Review Article

Enhancing End-of-Life Care With Home-Based Palliative Interventions: A Systematic Review

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Abstract

Context. Home-Based Palliative Care (HPC) interventions have emerged as a promising approach to deliver patient-centered care in familiar surroundings, aligning with patients' preferences and improving quality of life (QOL).

Objectives. This review aimed to systematically assess the impact of HPC interventions on symptom management, QOL, healthcare resource utilization and place of death among patients with severe, progressive illnesses requiring end-of-life care.

Methods. A comprehensive search was conducted across PubMed, Cochrane, and Scopus databases to identify relevant studies published between January 1, 2013, and December 31, 2023. Eligible studies included randomized controlled trials and clinical studies evaluating the effectiveness of HPC interventions compared to usual care. Risk of bias assessment was performed using Cochrane tools.

Results. Nine publications meeting inclusion criteria were identified. Findings indicate that HPC interventions, delivered by specialized teams or integrated care approaches, significantly improve QOL and increase the likelihood of patients dying at home. Moreover, HPC is associated with reduced healthcare utilization, including fewer hospital admissions, emergency department visits, and shorter hospital stays. No significant differences were observed in symptom management.

Conclusion. HPC interventions demonstrate significant benefits in addressing the complex needs of patients with advanced illnesses. These findings underscore the importance of integrating HPC into healthcare systems to optimize outcomes and promote quality end-of-life care. Future research should focus on expanding access to HPC services, enhancing interdisciplinary collaboration, and incorporating patient preferences to further improve care delivery in this vulnerable population. J Pain Symptom Manage 2024;68:e356–e372.

Keywords
Emergency room visits, Home care services, Length of stay, Palliative care, Quality of life, Symptom evaluation

Key Message

This systematic review highlights the significant benefits of Home-Based Palliative Care interventions, improving quality of life and increasing the likelihood of patients achieving home deaths. Moreover, they decrease healthcare utilization, notably hospital admissions and emergency department visits, thus emphasizing patient-centered care and bolstering healthcare system sustainability.

Introduction

Rationale

The rising prevalence of noncommunicable diseases, marked by increased frailty and vulnerability, has led to a significant global burden of suffering at the end of life, necessitating expanded provision of Palliative Care (PALC).[1–5]

Abbreviations: CI, Confidence interval; EDV, Emergency department visits; HPC, Home-based Palliative Care; INTG, Intervention group; LHS, Length of hospital stay; PALC, Palliative Care; QOL, Quality of life; RCT, Randomized controlled trial; RR, Relative risk

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Despite the complexities of home environments, physicians in community PALC teams observe the significant value patients and families place on being at home. This familiar setting affords them control and greater freedom compared to hospitals or hospices.[6,7]

Ensuring optimal PALC across all contexts is crucial. To align with people's preferences, investment should prioritize Home-based Palliative Care (HPC) services aiming to reduce dependence on end-of-life hospital care.[6] This requires timely and coordinated services addressing escalating symptom burdens and incorporating advanced care planning.[8,9] HPC teams need to be readily available, well-equipped, and competent, offering 24/7 availability and home visits.[10]

Community PALC teams demonstrate tangible benefits for patients, caregivers/families, and healthcare services.[6,10–16] Alongside enhanced symptom management and improved quality of life (QOL) for patients, there is a greater chance of spending time at home, particularly at the end of life.[6,12–14] Access to PALC also leads to improved caregiver outcomes, including better met information needs, increased sense of security, and enhanced ability to cope with life after the patient's death.[10,11–13,15–17]

Frequent emergency department visits (EDV), hospitalizations, and deaths in acute care facilities are indicators of subpar care for advanced-stage cancer patients.[14] Multiple avoidable hospitalizations not only incur high costs but may also lead to futile and burdensome interventions.[13,18] Access to PALC is associated with reduced EDV in the last year of life,[13,19] allowing patients to remain in their preferred care setting while receiving tailored and timely treatment. Avoiding an undesired hospital death, often less peaceful and harder for family members to accept, underscores the importance of these care practices.[13,15,19] In 2013, a systematic review (23 studies) showed evidence of small but statistically significant beneficial effects of HPC services (compared to usual care) on reducing symptom burden for patients and of no effect on caregiver grief. Moreover, it showed that evidence on cost-effectiveness of HPC services was inconclusive.[20] Although robust data on their cost-effectiveness are still needed, preliminary observational data from community-based programs and evidence from randomized trials of other outpatient PALC programs have demonstrated superior symptom management, increased patient and family satisfaction rates, and substantial reductions in costs, hospitalizations, EDV, length of hospital stay (LHS), days in the intensive care unit, and medical consultations.[21,22]

To honor individuals' preferences for home-based care and end-of-life experiences, it is vital to assess the effectiveness of integrated HPC teams within existing healthcare systems. This is particularly imperative in nations facing rising mortality rates and dependency ratios, aiming to mitigate unnecessary hospitalizations and unsustainable healthcare costs while enhancing overall care quality.[17,21]

Objectives

This review assessed systematically the effectiveness of HPC compared to standard care for patients with severe, prolonged, or progressive illnesses requiring end-of-life care. Outcomes included QOL, symptom control/burden, healthcare resource utilization (EDV, hospital admissions, LHS, and other resource usage) and place of death.

Given the rising preference for home deaths among patients and the strain on hospitals, this study aims to advocate for increased investment in HPC to better address current needs.

Methods

This systematic review followed the recommendations of the "Cochrane Handbook for Systematic Reviews of Interventions",[23] and was reported in accordance with the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" guidelines.[24]

Eligibility Criteria

The selection of studies was based on the following criteria:

Participants: Adults (≥18 years old) of any gender diagnosed with severe, prolonged, or progressive illnesses requiring end-of-life care.

Interventions: Studies related to HPC interventions were included. A detailed description of the specific intervention was required. The team for the intervention group (INTG) had to comprise either a specialized PALC team or include at least one PALC specialized/trained health professional.

Comparators: the control group received usual care for patients requiring end-of-life care.

Outcomes: Included studies had to report on at least two of the following outcomes: QOL, symptom control/burden, healthcare resource utilization (EDV, hospital admissions, or LHS) or place of death.

Study Designs: randomized controlled trials (RCT), controlled clinical trials (CCT), interrupted time series (ITS) studies, prospective and retrospective cohort studies, and case-control studies.

The included studies utilized recognized and validated scales and questionnaires.

Articles that were not freely available or not subscribed to by our Faculty's Library were excluded.

Information Sources

The PubMed, Cochrane, and Scopus databases were searched. Additionally, backward citation searching was conducted by examining the reference lists of

articles retrieved from the databases to identify relevant literature. Each source was last consulted on January 03, 2024.

Search Strategy

The search employed both free-text terms and MeSH terms, structured as follows: (["palliative care" OR "hospice care" OR "terminal care"] AND [home]) AND ("place of death" OR "quality of life" OR [symptom* OR "symptom control" OR "symptom burden"] OR "hospital admissions" OR ["length of stay" OR "hospital stay"] OR ["emergency department" AND {visit* OR use OR utilization}]).

Filters were applied for English language, participants aged ≥18 years, a time limit from January 1, 2013, to December 31, 2023, and study designs including RCT and clinical studies. The search strategy used in the 3 databases is located in Fig. 1.

Selection Process

Both authors independently reviewed all identified titles and abstracts retrieved from the search. Subsequently, both authors independently evaluated the full text of potentially relevant articles for eligibility and methodological quality. Any discrepancies regarding study selection and data extraction were resolved through discussion and consensus between the authors. No automation tools were employed during this process.

Data Collection Process

A data-charting form was created using Microsoft Excel© (Microsoft Corp, 2016) and iteratively refined through testing. The first author primarily conducted data charting, with the second author independently cross-verifying and augmenting the data. Any discrepancies between reviewers were resolved through discussion until consensus was achieved. Original authors were not contacted for additional data or confirmation. No automation tools were employed in this process.

Data items

Data were collected for the following outcomes: QOL, symptom control/burden, healthcare resource utilization (hospital admissions, EDV, and LHS) and place of death. All results corresponding to each

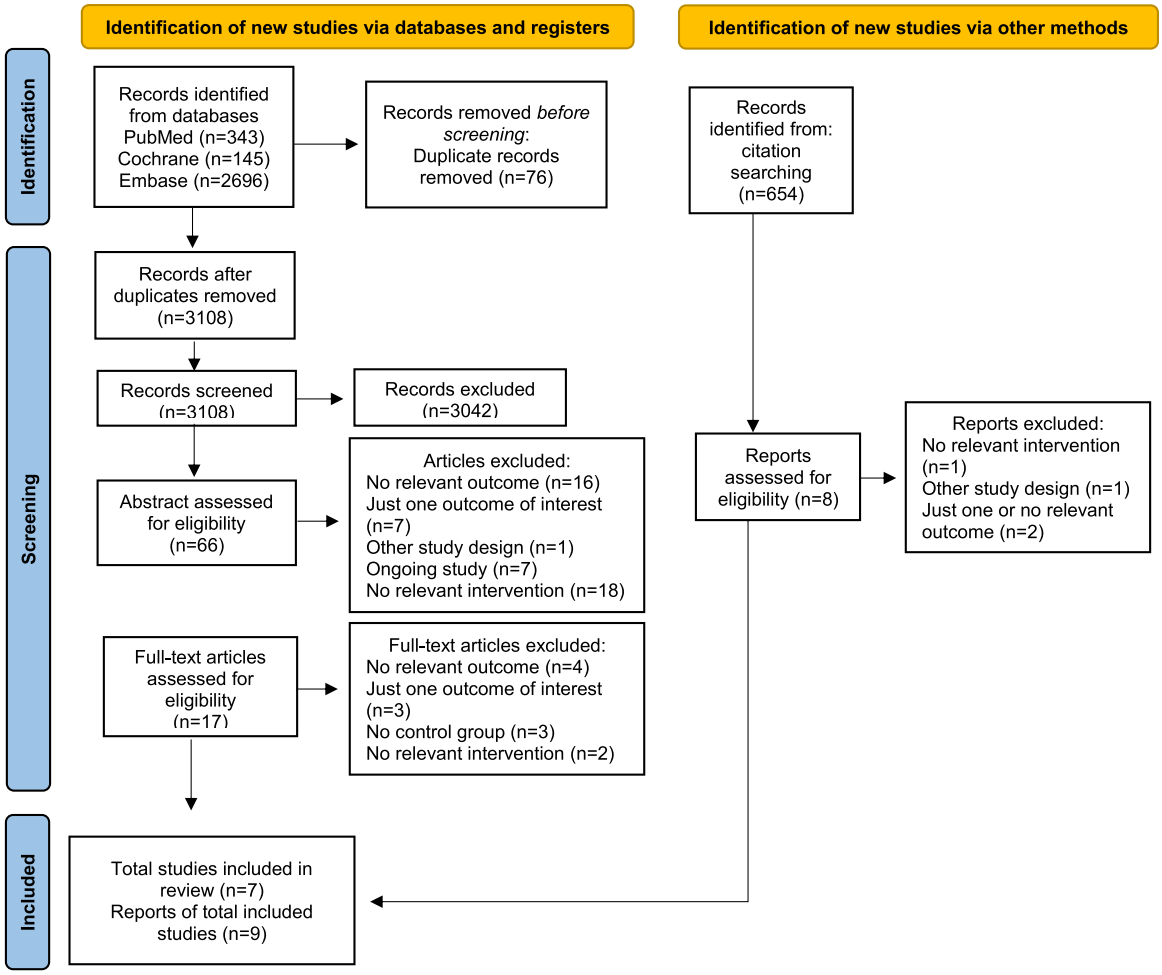

Fig. 1. Flow diagram of the study selection process.

outcome domain in each study were documented (including all measures).

Furthermore, data were gathered for variables such as: article characteristics (authors, country of origin, year of publication), study design, participant demographics, intervention details, comparator/controls information, main outcomes, main results and observations. These variables have been organized and presented in Table 1 and Table 2 (main results).

Study Risk of Bias Assessment

The risk of bias in the studies was assessed using Cochrane tools. For RCT, the Revised Cochrane risk-of-bias tool (RoB 2) was utilized.[32] For nonrandomized studies, the ROBINS-I assessment tool (cohort-type version) was employed.[33] Two independent reviewers conducted the quality evaluation of studies, and any discrepancies were resolved through discussion until consensus was reached.

Effect Measures

For each outcome, we accepted the effect measures as declared by the authors of each study. These measures were utilized both in the synthesis and presentation of the results.

Synthesis Methods

A meta-analysis was not conducted due to limitations such as the small number of studies and the lack of homogeneity among participants, interventions, and outcomes, which precluded meaningful summary. Evidence was presented in a narrative format. To visually display the results of individual studies and syntheses, we utilized a data-charting form, as presented in Table 2.

Results

Study Selection

The initial search across three databases yielded a total of 3184 articles. After removing duplicates, 3108 unique publications remained for eligibility assessment. During the title screening, 3042 articles were excluded, and an additional 49 were excluded during abstract screening. The full texts of the remaining 17 articles were thoroughly reviewed, resulting in the exclusion of 12 more articles. Of these, four were excluded due to the absence of any relevant outcome, three for having only one relevant outcome, three for lacking a control group, and two for not being a relevant intervention for the review (Appendix 1). Additionally, 654 records were identified through citation searching of the aforementioned 17 articles, leading to the further full-text analysis of eight articles and the exclusion of four. Of these four excluded studies, one had an intervention not relevant to the review, one had a study design outside the inclusion criteria, and the remaining two had just one or no relevant outcome (Appendix 1). Finally, nine publications related to seven studies met the inclusion criteria and were incorporated into the review. This study selection process is depicted in a flow diagram (Fig. 1).

Study Characteristics

Five RCT,[25–29] three retrospective cohort studies[13,30,31] and one retrospective population-based study[14] were included. The studies originated from China,[27–29] Sweden,[14,26] Denmark,[25] Belgium,[30] Canada,[13] and Italy.[31] The total number of participants across all studies was 27552. Detailed characteristics of the studies are presented in Table 1.

Benthien et al.[25] conducted an RCT assessing the impact of a fast-track transition from cancer treatment to specialized PALC versus usual care. The study involved 322 patients with incurable cancer and limited or no further treatment options. Participants in the INTG were assigned to either a HPC team or a hospital PALC team based on team availability and geographic coverage. The specialized PALC team comprised a minimum of physicians and nurses, along with at least two other types of healthcare professionals.[25]

Brännström and Boman[26] assessed the impact of person-centered and integrated HPC alongside heart failure care on symptom burden, health-related QOL, functional classes, hospitalizations, and hospitalization period compared to usual care in 72 advanced chronic heart failure patients. The intervention involved a multidisciplinary approach, including collaboration between PALC specialists and heart failure care experts, such as PALC nurses, PALC physicians, cardiologists, specialized nurses, physiotherapists, and occupational therapists.[26]

Ng & Wong[27] conducted an RCT investigating the impact of a HPC program for heart failure, compared to usual care, on QOL, symptom burden, functional status, patient satisfaction, and caregiver burden among 84 end-stage heart failure patients. Patients in the INTG were enrolled in a 12-week program following hospital discharge, which involved postdischarge home visits and telephone calls delivered by PALC nurse case managers experienced in caring for heart failure patients.[27]

Wong et al.[28,29] conducted two RCT investigating the effects of a transitional HPC program for end-stage heart failure patients compared to standard PALC services. Wong et al.[28] evaluated hospital readmissions, symptom changes, and QOL over time. In the other study Wong et al.,[29] assessed the cost-effectiveness of the program, including variables such as patient readmissions, EDV, hospital readmissions, LHS per patient, and QOL scores.

Table 1
Characteristics of Individual Reports From All Included Studies

Authors	Study design	Participants		Intervention	Comparator	Main Outcomes	Observations
		Intervention group	Controls				
Benthien et al.[25]	Randomized controlled trial (DOMUS Trial)	n=162; 79 men; mean age (±SD) 66 ± 9,6 years	n=160; 78 men; mean age (±SD) 65 ± 10,7 years	Fast-track transition from cancer treatment at the hospital to Specialized Home PC	Usual Care (possibility of referral to PC involving a waiting-list)	Symptom burden/ control (ESAS); Place of death	Participants had diagnosis of incurable cancer with limited or no antineoplastic treatment options
Brännström and Boman[26]	Randomized controlled trial (PREFER Trial)	n=36; 26 men; mean age (±SD) 81,9 ± 7,2 years	n=36; 25 men; mean age (±SD) 76,6 ± 10,2 years	Person-centered and integrated palliative Advanced Home Care and Heart Failure Care intervention	Usual Care	Symptom burden (ESAS); Health-related quality of life (EQ-5D); Hospitalizations; Number of days spent in hospital; Resource utilization	Participants had diagnosis of chronic heart failure patients (NYHA class III-IV)
Ng and Wong [27]	Randomized controlled trial	n=43; 18 men; mean age (±SD) 78,3 ± 16,8 years	n=41; 25 men; mean age (±SD) 78,4 ± 10 years	Home-based palliative heart failure program	Usual Care	Symptoms burden (ESAS); Quality of life (MQOL-HK)	Participants had end-stage heart failure. Between May 2013 and June 2015
Wong et al.[28]	Randomized controlled trial	n=43; 18 men; mean age (±SD) 78,3 ± 16,8 years	n=41; 25 men; mean age (±SD) 78,4 ± 10 years	Transitional home-based PC program	Usual Care	Hospital readmissions; Symptom intensity (ESAS); Quality of life (MQOL-HK)	Participants had end-stage heart failure. Between May 2013 and December 2014
Wong et al.[29]	Randomized controlled trial	n=43; 18 men; mean age (±SD) 78,3 ± 16,8 years	n=41; 25 men; mean age (±SD) 78,4 ± 10 years	Transitional home-based PC program	Usual Care	Hospital readmissions; Emergency room visits; Hospital stays; Quality of life (SF-6D)	Participants had end-stage heart failure. Between May 2013 and June 2015
Maetens et al.[30]	Cohort study (retrospective and matched)	n=8837; 4949 men; mean age (±SD) 74,4 ± 12,7 years	n=8837; 4869 men; mean age (±SD) 75 ± 12,3 years	Home PC support	No home PC support in the last 2 years of life	Place of death (home or hospital); Hospital admission; Emergency department admission	Participants were exposed to palliative home care support regardless of the diagnosis
Seow et al.[13]	Cohort study (retrospective and matched)	n=3109; 1509 men; median age 75 (64 to 84) years	n=3109; 1500 men; median age 74 (63 to 83) years	Care from specialist PC teams	Usual care	Hospital visits in the last two weeks of life; Emergency department visit in the last two weeks of life; Dying in hospital	Participants were exposed to care from specialist PC teams regardless of the diagnosis

(*Continued*)

Table 1
Continued

Authors	Study design	Participants		Intervention	Comparator	Main Outcomes	Observations
		Intervention group	Controls				
Riolfi et al.[31]	Cohort study (retrospective)	n=160; 96 men; mean age (±SD) 72,1 ± 11,9 years	n=242; 139 men; mean age (±SD) 75,1 ± 11,9 years	Palliative home-care program	Without PC support	Place of death; Hospital admissions; Number of days spent in hospital	The participants died with cancer as the first cause of death in 2011.
Bergqvist and Ljunggren[14]	Retrospective population-based study	n=2780; 1313 men; mean age (±SD) N/A		Specialized home-based PC	Same patients 90 days before Home PC	Place of death; Resource utilization; Emergency department admissions; Hospital admissions; Number of days spent in hospital	Participants were all patients of Stockholm who received Home PC in 2015

EQ-5D = euro quality of life-five dimensions; ESAS = Edmonton symptom assessment scale; MQOL-HK = McGill quality of life Hong Kong version; N/A = not applicable/assessed; NYHA = New York Heart Association; PC = palliative care; SD = standard deviation; SF-6D = short-form 6-dimension.

Maetens et al.[30] conducted a retrospective matched cohort study to assess the impact of HPC support on the quality of care and costs during the last 14 days of life. They compared 8837 individuals who received HPC support in the last 720 to 15 days of life with a matched 1:1 cohort who received usual care. The INTG received various forms of HPC support, including allowances for HPC patients, multidisciplinary HPC team visits, or home visits by palliative nurses or physiotherapists. Outcomes considered included home death, hospital death, hospital admissions, and EDV, among others.[30]

Seow et al.[13] conducted a retrospective matched cohort study to examine the combined association of reducing late-life acute care utilization and hospital death among patients exposed to various HPC teams compared to those receiving usual community care. The study involved 3109 patients who received care from specialist PALC teams in 2009-11 (exposed), matched by propensity score to 3109 patients who received usual care (unexposed). Patients in the INTG received support from formal PALC specialist teams available 24/7.[13]

Riolfi et al.[31] conducted a retrospective cohort study to evaluate the effectiveness of appropriate HPC services in reducing hospital admissions and to identify factors predicting the likelihood of hospitalization or home death among 402 cancer patients. Patients in the INTG received support from a HPC team consisting of PALC physicians and nonspecialist nurses who collaborated with general practitioners.[31]

Bergqvist & Ljunggren[14] conducted a retrospective population-based study to investigate the impact of integrating and expanding HPC services on palliative patients' use of emergency care, in-house care at an emergency hospital, and place of death. The study included 2780 patients during 90 days with HPC compared to 90 days before HPC. HPC teams operated with their own specialized PALC ward.[14]

Risk of Bias in Studies

The overall risk of bias within studies was moderate to high (Fig. 2 and 3).

Considering the included RCT,[25–29] the allocation sequence in the studies was deemed to be at low risk, as randomization was conducted using computer-generated random numbers,[25,28,29] or block randomization[26] (Fig. 2). Ng & Wong[27] employed a randomization process involving sealed opaque envelopes containing computer-generated random number sequences and utilized block randomization with a block size of six.[27] Although these RCT were conducted without blinding, participants, caregivers, and intervention providers were not blinded to the treatment conditions. However, there is no evidence of deviations from the intended intervention due to contextual factors within

Table 2
Summary of Results from Each Included Study

Authors	Results	
	Favoring the Intervention Group	No Difference Between The Intervention and Control Groups
Benthien et al.[25]	-Improvement in tiredness (P=0.02) after 6-months.	-Number of home deaths. -Other nine symptoms and total score of ESAS.
Brännström and Boman[26]	-Age-adjusted delta-value of QOL from baseline to 6-months (P=0.02) -Lower mean number of hospitalizations (P=0.009). -Lower mean number of days spent in hospital (P=0.011). -Lower utilization of visits and phone calls or prescriptions of physicians and nurses at the outpatient clinic of the hospitals (P<0.01) and the home PC (P<0.03; except for nurse visits).	-ESAS or any item of the ESAS or after adjusting for age difference.
Ng and Wong[27]	-Improvement in depression (P=0.01) and shortness of breath (P=0.018) at 4-weeks. -Improvements in QOL [physical (P=0.011), psychological (P=0.04), and existential (P=0.027) domains] over time. -The total QOL score over time (P=0.016) and group versus time interaction (P=0.032).	-ESAS at 12 weeks. -Support domain and global QOL items.
Wong et al.[28]	-Improvement in depression (P<0.05), dyspnea (P<0.05) and total score (P<0.05). -QOL (P<0.05) over time. -At 12-weeks, lower readmission rate (P=0.009) and mean number of readmissions (P=0.001). - Readmissions: the RR (95% CI) for 4-week and 12-week were 0.81 (0.51−1.27) and 0.55 (0.35−0.88), respectively.	-The symptom intensity ESAS. -At 4-week, lower readmission rate (P=0.79) and mean number of readmissions (P=0.097).
Wong et al.[29]	-Lower proportion of patients readmitted (P=0.005), fewer readmissions (P=0.001), fewer emergency room visits (P=0.020), and shorter hospital stays (P<0.001), at 84 days.	-Difference of QOL.
Maetens et al.[30]	-Higher relative risk to die at home (RR=4.08; 95%CI 3.86−4.31). -Lower relative risk to die in the hospital (RR=0.52; 95% CI 0.51−0.54). -Less people were admitted to a hospital (RR=0.45, 95%CI 0.43 to 0.46) or to an ED (RR=0.54, 95% CI 0.51−0.57) in the last 2 weeks of life.	
Seow et al.[13]	-Fewer patients died in hospital (P<0.01). -Lower relative risk of dying in hospital (RR= 0.46; 95% CI 0.40 to 0.52). -Fewer patients in hospital in the last two weeks of life (P<0.001). -Lower relative risk of being in hospital in the last two weeks of life (RR= 0.68; 95%CI 0.61−0.76). -Fewer patients had an ED visit in the last two weeks of life (P<0.001). -Lower relative risk of having an ED visit in the last two weeks of life (RR= 0.77; 95%CI 0.69−0.86).	
Riolfi et al.[31]	-Patients were more likely to die at home (P<0.001). -Irrespective of age, gender, or type of cancer, patients had 14-fold higher odds of dying at home. -Patients had a reduction for hospital admissions (P<0.001) and for days in hospital stays (P<0.001) in their last 2 months of life.	
Bergqvist and Ljunggren[14]	-The number of visits to the ED was reduced (51%). -Less ED visits per patient (P<0.001). -The number of hospital admissions was markedly reduced (41%). -The days in hospital got reduced (30%)	-Half of the patients died at a specialist palliative care unit. -Approximately one-third of the patients died at home (36%), whereas 14% died in hospital.

(*Continued*)

Table 2
Continued

Authors	Results	
	Favoring the Intervention Group	No Difference Between The Intervention and Control Groups
	-Fewer visits to a specialist outpatient clinic (3097 versus 4975). -The reduced number of visits to primary care was the major change for all palliative patients.	

CI = confidence interval; ED = emergency department; ESAS = Edmonton symptom assessment scale; QOL = quality of life; RR = relative risk.

the trials. Ng and Wong[27] confirmed that blinding of interventionists and participants was not feasible due to the nature of the intervention.

Regarding the risk of bias due to missing outcome data, there is no evidence in the evaluated RCT suggesting that incomplete outcome data are dependent on their true values. Wong et al.[28] noted a high loss of follow-up, which is common among PALC patients, with reasons primarily attributed to death and deterioration in both control and INTG. Similarly, Wong et al.[29] reported over 50% loss of follow-up by 12 weeks, primarily due to mortality.

There is no evidence in any of the RCTs indicating differences in outcome measurement methods between the groups. Although Ng and Wong[27] and Wong et al.[28,29] assumed blinding of data collectors to group assignment, outcomes such as symptomatic control and QOL were assessed by participants not blinded to the intervention, posing potential bias across all studied trials. The risk of selective reporting of results was deemed to have some concerns in all studies due to the lack of information confirming a specified analysis plan prior to data result availability.

Considering the four included nonrandomized studies,[13,14,30,31] the overall risk of bias was moderate to serious (Fig. 3).

Maetens et al.'s[30] and Seow et al.'s,[13] both retrospective cohort studies, were assessed as having a low risk of bias across all domains except for confounding bias. However, these studies, while suitable for nonrandomized designs, may not be directly comparable to well-executed RCT. Maetens et al.[30] acknowledged in their limitations that while their matched cohort study helped mitigate several sources of confounding, it did not address unmeasured covariates such as patients' or caregivers' personality traits and their knowledge of and preferences regarding end-of-life care. These factors could potentially influence the use of HPC support and the assessed outcomes. Therefore, the strong association between HPC use and end-of-life care characteristics may reflect underlying choices by patients, caregivers, and family that impact both. Similarly, Seow et al.[13] mentioned in their study limitations that propensity scores cannot adjust for unmeasured covariates, such as patient preferences for hospital care and availability of existing caregiver support.

Riolfi et al.'s[31] and Bergqvist & Ljunggren.'s[14] exhibited a serious overall risk of bias, primarily due to confounding bias. Riofi et al.[31] noted that while their patient cohort was homogeneous and eligible for HPC, their analyses compared patients who did/did not participate in the HPC team program without adjusting for individual characteristics such as symptoms or socio-economic status. This lack of adjustment could bias their results if such characteristics are associated with both exposure and outcome. Bergqvist and Ljunggren acknowledged limitations in their study.[14] Although they had a comparator group, they lacked a true and appropriate control group, as they could not rule out the possibility that patients with progressing disease might have reduced their use of emergency care even without access to specialized HPC. Additionally, they lacked information regarding patients' preferred place of death.

Risk of bias across studies was not evaluated due to insufficient information, and no additional analysis was performed.

Results of Individual Studies

In Benthien et al.'s[25] tiredness significantly improved (P=0.02) for the INTG after six months, while the other nine symptoms and total score of the *Edmonton Symptom Assessment System* showed no significant difference from controls. Additionally, there was no difference in the number of home deaths between the groups.

In Brännström and Boman's,[26] no significant differences were found between the INTG and controls regarding any symptom of the *Edmonton Symptom Assessment System* scale, even after adjusting for age difference. However, the between-group analysis of the age-adjusted delta-value of health-related QOL from baseline to six months was significantly better for patients in the INTG than for controls (P=0.02). Furthermore, the mean number of hospitalizations was significantly lower in the INTG compared to controls (P=0.009), as

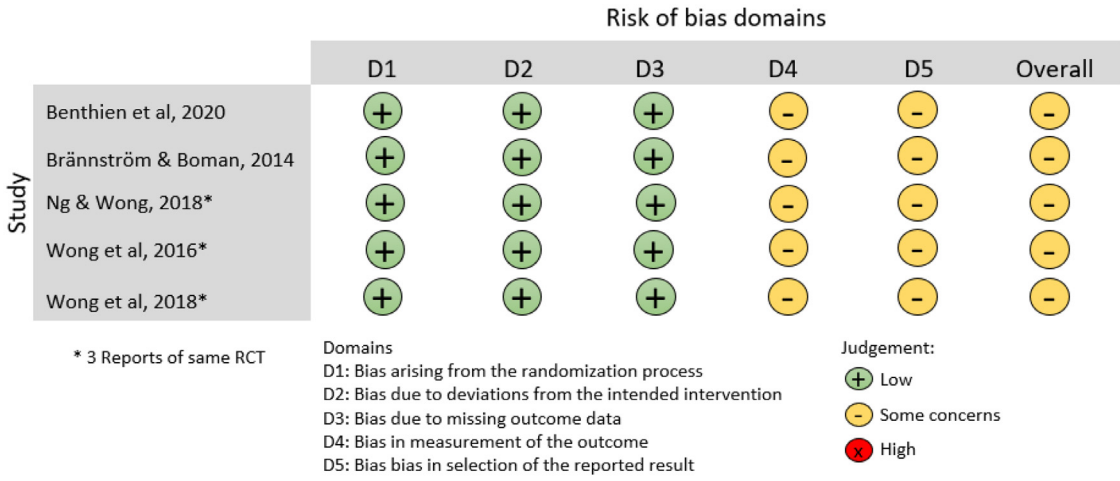

Fig. 2. Risk of Bias for Randomized Controlled Studies.

was the mean number of hospital days (P=0.011). Additionally, there were significant differences in the utilization of visits and phone calls or prescriptions of physicians and nurses between the INTG (lower) and controls at the outpatient clinics of the hospitals (P<0.01) and the primary healthcare centers (P<0.03), except for HPC nurse visits.

In Ng and Wong's[27] significant improvements in QOL were observed in the physical (P=0.011), psychological (P=0.04), and existential (P=0.027) domains in the INTG compared to controls over time. No significant differences were noted in the support domain and global QOL items. Overall, total QOL scores showed a significant difference when comparing the two groups over time (P=0.016), with a significant group-time interaction (P=0.032). There were no significant between-group improvements in symptoms at 12 weeks. However, at four weeks, the INTG showed better improvement than controls in depression (P=0.01) and shortness of breath (P=0.018). When comparing the groups individually over time, the INTG demonstrated improvement in tiredness and total symptom score (P<0.017) throughout the 12 weeks, whereas no such improvement was observed in controls.

In Wong et al.'s[28] the INTG showed significantly higher clinical improvement in depression (P<0.05), dyspnea (P<0.05), and total symptom score (pP<0.05) compared with controls. Although there was some improvement in the symptom intensity of depression and anxiety over time in the INTG, there was no difference in improvement between groups. QOL exhibited a significant difference in change over time between groups (P<0.05), favoring the INTG. When individual items were examined, all showed statistically significant differences with a group-time effect, except for the 'physical' and 'existential' QOL domains. The INTG had a lower four-week readmission rate and mean number of readmissions, but the difference was not significant. However, at 12 weeks, both the readmission rate (P=0.009) and mean number of readmissions (P=0.001) became significantly lower for the INTG. The relative risk (RR) for four-week and 12-week readmissions for the INTG were 0.81 [95% confidence interval (95%CI) 0.51 to 1.27] and 0.55 (95%CI 0.35 to 0.88), respectively.

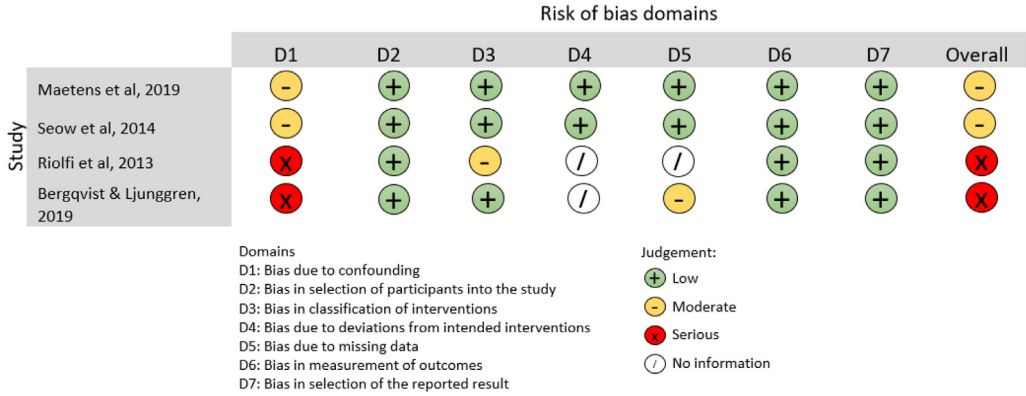

Fig. 3. Risk of Bias for nonrandomized Studies.

In Wong et al.'s[29] there was no significant difference in QOL between groups, but the INTG showed a significant within-group difference (P<0.001) over time. At 84 days, the INTG had a lower proportion of patients readmitted (P=0.005), fewer readmissions (P=0.001), fewer EDV (P=0.020), and shorter hospitalization period (P<0.001). No significant differences were noted at 28 days.

In Maetens et al.'s,[30] 56% of individuals receiving HPC support died at home, compared to 13.8% of controls (RR=4.08; 95%CI 3.86 to 4.31). Additionally, 39% of those receiving HPC support died in the hospital, compared to 74.8% of controls (RR=0.52; 95%CI 0.51 to 0.54). Furthermore, in the last two weeks of life, fewer individuals in the INTG, vs. controls, had an EDV (15.2% vs. 28.1%; RR=0.54, 95%CI 0.51 to 0.57) or were admitted to a hospital (27.4% vs. 60.8%; RR=0.45, 95% CI 0.43 to 0.46).

In Seow et al.'s[13] fewer exposed patients across all teams died in the hospital compared to unexposed patients [503 (16.2%) vs. 887 (28.6%), P<0.01]. The pooled RR of dying in the hospital for exposed versus unexposed groups was 0.46 (95% CI 0.40 to 0.52), with nine of the 11 teams showing significantly lower RR. Additionally, 970 (31.2%) of the exposed group were in the hospital in the last two weeks of life compared to 1219 (39.3%) of the unexposed group (P<0.001). The pooled RR of being in the hospital in the last two weeks of life for exposed versus unexposed patients was 0.68 (95%CI 0.61 to 0.76), with six of the 11 specialist PALC teams showing significantly lower RR. Similarly, 896 (28.9%) of the exposed group had an EDV in the last two weeks of life compared to 1070 (34.5%) of the unexposed group (P<0.001). The pooled RR of having an EDV in the last two weeks of life was 0.77 (95%CI 0.69 to 0.86), with four of the 11 teams showing significantly lower RR.

In Riolfi et al.'s[31] patients enrolled in the HPC program were slightly younger (73.9 vs. 75.1 years) and more likely to die at home (53.8% vs. 7.9%; P<0.001). Regardless of age, gender, or type of cancer, patients in the HPC had approximately 14 times higher odds of dying at home than controls. The HPC program was also associated with a reduction in hospital admissions (0.4 vs. 1.3 admissions; P<0.001) and duration of hospitalization (4.4 vs. 19.6 days; P<0.001) in their last two months of life compared to controls.

In Bergqvist and Ljunggren's,[14] 50% of the HPC patients died at a specialist PALC unit, 36% died at home, and 14% died in the hospital. Among patients alive 90 days after admission to HPC (n=1773), the number of EDV reduced by 51%, from 2188 to 1071. The number of EDV per patient varied between 1−32 before HPC compared with 0−10 visits per patient during HPC, with a statistically significant difference observed for the subgroups "chronic medical illness" and "cancer" (P<0.001). The total number of hospital admissions markedly reduced during HPC for the departments of oncology, surgery, medicine, and specialized PALC. Patients who lived through 90 days with HPC were admitted to the hospital 2789 times before HPC compared with 1649 times with HPC, a reduction of 41%. Similarly, the LHS decreased by 30%, from 19628 days before HPC to 13743 days with HPC. Before HPC, patients had generated 4975 visits to a specialist outpatient clinic compared with 3097 visits during HPC. The reduced number of visits to primary care was the major change for all PALC patients.

Results of Syntheses

The synthesis results are summarized in Table 3, according to the outcomes under study.

Quality of Life

Three of the studies assessing QOL reported statistically significant improvements in the QOL of the HPC group compared to the usual care group,[26−28] while one study did not find significant differences between the groups.[29] Thus, there is evidence in 75% of the studies that HPC is effective in improving QOL. However, caution is necessary due to the studies had small samples and none of the RCT demonstrated high methodological quality.

Symptom Burden

The included studies examined symptom burden and/or control of specific symptoms.[25−28] Most RCT found no statistically significant differences between the intervention and control groups. However, there were statistically significant improvements in specific symptoms (tiredness, depression and dyspnea) within the INTG compared to those receiving usual care.[25,27,28]

Healthcare Resource Utilization

Seven studies in this review examined the utilization of healthcare resources associated with the HPC group and the comparison group. These resources included hospital (re)admissions/hospitalizations,[13,14,26,28−31] EDV,[13,14,29,30] and LHS.[14,26,29,31] Additionally, two studies considered other types of resources used, such as physician and nurse visits, phone calls, or prescriptions.[14,26]

All studies that evaluated hospital (re)admissions/hospitalizations reported a statistically significant decrease in the number of hospitalizations in patients receiving HPC compared to patients without this support. This is the outcome with the greatest consensus among studies, suggesting that there is evidence that HPC reduces hospital admissions.

Table 3
Synthesis Results Based on Study Outcomes

Authors	Outcomes						
	Place of death	Symptoms	Quality of Life	Hospital admissions	Emergency Department Visits	Length of Hospital Stay	Other resources
Benthien et al.[25]	No difference	-Improvement in tiredness	N/A	N/A	N/A	N/A	N/A
Brännström and Boman[26]	N/A	-No difference	Improved	Lower	N/A	Lower	Lower
Ng and Wong [27]	N/A	-Improvement in depression and dyspnea	Improved	N/A	N/A	N/A	N/A
Wong et al.[28]	N/A	-Improvement in tiredness, dyspnea and total score	Improved	Lower	N/A	N/A	N/A
Wong et al.[29]	N/A	N/A	No difference	Lower	Lower	Lower	N/A
Maetens et al.[30]	-Increased the probability of dying at home -Decreased the probability of dying at hospital	N/A	N/A	Lower	Lower	N/A	N/A
Seow et al.[13]	-Decreased the probability of dying at hospital	N/A	N/A	Lower	Lower	N/A	N/A
Riolfi et al.[31]	-Increased probability of dying at home	N/A	N/A	Lower	N/A	Lower	N/A
Bergqvist and Ljunggren[14]	N/A	N/A	N/A	Lower	Lower	Lower	Lower

N/A = not applicable/assessed.

Furthermore, there was unanimity across the four studies that evaluated it, indicating a statistically significant decrease in EVD in the HPC group compared to controls, which also provides evidence that HPC decreases visits to the emergency department.

There were also significantly shorter LHS among patients receiving HPC in all studies that assessed it. This demonstrates evidence that HPC shortens the LHS.

The analysis of other types of resources (in just two studies) also revealed significant differences in the demand for consultations, phone calls, or prescriptions in outpatient clinics or primary care centers, which were lower in the HPC group compared to controls. Considering the poor methodological quality of one of the two studies mentioned,[14] the evidence of reduced resource utilization, such as visits or prescriptions, with HPC is not robust.

Place of Death

Five studies analyzed the impact of the intervention on the place of death.[13,14,24,27,28] Four studies reported whether the patient died at home or not,[13,25,30,31] with two of them also considering hospital death,[14,30] and one considering only hospital death.[13] Among these five studies, two found statistical evidence indicating a higher likelihood of dying at home with HPC,[30,31] and the two nonrandomized studies with greater methodological robustness demonstrated a lower likelihood of patients dying in the hospital when they were part of an HPC program.[13,30] The other two studies found no significant differences between the HPC group and the group without HPC support,[14,25] with one of them presenting serious bias risks,[14] notably for lacking suitable control group. More than half of the studies that evaluated the place of death showed evidence that HPC increase the likelihood of dying at home and decrease the likelihood of dying in the hospital.

Discussion

Summary of Evidence

The evidence synthesized in this systematic review highlights the effectiveness of HPC interventions over the last decade for patients with advanced incurable diseases, irrespective of diagnosis. Specifically, findings suggest that HPC interventions, whether delivered by specialized teams or through integrated care approaches, lead to significant improvements in QOL and increase the likelihood of patients dying at home. Additionally, HPC is linked to reduced healthcare resource utilization, including fewer hospital admissions, EDV, and shorter LHS. However, no significant differences were observed in symptom management outcomes.

General Interpretation of the Results

Measuring the effectiveness and quality of HPC remains a continual debate.[14]

Quality of Life

This review corroborates that there was evidence in three out of four studies evaluating this outcome, indicating that HPC was effective in enhancing QOL. Although Gomes et al.[20] concluded that evidence regarding the effect of HPC compared to usual care on patients' QOL was controversial, the results of this review suggest a positive influence of HPC on patients' QOL. It is important to note that none of the RCT included in this review demonstrated high methodological quality, and the sample sizes were small. Melin-Johansson et al.[34] emphasized that QOL significantly improved in the physical, psychological, medical, and global domains when patients were assigned to the HPC team. Another study indicated that HPC had a cumulative, statistically significant positive effect on the QOL of elderly patients with heart failure.[35]

Symptom Burden

Regarding symptom burden, the included studies did not provide evidence that HPC leads to its overall improvement. However, HPC intervention appeared to ameliorate specific symptoms such as fatigue, depression, and dyspnea. These findings contrast somewhat with previous results from a systematic review which—through narrative synthesis—demonstrated small but statistically significant positive effects on the symptom burden.[20] The lack of observed effect of HPC on symptom burden could be partially attributed to the fact that controls received an active comparator (usual care) rather than a placebo, which is ethically appropriate. The study by Ornstein et al. supports these findings by demonstrating that PALC and HPC significantly alleviated certain specific symptoms in patients, specifically depression and fatigue.[36] Conversely, Eagar et al. investigated differences in severe symptom outcomes for PALC patients receiving hospital care versus those receiving HPC and found that symptom outcomes were more favorable for hospital patients, while home patients experienced less overall improvement.[37]

Healthcare Resource Utilization

A key outcome for community PALC programs is to reduce hospitalizations since admissions to acute care do not demonstrably improve symptom control or QOL, and they may even worsen cognitive decline in patients with dementia.[18] However, hospitalizations are not always avoidable, and shortening the LHS is an important aspect to limit the potential negative consequences of these stays.

All included studies that evaluated hospital (re) admissions/hospitalizations were consensual on the

existence of evidence that HPC reduces hospital admissions. These findings are consistent with those of a systematic review that demonstrated a statistically significant impact of specialized community PALC teams on reducing acute hospital admissions in adult patients requiring end-of-life care.[38] However, it is important to acknowledge that the accuracy of these results may have been influenced by confounding bias, as observed in the nonrandomized studies included in the review.

Our findings also offer evidence that HPC decreases patients' EDV and shortens their LHS. Two studies examined resource utilization and demonstrated evidence of reduced resource use, such as visits, phone calls, or prescriptions from physicians and nurses. However, one of these studies exhibited poor methodological quality, highlighting the need for caution in generalizing these results.

Cassel et al. evaluated the impact of an HPC program on healthcare utilization and costs, revealing that intervention participants had lower rates of hospital readmissions, admissions, and LHS, along with reduced hospital costs compared to nonintervention participants.[39] This resulted in lower overall healthcare costs. Similarly, the systematic review by Gonzalez-Jaramillo et al.[40] investigated the effectiveness of HPC in reducing hospital visits and healthcare costs. The review concluded that in both oncological and nononcological patients, HPC consistently decreased the number and duration of hospital visits, as well as hospitalization costs and overall healthcare costs. These two studies reinforce the findings of the present review regarding resource utilization.

Place of Death

The place of death serves as a significant indicator of end-of-life care success globally.[11,41,42] Despite the preference for dying at home among the majority of patients,[6,41–44] the end-of-life phase still witnesses high levels of acute care utilization, hospital deaths, and associated healthcare costs.[44] Analyzing experiences in other countries that have implemented targeted national strategies to support PALC can shape trends in hospital mortality.[45] If no action is taken to address this, countries with aging populations and limited PALC services may experience a significant rise in hospital deaths, which is neither economically sustainable nor desired by the population.[45] This underscores the necessity for more effective and adaptable measures to enable more individuals to fulfill their preferences.[44,46,47]

More than half of the included studies assessing the place of death, many of which exhibit higher methodological quality, indicated that HPC increases the probability of dying at home while reducing the likelihood of hospital deaths. While not all studies directly measured the likelihood of dying at home, these findings partly corroborate the results of the Cochrane systematic review.[20] The review, based on meta-analyses of seven trials involving 1222 patients (including three high-quality trials), demonstrated that HPC services more than double the likelihood of patients with cancer, heart failure, and Chronic Obstructive Pulmonary Disease dying at home.[20] Another systematic review and meta-analysis of 26 retrospective cohort studies revealed that factors associated with an increased likelihood of home death (versus hospital) included multidisciplinary HPC, preference for home death, cancer as opposed to other diagnoses, early referral to PALC, not living alone, having a caregiver, and the caregiver's coping skills.[48] In a longitudinal prospective cohort study, Cai et al.[49] examined the alignment between preferred and actual place of death among cancer patients receiving HPC, revealing an overall congruence of 71.72%. Home emerged as the most favored place of death, with the intensity of HPC correlating with a higher likelihood of achieving death in the preferred setting.[49] Furthermore, Butler et al.'s[50] study demonstrated that hospice at home offers high-quality care and facilitates a "good death," with the majority of patients passing away in their chosen location, thereby reducing hospital deaths.

Home-Based Palliative Care and Integrated Service Delivery

HPC should be seen a model of integrating PALC in the continuum of care.[51] Integrated PALC strategies are frequently implemented based on models, which offer standardized designs for organizing care for individuals with a progressive life-threatening illness and/or for their (in) formal caregivers.[52]

The World Health Organization emphasizes the value of PALC as a holistic approach to care, recognizing both the patient and family as the unit of care, and advocating for its early application in the course of the illness.[51] Integrated PALC aims to achieve continuity of care by bringing together administrative, organizational, clinical, and service aspects.[53] It involves collaboration among all caregivers (paid and unpaid) to ensure a quality of life and a well-supported dying process for both the patient and their family.[53] Integrating PALC Into National Health Systems is Essential for Achieving Universal Health Coverage.[54]

Strengths

The evidence gleaned from this systematic review underscores the benefits of HPC interventions, indicating positive impacts on various fronts such as improving QOL, reducing hospital admissions, EDV, LHS, and

resource utilization, as well as increasing the likelihood of dying at home. While certain specific symptoms show improvement with HPC, overall, there were no significant differences observed between the intervention groups and controls in symptom management.

To advance the field, future studies should aim for methodological consistency by standardizing and clearly defining the characteristics of HPC interventions and usual care, as well as standardizing the use of measurement instruments and reporting practices across studies. Additionally, further research endeavors should focus on replicating these findings in diverse populations and healthcare contexts to enhance the generalizability of the results, while also exercising caution when extrapolating them to other populations and settings, acknowledging potential nuances and variations that may exist.

Limitations

Despite the strengths of our study, including a comprehensive review of recent literature and rigorous methodology, several limitations should be acknowledged.

This systematic review was not registered with any specific registration platform.

This study had no funding, which limited our ability to access paid articles. We only consulted three databases for our review.

The review process itself may introduce potential biases. Our inclusion criterion, requiring studies to have at least two outcomes of interest, may have limited access to knowledge generated in the last decade. In retrospect, broader eligibility criteria would have been more appropriate to encompass a wider range of relevant research.

The considerable heterogeneity among the included studies presents a challenge in drawing firm and conclusive interpretations regarding the outcomes under consideration. The studies included in this review examined HPC interventions implemented at various stages of the disease trajectory. Across the studies, there was notable diversity in the employed measures, including assessment tools, follow-up and evaluation periods, types of analyses, and reported statistics. The components, format, and duration of the programs provided by the intervention teams varied across studies. Additionally, the control or comparator groups, mostly designated as usual care, differed between studies according to local practices.

This diversity restricted our capacity to conduct meaningful comparisons and meta-analyses. These limitations may have influenced the results presented in this review.

Conclusion

Our review underscores the effectiveness of HPC in meeting the diverse needs of patients with severe, prolonged, or progressive illnesses requiring end-of-life care. Studies consistently demonstrate that HPC interventions, including specialized teams and integrated care approaches, contribute to enhanced QOL and increased likelihood of patients dying at home, aligning with their preferences.

HPC interventions are associated with a significant reduction in healthcare utilization, including fewer hospital admissions, decreased EDV, and shorter hospital stays. These findings emphasize the potential of HPC to alleviate the burden on healthcare systems while delivering patient-centered care in preferred settings.

Despite the compelling evidence supporting the benefits of HPC, challenges remain in ensuring equitable access and addressing the diverse needs of patients and caregivers.

Future inquiries ought to prioritize addressing lingering knowledge gaps, such as determining the most effective delivery models for HPC, assessing the enduring effects of HPC interventions on patient and caregiver outcomes over time, and evaluating the cost-effectiveness of HPC interventions across various healthcare contexts. Additionally, forthcoming studies should emphasize expanding the scope of HPC services, fostering interdisciplinary collaboration, and integrating patient preferences into care delivery protocols to continually refine outcomes and enhance the quality of end-of-life care.

Authors' contributions

This study was conceptualized by DRF and PRP.

DRF conducted searches and screening of articles, analyzed data, wrote the manuscript, and approved the final version of the paper.

PRP designed the review protocol, screened articles, analyzed data, wrote the manuscript, reviewed it, and approved the final paper.

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The authors declare that they have no competing interests related to the research, authorship, and publication of this systematic review.

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Appendix 1. Rationale for Exclusion of Full-Text Articles from Databases and Reports Identified Through Citation Searching

Excluded report	Study design	Reason for exclusion
Ornstein et al.[36]	Prospective longitudinal study	Just one relevant outcome (Symptom control)
Ersek and Carpenter[55]	Literature review	Other study design
Kerr et al.[22]	Prospective observational database study	No comparator/control group
Chai et al.[56]	Prospective cohort study	No relevant outcome (Unpaid care costs)
Miller et al.[57]	Prospective multicenter survey	No relevant intervention (different levels of Nursing Home Palliative Care knowledge and practice and residents' end-of-life health care outcomes)
Miyashita et al.[58]	Cross-sectional, anonymous, self-report questionnaire survey	No relevant outcome
Sahlen et al.[59]	Randomized controlled trial	No relevant outcome
Kaiser et al.[60]	Retrospective multicenter survey	No comparator/control group
Heymann-Horan et al.[61]	Randomized controlled trial	No relevant outcome
Temkin-Greener et al.[62]	Randomized controlled trial	No relevant intervention (2 months of training in Palliative Care for nursing home teams)
Webber et al.[46]	Retrospective cohort study	No relevant intervention (compares two groups to receive Home Palliative Care)
Halling et al.[63]	Randomized controlled trial	No relevant outcome
Forbat et al.[18]	Prospective stepped-wedge cluster Randomized controlled trial	Just one relevant outcome (Length of Hospital Stay)
Evans et al.[3]	Randomized controlled trial (single-blind mixed method)	Just one relevant outcome (Symptom burden)
Nguyen et al.[64]	Retrospective observational database study	Just one relevant outcome (Symptom control)
Chang et al.[41]	Prospective observational study	No comparator/control group

References

1. World Health Organization. The top 10 causes of death. [Online] December 9, 2020. Accessed 2023 Dec, 15 Available from https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death.

2. Bone A, Gomes B, Etkind S, et al. What is the impact of population ageing on the future provision of end-of-life care? Population-based projections of place of death. Palliat Med 2018;32:329–336. https://doi.org/10.1177/0269216317734435.

3. Evans C, Bone A, Yi D, et al. Community-based short-term integrated palliative and supportive care reduces symptom distress for older people with chronic noncancer conditions compared with usual care: A randomised controlled single-blind mixed method trial. Int J Nurs Stud 2021;120:103978. https://doi.org/10.1016/j.ijnurstu.2021.103978.

4. World Health Organization. Palliative care. [Online], 2020. Accessed 2023 Dec, 15 Available from https://www.who.int/news-room/fact-sheets/detail/palliative-care.

5. Sleeman KE, Brito M, Etkind S, et al. The escalating global burden of serious health-related suffering: projections to 2060 by world regions, age groups and health conditions. Lancet Glob Health 2019;7:e883–e892. https://doi.org/10.1016/S2214-109X(19)30172-X.

6. Higginson I, Sarmento VP, Calanzani N, Benalia H, Gomes B. Dying at home − is it better: a narrative appraisal of the state of the science. Palliat Med 2013;27:918–924. https://doi.org/10.1177/0269216313487940.

7. Milligan C, Turner M, Blake S, et al. Unpacking the impact of older adults' home death on family care-givers' experiences of home. Health Place 2016;38:103–111. https://doi.org/10.1016/j.healthplace.2016.01.005.

8. Bone A, Gao W, Gomes B, et al. Factors associated with transition from community settings to hospital as place of death for adults aged 75 and older: a population-based mortality follow-back survey. J Am Geriatr Soc 2016;64:2210–2217. https://doi.org/10.1111/jgs.14442.

9. Miranda R, Bunn F, Lynch J, Van den Block L, Goodman C. Palliative care for people with dementia living at home: a systematic review of interventions. Palliat Med 2019 Jul;33:726–742. https://doi.org/10.1177/0269216319847092.

10. Sarmento V, Gysels M, Higginson I, Gomes B. Home palliative care works: But how? A meta-ethnography of the experiences of patients and family caregivers. BMJ Support Palliat Care 2017;7:390–403. https://doi.org/10.1136/bmjspcare-2016-001141.

11. Hamano J, Takeuchi A, Mori M, et al. Comparison of survival times of advanced cancer patients with palliative care at home and in hospital. Plos One 2023;18:e0284147. https://doi.org/10.1371/journal.pone.0284147.

12. Currow DC, Agar MR, Philips JL. Role of hospice care at the end of life for people with cancer. J Clin Oncol 2020;38:937–943. https://doi.org/10.1200/JCO.18.02235.

13. Seow H, Brazil K, Sussman J, et al. Impact of community based, specialist palliative care teams on hospitalisations and emergency department visits late in life and hospital deaths:

a pooled analysis. BMJ 2014;348:g3496. https://doi.org/10.1136/bmj.g3496.

14. Bergqvist J, Ljunnggren G. The impact of integrated home palliative care services on resource use and place of death. J Palliat Med 2020;23:67–73. https://doi.org/10.1089/jpm.2018.0639.

15. Gomes B, Calanzani N, Koffman J, Higginson I. Is dying in hospital better than home in incurable cancer and what factors influence this? A population-based study. BMC Med 2015;13:235. https://doi.org/10.1186/s12916-015-0466-5.

16. Alvariza A, Arestedt K, Boman K, Brännström M. Family members' experiences of integrated palliative advanced home and heart failure care: a qualitative study of the PREFER intervention. Palliat Support Care 2018;16:278–285. https://doi.org/10.1017/S1478951517000256.

17. Wicaksono RB, Muhaimin A, Willems DL, Pols AJ. Family Perspectives on Key Elements of Good Home Palliative Care in South and Southeast Asia: A Scoping Review. Home Health Care Manage Pract 2024. https://doi.org/10.1177/10848223231224779.

18. Forbat L, Liu W, Koerner J, et al. Reducing time in acute hospitals: a stepped-wedge randomised control trial of a specialist palliative care intervention in residential care homes. Palliat Med 2020;34:571–579. https://doi.org/10.1177/0269216319891077.

19. Bone A, Evan C, Etkind S, et al. Factors associated with older people's emergency department attendance towards the end of life: a systematic review. Eur J Public Health 2019;29:67–74. https://doi.org/10.1093/eurpub/cky241.

20. Gomes B, Calanzani N, Curiale V, et al. Effectiveness and cost-effectiveness of home palliative care services for adults with advanced illness and their caregivers. Cochrane Database Syst Rev 2013;2013:1–230. https://doi.org/10.1002/14651858.CD007760.pub2.

21. Kelley AS, Morrison RS. Palliative care for the seriously ill. N Engl J Med 2015;373:747–755. https://doi.org/10.1056/nejmra1404684.

22. Kerr C, Tangeman JC, Rudra CB, et al. Clinical impact of a home-based palliative care program: a hospice-private payer partnership. J Pain Symptom Manage 2014;48. https://doi.org/10.1016/j.jpainsymman.2014.02.003. 883-92.e1.

23. Higgins J, Thomas J, Chandler J, et al. (eds). Cochrane Handbook for Systematic Reviews of Interventions version 6.4 (updated August 2023). *Cochrane*. 2023. Accessed March 16, 2024. https://training.cochrane.org/handbook/current

24. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. https://doi.org/10.1136/bmj.n71.

25. Benthien K, Diasso P, Heymann A, et al. Oncology to specialised palliative home care systematic transition: the Domus randomised trial. BMJ Support Palliat Care 2020;10:350–357. https://doi.org/10.1136/bmjspcare-2020-002325.

26. Brännström M, Boman K. Effects of person-centred and integrated chronic heart failure and palliative home care. PREFER: a randomized controlled study. Eur J Heart Fail 2014;16:1142–1151. https://doi.org/10.1002/ejhf.151.

27. Ng A, Wong F. Effects of a home-based palliative heart failure program on quality of life, symptom burden, satisfaction and caregiver burden: a randomized controlled trial. J Pain Symptom Manage 2018;55:1–11. https://doi.org/10.1016/j.jpainsymman.2017.07.047.

28. Wong F, Ng A, Lee P, et al. Effects of a transitional palliative care model on patients with end-stage heart failure: a randomised controlled trial. Heart 2016;102:1100–1108. https://doi.org/10.1136/heartjnl-2015-308638.

29. Wong F, So C, Man A, et al. Cost-effectiveness of a transitional home-based palliative care program for patients with end-stage heart failure. Palliat Med 2018;32:476–484. https://doi.org/10.1177/0269216317706450.

30. Maetens A, Beernaert K, Schreye R, et al. Impact of palliative home care support on the quality and costs of care at the end of life: a population-level matched cohort study. BMJ Open 2019;9:e025180. https://doi.org/10.1136/bmjopen-2018-025180.

31. Riolfi M, Buja A, Zanardo C, et al. Effectiveness of palliative home-care services in reducing hospital admissions and determinants of hospitalization for terminally ill patients followed up by a palliative home-care team: a retrospective cohort study. Palliat Med 2014;28:403–411. https://doi.org/10.1177/0269216313517283.

32. Sterne JAC, Savović J, Page MJ, et al. Rob 2: a revised tool for assessing risk of bias in randomised trials. BMJ 2019;366:l4898. https://doi.org/10.1136/bmj.l4898.

33. Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ 2016;355:i4919. https://doi.org/10.1136/bmj.i4919.

34. Melin-Johansson C, Axelsson B, Gaston-Johansson F, Danielson E. Significant improvement in quality of life of patients with incurable cancer after designation to a palliative homecare team. Eur J Cancer Care (Engl) 2010;19:243–250. https://doi.org/10.1111/j.1365-2354.2008.01017.x.

35. Khajehpoor MH, Shahrbabaki PM, Nouhi E. Effects of a home-based palliative heart failure program on quality of life among the elderly: a clinical trial study. BMC Palliat Care 2023;22:130. https://doi.org/10.1186/s12904-023-01245-x.

36. Ornstein K, Wajnberg A, Kaye-Kauderer H, et al. Reduction in symptoms for homebound patients receiving home-based primary and palliative care. J Palliat Med 2013;16:1048–1054. https://doi.org/10.1089/jpm.2012.0546.

37. Eagar K, Clapham SP, Allingham SF. Palliative care is effective: but hospital symptom outcomes superior. BMJ Support Palliat Care 2020;10:186–190. https://doi.org/10.1136/bmjspcare-2018-001534.

38. Mccarroll S, Avsar P, Moore Z, et al. The impact of specialist community palliative care teams on acute hospital admission rates in adult patients requiring end of life care: A systematic review. Eur J Oncol Nurs 2022;59:102168. https://doi.org/10.1016/j.ejon.2022.102168.

39. Cassel JB, Kerr KM, McClish DK, et al. Effect of a home-based palliative care program on healthcare use and costs. J Am Geriatr Soc 2016;64:2288–2295. https://doi.org/10.1111/jgs.14354.

40. Gonzalez-Jaramillo V, Fuhrer V, Gonzalez-Jaramillo N, et al. Impact of home-based palliative care on health care costs and hospital use: a systematic review. Palliat Support Care 2021;19:474–487. https://doi.org/10.1017/S1478951520001315.

41. Chang P, Lin C, Juang Y, et al. Death place and palliative outcome indicators in patients under palliative home care service: an observational study. BMC Palliat Care 2023;22:44. https://doi.org/10.1186/s12904-023-01167-8.

42. Gomes B, Pinheiro M, Lopes S, et al. Risk factors for hospital death in conditions needing palliative care: Nationwide population-based death certificate study. Palliat Med 2018;32:891–901. https://doi.org/10.1177/0269216317743961.

43. Gomes B, Higginson I, Calanzani N, et al. Preferences for place of death if faced with advanced cancer: a population survey in England, Flanders, Germany, Italy, The Netherlands, Portugal and Spain. Ann Oncol 2012;23:2006–2015. https://doi.org/10.1093/annonc/mdr602.

44. Gomes B, Calanzani N, Gysels M, Hall S, Higginson I. Heterogeneity and changes in preferences for dying at home: a systematic review. BMC Palliat Care 2013;12:7. https://doi.org/10.1186/1472-684X-12-7.

45. Sarmento VP, Higginson I, Ferreira PL, Gomes B. Past trends and projections of hospital deaths to inform the integration of palliative care in one of the most ageing countries in the world. Palliat Med 2016;30:363–373. https://doi.org/10.1177/0269216315594974.

46. Webber C, Viola R, Knott C, Peng W, Groome P. Community palliative care initiatives to reduce end-of-life hospital utilization and in-hospital deaths: a population-based observational study evaluating two home care interventions. J Pain Symptom Manage 2019;58. https://doi.org/10.1016/j.jpainsymman.2019.04.021. 181-9.e1.

47. Maetens A, Deliens L, Block LV, Beernaert K, Cohen J. Are we evolving toward greater and earlier use of palliative home care support? A trend analysis using population-level data from 2010 to 2015. J Pain Symptom Manage 2019;58:19–28.e10. https://doi.org/10.1016/j.jpainsymman.2019.04.008.

48. Costa V, Earle CC, Esplen MJ, et al. The determinants of home and nursing home death: a systematic review and meta-analysis. BMC Palliat Care 2016;15:8. https://doi.org/10.1186/s12904-016-0077-8.

49. Cai J, Zhang L, Guerriere D, Coyte PC. Congruence between preferred and actual place of death for those in receipt of home-based palliative care. J Palliat Med 2020;23:1460–1467. https://doi.org/10.1089/jpm.2019.0582.

50. Butler C, Wilson P, Abrahamson V, et al. Optimum models of hospice at home services for end-of-life care in England: a realist-informed mixed-methods evaluation. Southampton (UK). National Institute for Health Soc Care Deliv Res 2022;10. https://doi.org/10.3310/MSAY4464.

51. Organization World Health. Strengthening of palliative care as a component of integrated treatment throughout the life course. J Pain Palliat Care Pharmacother 2014;28:130–134. https://doi.org/10.3109/15360288.2014.911801.

52. Siouta N, Van Beek K, van der Eerden ME, et al. Integrated palliative care in Europe: a qualitative systematic literature review of empirically-tested models in cancer and chronic disease. BMC Palliat Care 2016;15:56. https://doi.org/10.1186/s12904-016-0130-7.

53. Ewert B, Hodiamont F, van Wijngaarden J, et al. Building a taxonomy of integrated palliative care initiatives: results from a focus group. BMJ Support Palliat Care 2016;6:14–20. https://doi.org/10.1136/bmjspcare-2014-000841.

54. Knaul FM. Integrating palliative care into health systems is essential to achieve Universal Health Coverage. Lancet Oncol 2018;19:e566–e567. https://doi.org/10.1016/S1470-2045(18)30600-4.

55. Ersek M, Carpenter JG. Geriatric palliative care in long-term care settings with a focus on nursing homes. J Palliat Med 2013;16:1180–1187. https://doi.org/10.1089/jpm.2013.9474.

56. Chai H, Guerriere DN, Zagorski B, et al. The magnitude, share and determinants of unpaid care costs for home-based palliative care service provision in Toronto, Canada. Health Soc Care Community 2014;22:30–39. https://doi.org/10.1111/hsc.12058.

57. Miller SC, Lima JC, Thompson SA. End-of-life care in nursing homes with greater versus less palliative care knowledge and practice. J Palliat Med 2015;18:527–534. https://doi.org/10.1089/jpm.2014.0393.

58. Miyashita M, Morita T, Sato K, et al. A nationwide survey of quality of end-of-life cancer care in designated cancer centers, inpatient palliative care units, and home hospices in Japan: The J-HOPE study. J Pain Symptom Manage 2015;50:38–47. https://doi.org/10.1016/j.jpainsymman.2015.01.007.

59. Sahlen KG, Boman K, Brännström M. A cost-effectiveness study of person-centered integrated heart failure and palliative home care: Based on a randomized controlled trial. Palliat Med 2016;30:296–302. https://doi.org/10.1177/0269216315618544.

60. Kaiser F, Rudloff LV, Vehling-Kaiser U, et al. Palliative home care for patients with advanced haematological malignancies - a multicenter survey. Ann Hematol 2017;96:1557–1562. https://doi.org/10.1007/s00277-017-3045-3.

61. Heymann-Horan AV, Bidstrup P, Guldin MB, et al. Effect of home-based specialised palliative care and dyadic psychological intervention on caregiver anxiety and depression: A randomised controlled trial. Br J Cancer 2018;119:1307–1315. https://doi.org/10.1038/s41416-018-0193-8.

62. Temkin-Greener H, Mukamel DB, Ladd H, et al. Impact of nursing home palliative care teams on end-of-life outcomes: A randomized controlled trial. Med Care 2018;56:11–18. https://doi.org/10.1097/MLR.0000000000000835.

63. Halling CMB, Wolf RT, Sjøgren P, et al. Cost-effectiveness analysis of systematic fast-track transition from oncological treatment to specialised palliative care at home for patients and their caregivers: the DOMUS trial. BMC Palliat Care 2020;19:1–13. https://doi.org/10.1186/s12904-020-00645-7.

64. Nguyen V, Khanh QT, Hocaoglu M, et al. Integrated hospital- and home-based palliative care for cancer patients in Vietnam: People-centered outcomes. J Pain Symptom Manage 2023;66:175–182. https://doi.org/10.1016/j.jpainsymman.2023.04.016.