Rassouli M, et al. Challenges of integrated home-based palliative care services for cancer patients during the COVID-19 pandemic: a qualitative content analysis. *Home Health Care Manag Pract* 2023;35(3):180-189. doi:10.1177/10848223221134780
 60. Jiang B, Bills M, Poon P. Integrated telehealth-assisted home-based specialist palliative care in rural Australia: a feasibility study. *J Telemed Telecare* 2023;29(1):50-57. doi:10.1177/1357633X20966466
 61. Funderskov KF, Boe Danbjørg D, Jess M, et al. Telemedicine in specialised palliative care: healthcare professionals' and their perspectives on video consultations—a qualitative study. *J Clin Nurs* 2019;28(21-22):3966-3976. doi:10.1111/jocn.15004
 62. Funderskov KF, Raunkjær M, Danbjørg DB, et al. Experiences with video consultations in specialized palliative home-care: qualitative study of patient and relative perspectives. *J Med Internet Res* 2019;21(3):e10208. doi:10.2196/10208
 63. Ebnester AS, Maessen M, Sauter TC, et al. Perceptions and needs of an outpatient palliative care team regarding digital care conferences in palliative care: a mixed-method online survey. *Swiss Med Wkly* 2024;154(1):3487. doi:10.57187/s.3487
 64. Oelschlägel L, Dihle A, Christensen VL, et al. Implementing welfare technology in palliative homecare for patients with cancer: a qualitative study of health-care professionals' experiences. *BMC Palliat Care* 2021;20(1):146. doi:10.1186/s12904-021-00844-w
 65. Middleton-Green L, Gadoud A, Norris B, et al. "A friend in the corner": supporting people at

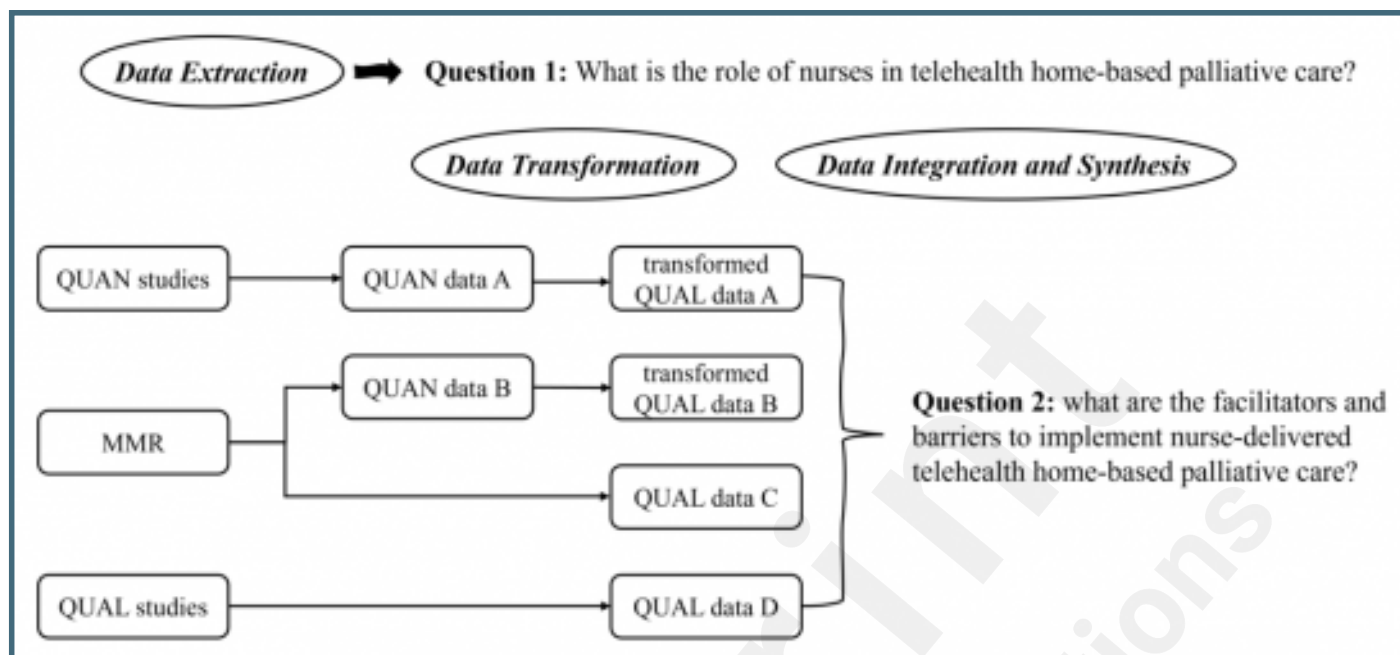
- home in the last year of life via telephone and video consultation—an evaluation. *BMJ Support Palliat Care* 2016;9(4):e26. doi:10.1136/bmjspcare-2015-001016
66. Guo J, Dai Y, Gong Y, et al. Exploring the telehealth readiness and its related factors among palliative care specialist nurses: a cross-sectional study in China. *BMC Palliat Care* 2023;22(1):82. doi:10.1186/s12904-023-01209-1
67. Salem R, El Zakhem A, Gharamti A, et al. Palliative care via telemedicine: a qualitative study of caregiver and provider perceptions. *J Palliat Med* 2020;23(12):1594-1598. doi:10.1089/jpm.2020.0002
68. Balasubramanian S, Biji MS, Ranjith MK, et al. Patient satisfaction in home care services through e-palliative care—an experience of tertiary cancer centre from Kerala. *Indian J Palliat Care* 2022;28(3):250-255. doi:10.25259/IJPC_36_2021
69. Chagani J, Li D, Keating B, et al. Experiences and lessons learned from implementing the RELIEF digital symptom self-reporting app in a palliative home care setting. *Curr Oncol* 2022;29(12):9401-9406. doi:10.3390/curroncol29120738
70. May S, Bruch D, Gehlhaar A, et al. Digital technologies in routine palliative care delivery: an exploratory qualitative study with health care professionals in Germany. *BMC Health Serv Res* 2022;22:1516. doi:10.1186/s12913-022-08802-9
71. Mirshahi A, Bakitas M, Khoshavi M, et al. The impact of an integrated early palliative care telehealth intervention on the quality of life of heart failure patients: a randomized controlled feasibility study. *BMC Palliat Care* 2024;23(1):22. doi:10.1186/s12904-024-01348-z
72. Jarva E, Oikarinen A, Andersson J, et al. Healthcare professionals' perceptions of digital health competence: a qualitative descriptive study. *Nurs Open* 2022;9(2):1379-1393. doi:10.1002/nop2.1184
73. Cengiz A, Yoder LH, Danesh V. A concept analysis of role ambiguity experienced by hospital nurses providing bedside nursing care. *Nurs Health Sci.* 2021;23(4):807-817. doi:10.1111/nhs.12888
74. Kennedy C, Brooks Young P, Nicol J, Campbell K, Gray Brunton C. Fluid role boundaries: exploring the contribution of the advanced nurse practitioner to multi-professional palliative care. *J Clin Nurs.* 2015;24(21-22):3296-3305. doi:10.1111/jocn.12950
75. Ohlén J, Segesten K. The professional identity of the nurse: concept analysis and development. *J Adv Nurs* 1998;28(4):720-727. doi:10.1046/j.1365-2648.1998.00704.x
76. Niskala J, Kanste O, Tomietto M, et al. Interventions to improve nurses' job satisfaction: a systematic review and meta-analysis. *J Adv Nurs* 2020;76(7):1498-1508. doi:10.1111/jan.14342
77. Parekh de Campos A, Levoy K, Pandey S, et al. Integrating palliative care into nursing care. *Am J Nurs* 2022;122(11):40-45. doi:10.1097/01.NAJ.0000897124.77291.7d
78. Xie L, Li Y, Ge W, et al. The relationship between death attitude and professional identity in nursing students from mainland China. *Nurse Educ Today* 2021;107:105150. doi:10.1016/j.nedt.2021.105150
79. Rutledge CM, O'Rourke J, Mason AM, et al. Telehealth competencies for nursing education and practice: the four P's of telehealth. *Nurse Educ* 2021;46(5):300-305. doi:10.1097/NNE.0000000000000988
80. World Health Organization. State of the world's nursing 2020: investing in education, jobs and leadership. Available from: <https://www.who.int/publications-detail-redirect/9789240003279> [Accessed 11 April 2025].
81. Lindell JM, Godsey JA, Hayes T, et al. A framework for transforming the professional identity and brand image of all nurses as leaders. *Nurs Outlook* 2023;71(6):102051. doi:10.1016/j.outlook.2023.102051
82. Stievano A, Sabatino L, Affonso D, et al. Nursing's professional dignity in palliative care:

- exploration of an Italian context. *J Clin Nurs* 2019;28(9-10):1633-1642. doi:10.1111/jocn.14753
83. O'Connor S, Cave L, Philips N. Informing nursing policy: an exploration of digital health research by nurses in England. *Int J Med Inform* 2024;185:105381. doi:10.1016/j.ijmedinf.2024.105381
84. Dzioba C, Lamanna J, Perry CK, et al. Telehealth competencies: leveled for continuous advanced practice nurse development. *Nurse Educ* 2022;47(5):293-297. doi:10.1097/NNE.0000000000001196
85. Guo J, Liu J, Liu C, et al. Nursing informatics competency and its associated factors among palliative care nurses: an online survey in mainland China. *BMC Nurs* 2024;23(1):157. doi:10.1186/s12912-024-01803-5

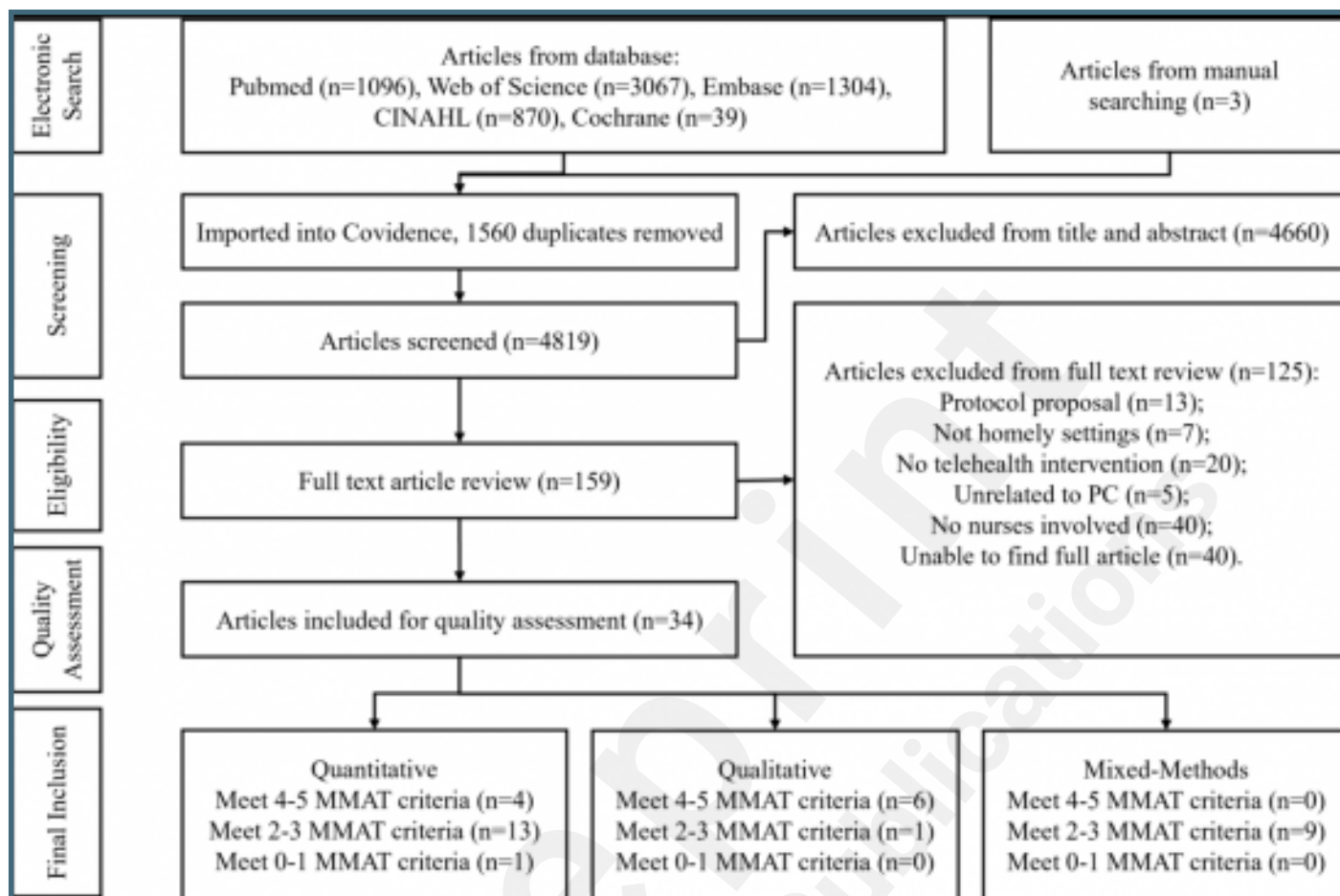
Supplementary Files

Figures

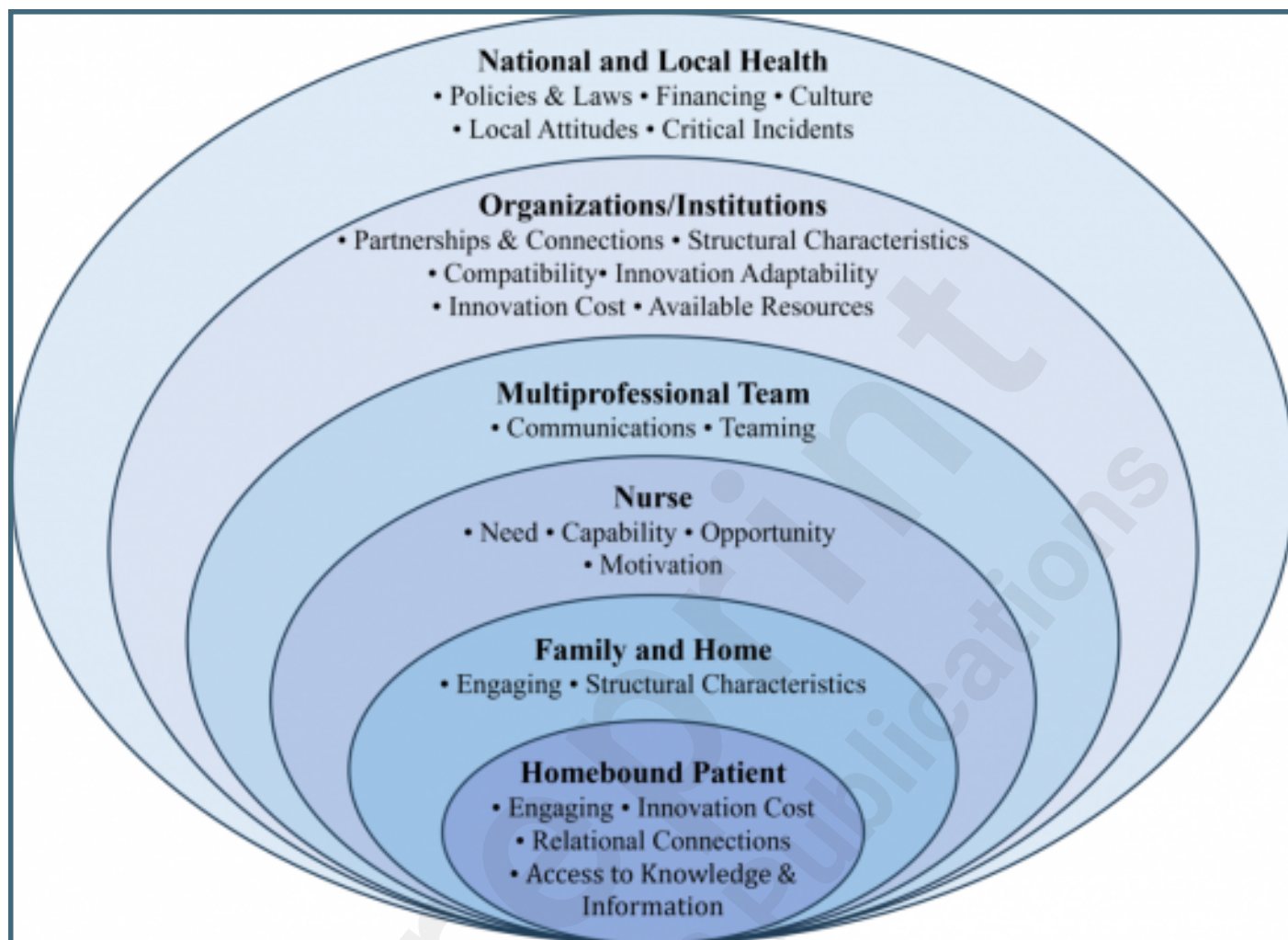
Flow diagram of data extraction, transformation, integration, and synthesis.



PRISMA flow diagram of systematic literature review.



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



Multimedia Appendixes

PRISMA 2020 checklist of this integrative systematic review.

URL: <http://asset.jmir.pub/assets/85d8b2f9e951b03f51a9efafe32ff11f.docx>

The search strategy of PubMed, Web of Science, and Embase.

URL: <http://asset.jmir.pub/assets/ae0c9a9c18e7d0a5bcdbb3e92535a761.docx>

Characteristics of the included studies based on TIDieR checklist.

URL: <http://asset.jmir.pub/assets/114e2bb355eb46a42dca5e3054e8874a.docx>

Assessment of methodological quality of the included studies using Mixed Methods Appraisal Tool (version 2018).

URL: <http://asset.jmir.pub/assets/fcbe37efcfefbf88a2e947a987a973d5b.docx>

