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Featured Article

Transitional care from hospital to home for frail older adults: A systematic review and meta-analysis

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ABSTRACT

Frail older adults are vulnerable to hospitalization and transitional care is needed to maintain care continuity; however, there exists no review regarding transitional care focusing on frailty. This study aimed to investigate transitional care for frail older adults and its effectiveness. Search terms were (P) frail older adults; (I) transitional care initiated before discharge; (C) usual care; (O) all health outcomes. Fourteen trials were identified. The most measured outcome was readmission ($n = 13$), followed by mortality ($n = 9$), function ($n = 7$), quality of life ($n = 5$), and self-rated health ($n = 5$). Statistical significance effects were reported in the followings: $n = 6$, readmission; $n = 0$, mortality; $n = 3$, function; $n = 2$, quality of life; and $n = 4$, self-rated health. The meta-analysis demonstrated that transitional care reduced readmission at six months but not other time points nor mortality or quality of life. The intervention effectiveness was inconclusive; therefore, an evidence-based yet novel approach is necessary to establish an adequate transitional care intervention for frail older adults.

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Introduction

Frail older adults experience health problems in multiple domains, including physiological, physical, psycho-cognitive, and social domains, which in turn decreases their capacity to overcome stress stimuli from acute and chronic illnesses.¹ When frail older adults are hospitalized, they are at a high risk of negative consequences, such as readmission, death, further functional decline, and poor quality of life (QOL).^{2–4} As their health status may be affected not only by a disease but also by multidimensional problems, interventions should be comprehensive to cover all health-related problems rather than focusing only on a single disease.⁵ Moreover, frail older adults experience difficulties after their discharge from the hospital because of the abrupt discontinuation of the hospital's intervention and support. Their function and health do not return to pre-existing levels immediately after discharge, and they require longer recovery periods.^{6–7} Thus, it is vital to maintain a continuity of care until frail older adults recover to a level where they can manage their chronic illness or symptoms and resume their daily routines and social activities.

Transitional care encompasses a broad range of healthcare services for care continuity.⁸ Hospital-based transitional care is a

transitional care approach wherein the patient is assisted in transitioning from a hospital to an outpatient setting.⁹ There is a substantial body of knowledge regarding hospital-based transitional care models and their effectiveness. Transitional care models were found to be effective in reducing readmission in heart failure^{10–11} and chronic obstructive pulmonary disease;¹² decreasing mortality in heart failure,^{11,13} myocardial infarction,¹⁴ and clinically ill patients;¹⁵ and improving quality of life in heart failure.¹³ There was no effect on psychological factors in heart failure;¹³ mortality in chronic obstructive pulmonary disease;¹² or quality of life in clinically ill patients.¹⁵

Although a substantial body of knowledge regarding transitional care models and their effectiveness exists, most models focused on specific diseases, such as heart failure,¹⁵ while those focusing on frailty have been scarce. Additionally, effects on health outcomes other than readmission and mortality were rarely explored, and results have been inconclusive. It is thus necessary to extensively explore health outcomes in frail older adults, whose health status is affected across multiple health domains.

Therefore, this study aimed to systematically review and synthesize the existing evidence on the effect of transitional care on all health outcomes of frail older adults who were discharged home from the hospital. The research questions that guided this systematic review were as follows: 1) What transitional care intervention (i.e., from hospital to home) that is not disease-specific has been

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established for frail older adults? and 2) How effective are these transitional care approaches?

Methods

This systematic review and meta-analysis followed the Cochrane Handbook for Systematic Reviews of Interventions¹⁶ and was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Table S1).¹⁷ The protocol was registered at the International Prospective Register of Systematic Reviews (ref no.: CRD42020198798).

Search strategies and selection criteria

The “PICO” framework (i.e., population, intervention, comparison, and outcomes) was used to develop research questions and structure potential search terms (Table 1).¹⁸ The “population” included frail older adults aged ≥ 65 years who were in transition from hospital to home. We applied the concept of frailty in a broad, multi-domain phenotype that encompasses symptoms such as physical disability, decreased physiological function, and cognitive/psychosocial function decline.¹⁹ The “intervention” was healthcare services that provided continuity of care. We focused on hospital-based transitional care, which was initiated during admission and continued after discharge.⁹ The “comparison” term was the usual care provided by the hospital or clinic where each study was conducted. As “outcomes,” we included all healthcare outcomes that were investigated for an effect of transitional care. Only randomized controlled trials (RCTs) were included in the search.

Thus, the search strategy in this review included four key concepts: older adults, frailty, transitional care, and RCT. Moreover, to include all health-related interventions that provided continuity of care before the term transitional care was defined in the academic community,⁸ we used extensive search terms. For all search terms, plural forms, abbreviations, MeSH terms, and US/UK English spellings were considered. The search terms were described using a template²⁰ and reviewed by a university librarian before commencing the search (Table S2).

The search for studies written in English and published by August 2021 was performed using the following four electronic databases: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, and Cochrane Database of Systematic Reviews. No systematic review of the literature on transitional care focusing on frailty has been conducted; thus, we set no lower year limit for the search year. Studies that did not include a frail population, non-RCTs, studies on transitional care that were not of our interest (e.g., care that started after discharge or transition to a long-term care facility), and those without full-text access were excluded from the review.

Study selection and synthesis of results

Data were independently extracted by two authors. Discordance in cross-checks was resolved through discussion during research

meetings. Studies obtained from the four electronic databases were initially screened. After excluding duplicate studies, titles and abstracts were screened; subsequently, a full-text review of the eligible studies was performed. Studies for the systematic review were selected based on the inclusion and exclusion criteria. The selected studies were further reviewed for the meta-analysis, specifically in terms of outcomes, measurement tools, and time points. The meta-analysis was conducted when at least three studies measured the same outcomes at the same time point.

For the narrative synthesis, the information extracted included demographics (e.g., country, publication year, sample size, population, clinical setting), transitional care components, healthcare professionals involved in the intervention and key coordinator, time points of follow-up, study outcomes, and study results. For the meta-analysis, we extracted data on the type of outcomes and statistical values, and in studies with multiple experimental arms, we selected one arm that best corresponded to transitional care as defined in this review.

Data analysis

The meta-analysis was conducted using the Review Manager (Revman) software (version 5.4.1). Risk difference (RD) was calculated for dichotomous outcomes, and the standardized mean difference was calculated for continuous outcomes. Statistical significance was reported at $p < 0.05$, and confidence intervals (CIs) at 95% were calculated. Heterogeneity was assessed by calculating the I^2 value. As the transitional care components in the included studies were not homogeneous, a random-effects model was employed to estimate the pooled treatment effect.²¹

Risk of bias

We used the revised Cochrane risk-of-bias tool for randomized trials (ROB2),²² which consists of the following five domains regarding risk of bias: randomization process (3 items), deviations from the intended interventions (3–7 items), missing outcome data (1–4 items), measurement of the outcome (1–5 items), and selection of the reported result (2–3 items). Each item was assessed as “yes/probably yes,” “no/probably no,” “no information,” or “not applicable.” The risk of bias of each study was classified as low risk, some concern, or high risk, according to suggested algorithms. Two authors independently assessed the risk of bias, and any disagreement for each item of the ROB2 was discussed during research meetings, where a consensus was reached.

Results

A total of 3,182 studies were identified in the four electronic databases. After removing 1,485 duplicates, the title and abstract of the remaining 1,697 studies were assessed according to the inclusion and exclusion criteria. This resulted in the further exclusion of 1,464 studies. After reviewing the full text of 233 eligible studies, 212 studies were excluded for the following reasons: studies did not include frail older adults ($n = 10$); studies were non-RCTs (e.g., abstracts, protocols, descriptive studies, reviews, and qualitative studies) ($n = 61$); the intervention was not of our interest ($n = 139$); the full text could not be accessed ($n = 2$). Thus, 21 studies (i.e., 14 trials) were included in the final analysis; three trials had multiple publications: there were six studies for the trial “Continuum of care for frail older people”,^{23–28} two studies for the AMIGOS trial (i.e., “Acute Medical Unit Comprehensive Geriatric Assessment Intervention”),^{29–30} and two studies for the Disease Management Program (DMP) trial.^{31–32}

Table 1
The PICO framework.

PICO	Research Interest
Population:	Frail older adults (age of 65 years or older) who were discharged home from a hospital
Intervention:	Transitional care from hospital to home, which started when older adults were in the hospital and provided continuity of care after they were discharged to home
Comparison:	Usual care
Outcomes:	Impact of transitional care on all health outcomes

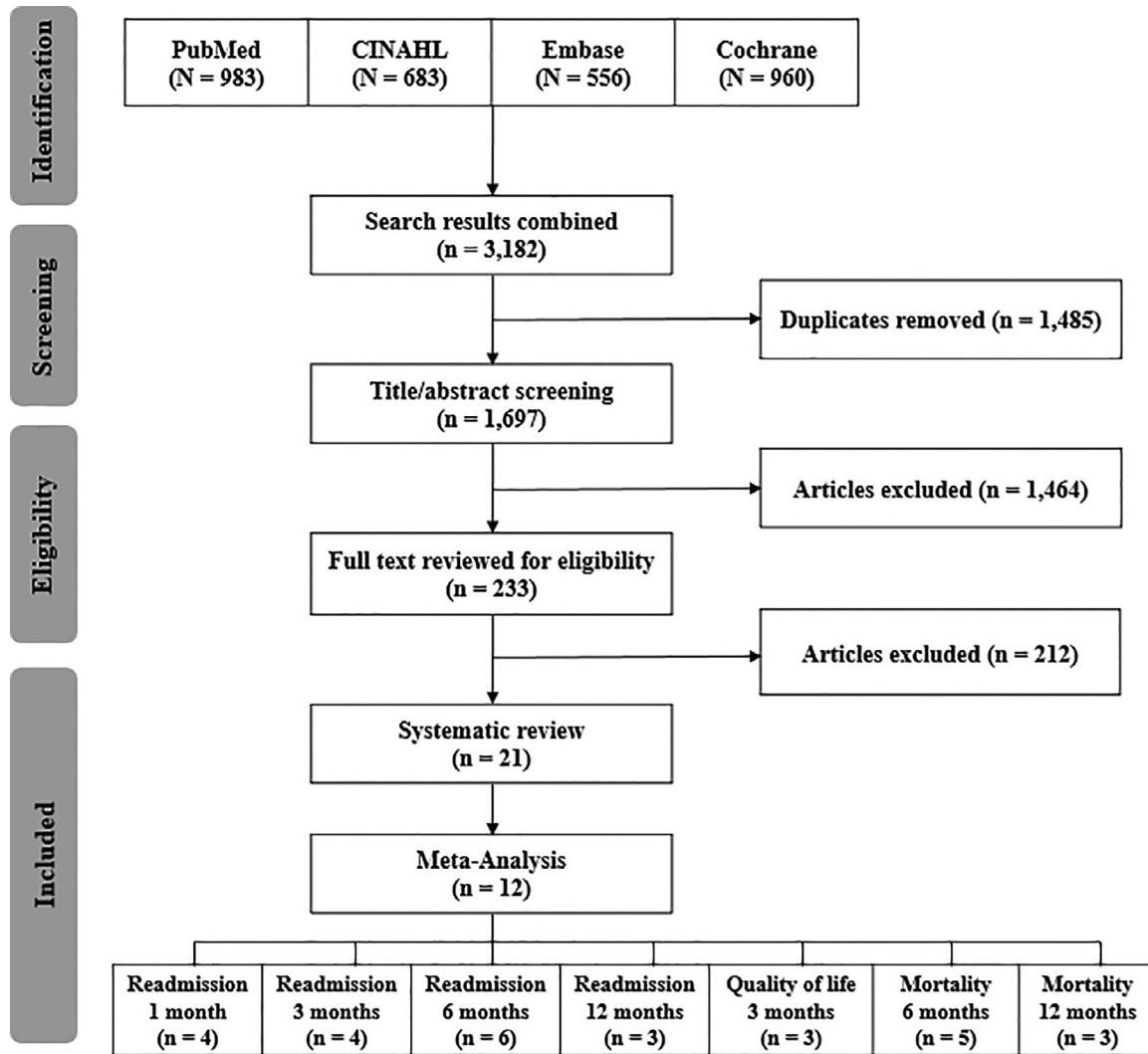


Fig. 1. Flowchart of study selection.

From the 21 studies, 12 studies were further included in the meta-analysis: 11 studies for readmission, three studies for health-related QOL, and seven studies for mortality (Figure 1).

Study characteristics

The characteristics of the included studies are described in Table 2. The total number of frail older adults who participated in the 14 trials was 5,776. The mean sample size, including experimental and control groups, was 413 (range, 128–2353). The age range of the participants was 77.0–85.7 years. The trials were conducted in Denmark (n = 3), Australia (n = 2), United Kingdom (n = 2), United States of America (n = 2), Argentina (n = 1), Germany (n = 1), Italy (n = 1), Netherlands (n = 1), and Sweden (n = 1). The publication years of the studies were between 1995 and 2021. The number of trial arms was up to four, although most trials consisted of two arms (n = 12).

Intervention components

The intervention varied widely, and care could be divided by time point (i.e., before hospital discharge, at home after discharge, and throughout the entire period). The intervention provided at the hospital included geriatric assessment (e.g., comprehensive geriatric assessment and physical examination that focused on geriatric

clinical problems), discharge planning that is more structured or advanced than usual (e.g., including medication review), early rehabilitation (e.g., exercise and training of activities of daily living [ADL]), and advanced care planning. The interventions provided at home were home visits (1–4 times), rehabilitation, community care service, telephone follow-up, geriatric assessment, and home safety assessment. Throughout the entire period, a multidisciplinary approach and family involvement were considered. The healthcare providers involved were nurses/municipal nurses (n = 13), physiotherapists (n = 10), geriatricians (n = 6), social workers (n = 6), occupational therapists (OT) (n = 5), advanced practice registered nurses (APRN) (n = 3), primary care physicians (n = 3), and others. Among the healthcare professionals, the identified key coordinators were nurses (n = 4), APRNs (n = 2), a geriatrician (n = 1), and an OT (n = 1). The intervention period varied from one home visit to multiple visits over the 12 months following discharge.

Effects of transitional care

The measurement time points and outcome variables in the evaluation of the intervention effect varied in the included trials. The measurement time points were 1 week (n = 3), 3 to 4 weeks (n = 8), 2 months (n = 3), 3 months (n = 7), 4 months (n = 2), 6 months (n = 9), 12 months (n = 4), and 24 months (n = 1) after discharge. Outcomes

Table 2

Characteristics of included studies.

First author(year) country	Mean age(setting)sample size of I/C	[Project]Intervention and contents(Control)	Intervient (<u>Key coordinator</u>)	Measure points	Outcomes	Results
Berglund (2013)	83 years (ER to home)	[Continuum of care for frail elderly people] Geriatric assessment	<u>Municipal nurse</u> SW	0 m 3 m	Quality of care Care planning	High quality of care (specifically regarding care planning); increased knowledge of whom to contact in the intervention group
Berglund (2015)	85/76	Transfer assessment information to municipal nurse	OT PT	6 m 12 m	Whom to contact Satisfaction Life satisfaction	
Eklund (2013)		Discharge planning (collaboration among case manager, social worker, patient, nurse, and physician at ward)				Satisfaction (functional capacity, psychologi- cal health, financial situation) increased between 6 and 12 months
Ekelund (2015)		Care planning at home after discharge			Functional ability	Improved ADL independence at 3 and 12 months; lower odds of decreased ADL independence at 6 months
Ebrahimi (2017)		Case manager to contact older person within 1 week after care-planning meeting and decide on f/u frequency			Self-determination	Significant effect on activity at home at 3 months and social relationship at 6 and 12 months
Wihelmsen (2017)		CGA at home (Usual care)			SRH Symptoms Security/safety Health service use Readmission Hospital days Outpatient visit	Improved SRH and symptoms, but not secu- rity/safety
Courtney (2009)	78.8 years (Medical ward to home)	Exercise intervention: muscle stretching/ strengthening, balance training, and walking	Nurse PT	0 1 m 3 m 6 m	Health service use Unplanned ED visit QOL	Fewer visits to physicians and more home visits by OT/PT in the intervention group; time to first readmission almost doubled in the intervention group but not significant
Australia	64/64	Nursing intervention in the hospital: visit and address concerns, facilitate the exercise pro- gram, discharge planning Home visit within 48 hours by nurse, additional visit if needed Telephone f/u (9 calls for 6 months) (Usual care: routine care, discharge planning, rehabilitation advice)				Fewer emergency hospital readmission and emergency GP visits Greater improvements in QOL
Del Sindaco (2007)	77 years	[Disease Management Program (DMP)]	<u>Cardiologist</u>	0	Death	Improved in all-cause death hospital admis- sions, functional status, and quality of life;
Puligano (2010)	(Cardiology ward to home) 86/87	Discharge planning, continuing education, therapy optimization, improved communica- tion, and early attention to signs and symp- toms Hospital visits within 7 to 14 days of discharge and at 1, 3, and 6 months thereafter for rein- forcement of education and optimization of therapy Follow-up phone calls by nurses (8.5 calls per patient average) PCP: assessment of adherence to treatment, eval- uation of possible adverse drug reactions, and identification signs of worsening clinical condi- tion, management of all health problems (Usual care)	Nurse PCP	2 y	Readmission QOL Functional status Cost effectiveness	cost saving € 982.04 per patient

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Table 2 (Continued)

First author(year) country	Mean age(setting)sam- ple size of I/C	[Project]Intervention and contents(Control)	Intervenient (Key coordinator)	Measure points	Outcomes	Results
Finlayson (2018) Australia	77.6 years (Medical ward to home) 57 (arm 1), 56 (arm 2), 54 (arm 3)/54	Arm 1 (exercise + nurse intervention) Assessment + arm 2 + arm 3 Arm 2 (exercise intervention) Tailored 2-h exercise program Six weekly in-home f/u visits by an exercise physiologist (2 h per visit) and one visit within 48 h of discharge Arm 3 (nurse intervention) Regular telephone f/u (~30 min/call) for 24 weeks by gerontic nurse: weekly for the first 4 weeks and every ≥4 weeks thereafter (Routine hospital and f/u care: need assessment by hospital health staff, discharge planning, referrals for f/u services)	APGN PT	0 28 d 12 w 24 w	Health service use Unplanned readmission	Readmission decreased at 28 days and 3 months
Edman (2013)	83 years (Acute medical unit to home) 216/217	[AMIGOS] Assessment before discharge by geriatricians Additional care if necessary (i.e., review of diagnoses, drug review, further assessment (home or clinic), advanced care planning, liaison with primary care, intermediate care, specialist community service, f/u home visits, phone calls) (Usual care in hospital)	Geriatrician PT OT Nurse Physician	0 90 d	Days at home [†] Death Institutionalization Secondary care contacts ADL Fall Psychological wellbeing Health-related QOL	NS in all outcomes
Tanajewski (2015) UK					QALY gained [†] Cost	No significant effect on in QALY and cost
Hansen (1995) Denmark	79.7 years (Subacute geriatric ward to home) 96/97	Discharge summary sent to GP and social support on the day of discharge Home visit at 1, 3, 8, 16 weeks after discharge Geriatric evaluation at every visit Rehabilitation if necessary Social service planned with a home nurse (Usual care)	Geriatrician Nurse PT Community nursing services	0 1 w 3 w 8 w 16 w 24 w	Readmission [†] Mortality Living condition Allocated social care	Lower readmission rate; more allocated to home help; no differences in mortality and nursing-home placement
Jepma (2021) Netherlands	82.4 years (Cardiology department to home) 153/153	[Cardiac Care Bridge (CCB)] Clinical phase: health issues discussed by the cardiac research nurse and the patient and geriatrician and other were consulted based on CGA finding. Integrated care plan estab- lished Discharge plan: contact to community nurse and PT; CN visited patients and cardiac research nurse for a handover of the integrated care plan; medical discharge letter sent to all CCB healthcare professionals Post-discharge phase: 4 home visits (within 3 days and 1, 3, and 6 weeks), additional home visit within 12 weeks if needed by community nurse; PT provided one or two home-based sessions per week (maximum 9 sessions during the first 6 weeks) (Usual care: CGA at baseline)	Nurses (Cardiac research nurse, CN) Geriatrician PT	0 3 m 6 m 12 m	Composite outcome of readmission and mortality [†] Unplanned readmission Mortality	NS in all outcomes

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Table 2 (Continued)

First author(year) country	Mean age(setting)sample size of I/C	[Project]Intervention and contents(Control)	Intervent (Key coordinator)	Measure points	Outcomes	Results
Lembeck (2019) Denmark	82.5 years (Ward to home) 270/267	Discharge planning by both project nurse and ward nurse on the day before discharge Project nurse accompanied the patient home and met the municipal nurse Structured assessment, reviewing cognitive skills, medicine, nutrition, home environment, mobility, and level of functioning and setting future appointments (by project and municipal nurses) Referral to skilled nursing specialist or GP Home environment adjustment (Usual care)	Project nurse Ward nurse Municipal nurse (GP, skilled nursing specialist, if needed)	0 8 d 30 d 180 d	Unplanned readmission [†] LOS Consultation at GP Visit by GP Municipal service Mortality	No effect on readmission and other secondary outcomes
Nikolaus (1999) Germany	81.4 years (Geriatric center to home) 181 (arm 1) /179 (arm 2) /185	Arm 1 (CGA + additional in-hospital and post-discharge f/u treatment by an interdisciplinary home intervention team) Hospital care: CGA and additional training in washing, eating, dressing, and/or walking One home visit during hospital stay to evaluate home safety Technical aids, if necessary Home treatment (e.g., physiotherapy/occupational therapy immediately after discharge as long as necessary or 2 times/week for 30 min) One home visit within 3 days F/u visit at 3 months to check whether recommendations were being implemented, home care continued, and technical aids used and to identify any new problems Arm 2 (CGA + usual home care) (Usual care: ADL/cognition assessment)	Nurses PT OT SW Secretary	0 12 m	Survival Functional status Readmission Nursing home placement Costs Life satisfaction SRH	Significant effect on LOS, nursing home placement at discharge, cost, functional status, life satisfaction, SRH, and hospital readmission days in the intervention group; no difference in survival and readmission rate
Sahota (2017) UK	84.1 years (Medical ward to home) 106/106	[CIRACT] Comprehensive assessment of the participant's ability and formulated a rehabilitation plan Daily rehabilitation Home visits to assess and provide recommendations for equipment and make adaptations and/or modifications as required Coordination with the appropriate community service providers to ensure a smooth and effective discharge Home visits to assess the level of rehabilitation required and further f/u visits Appropriate referral to additional community service providers (Standard care)	OT PT Assistant practitioner Social services practitioner	0 28 d 91 d	LOS [†] Readmission Bed days ADL Health-related QOL Co-morbidity Cost	No effect on LOS and no effect on readmission and any other secondary outcomes

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Table 2 (Continued)

First author(year) country	Mean age(setting)sam- ple size of I/C	[Project]Intervention and contents(Control)	Intervenient (Key coordinator)	Measure points	Outcomes	Results
Schapira (2021) Argentina	85.7 years (Medical ward to home) 120/120	Co-management provided by a geriatric team Hospital stage: CGA within 72 hours of admis- sion, implementation of tailored strategies focusing on geriatric issues Discharge stage: discharge letter that includes a personalized treatment plan, updated medication reconciliation After discharge: geriatrician contacts PCP and contacts patients/family to check on symp- toms, compliance with the treatment plan, and medical care provision Health and social care counselor: gerontological care, home care, helping family, making a change in the environment and procedure of care, medication reconciliation, evaluation of treatment adherence (Usual care)	Geriatricians Nurses PT Pharmacists Dietitians Speech therapist SW	0 1 m 6 m	Readmission [†] ER visit Mortality	Lower readmission rate at 30 days and ER visits at 6 months; no effect on mortality
Siu (1996) USA	28.8% were over 85 years old (Acute care to home) 178/176	Medical records review by NP before discharge Limited physical examination that focused on geriatric clinical problems (e.g., cognitive dysfunction, mobility impairment, and continence) and other relevant clinical findings before discharge Home visit by NP within 1–3 days Home nursing services, as indicated Team meetings (geriatrician, NP, SW, PT) Recommendations to PCP for further medication evaluation and physiotherapy/occupational therapy at home PCP received emergency call from NP/team geriatrician Three f/u visits (Routine medical care)	NP Geriatrician SW PT PCP	0 30 d 60 d	Functional status [†] Health-related QOL Medication adherence Satisfaction Readmission	No effect on functional status, quality of life, satisfaction, and readmission

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Table 2 (Continued)

First author(year) country	Mean age(setting)sample size of I/C	[Project]Intervention and contents(Control)	Interventent (Key coordinator)	Measure points	Outcomes	Results
Reuben (1995) USA	77.2 years (Ward to home) 1337/1016	Inpatient CGA Discharge planning by SW Call after 3 weeks Structured consultation note sent to both the attending physician and PCP NP: medical history taking and limited physical examination focusing on geriatric issues SW: assessment of function, cognition, emotion, stress, support system, community service usage, and advance directives Geriatrician: discussion of the case with the entire team, summarization of the geriatric problems (Usual care)	SW NP Geriatrician	0 3 m 12 m	Functional status Mortality SRH Mental health Unplanned readmission	No substantial differences in functional status and survival; improved scores in mental health index and current health perceptions
Rytter (2010) Denmark	83.5 years (Geriatric or internal medical ward to home) 148/145	A Structured interview with OT GP, local district nurse was contacted for the visit Intervention follow-up: 3 contacts Week 1: Joint home visit involving both the GP and the district nurse Week 3 & 8: Clinic or home visit depending on the condition (Usual care)	OT GP District nurse	0 6 m	All-cause readmission Control of medication Cost Functional ability Death rate Satisfaction SRH	Lower readmission rate; no difference in function, mortality, satisfaction, and SRH

ADL = activities of daily living; AMIGOS = Acute Medical Unit Comprehensive Geriatric Assessment Intervention; APGN = advanced practice gerontic nurse; CGA = comprehensive geriatric assessment; CIRACT = Community In-reach Rehabilitation and Care Transition; CN = community nurse; d = day; ED = emergency department; ER = emergency room; f/u = follow-up; GP = general practitioner; IADL = instrumental activities of daily living; I/C = intervention/control group; LOS = length of hospital stay; NP = nurse practitioner; NS = not significant; m = month; OT = occupational therapist; PCP = primary care physician; PT = physiotherapist; SRH = self-rated health; SW = social worker; QALY = quality-adjusted life years; QOL = quality of life; w = week; y = year.

[†] = Primary outcome of the study.

included readmission ($n = 13$), mortality ($n = 9$), physical function (i.e., ADL) ($n = 7$), health-related QOL ($n = 5$), self-rated health ($n = 5$), cost ($n = 5$), life satisfaction ($n = 3$), institutionalization ($n = 2$), length of hospital stay ($n = 2$), satisfaction to care ($n = 2$), bed days ($n = 1$), self-determination ($n = 1$), fall ($n = 1$), co-morbidity ($n = 1$), and days at home ($n = 1$). Among the outcomes, the primary outcomes were readmission ($n = 4$), functional status ($n = 2$), length of stay ($n = 1$), cost ($n = 1$), and days at home ($n = 1$); their main results are reported in the following sections.

Readmission

Readmission was measured in most trials ($n = 13$) (i.e., unplanned readmission, $n = 6$; not specified readmission, $n = 7$). Measurement time points were 8 days ($n = 1$), 1 month ($n = 4$), 2 months ($n = 1$), 3 months ($n = 4$), 6 months ($n = 6$), 12 months ($n = 3$), and 24 months ($n = 1$). The effect of the intervention on readmission was controversial. Seven trials reported no effect on readmission at any time point,^{28,33–38} six trials reported that the readmission rate was lower in the intervention group: (5% vs. 25%; $p = 0.01$)³⁹ and (18.3% vs. 35.0%; $p = 0.040$)⁴⁰ at 1 month; (20% vs. 38%; $p = 0.049$)³⁹ at 3 months; and (22% vs. 46.7%; $p = 0.007$)⁴¹ (34% vs. 46%; $p = 0.04$)³⁹ (44% vs. 64%; $p < .005$)⁴² and (40% vs. 52%; $p = 0.03$)⁴³ at 6 months. One trial reported that the time to readmission was longer in the intervention group (136.6 days vs. 123.0 days; $p = 0.549$), although the difference was not significant;²⁸ and one trial reported fewer readmission days in the intervention group (22.2 days vs. 35.7 days; $p < 0.05$).³⁵

Figure 2 shows the pooled RD of readmission at each time point. The overall effects were -0.03 (95% CI, -0.08–0.03) at 1 month ($n = 4$), -0.03 (95% CI, -0.11–0.06) at 3 months ($n = 4$), -0.12 (95% CI, -0.24 to -0.01) at 6 months ($n = 6$), and 0.00 (95% CI, -0.07–0.07) at 12 months ($n = 3$). The I^2 values were 80%, 59%, 81%, and 0%, respectively.

Mortality

In nine trials, the mortality rates in the intervention and control groups, respectively, were 7% and 6% at 3 months ($p = 0.61$);²⁹ 2% and 2% at 1 week ($p = 0.98$), 9% and 6% at 1 month ($p = 0.26$), 23% and 22% at 6 months ($p = 0.66$);³⁴ 18% and 20% at 6 months ($p = \text{NS}$);⁴² 10.1% and 13.8% at 6 months (95% CI, 0.37–1.41);⁴³ 25.8% and 35% at 6 months ($p = 0.123$);⁴⁰ 18.2% and 17.3% at 12 months ($p > 0.05$);³⁵ 38.6% and 26.8% at 12 months,³³ 74% and 75% at 12 months ($p = 0.89$);³⁶ and 31.4% and 36.8% ($p = \text{NS}$) at 2 years.³¹ All studies reported that transitional care had no effect on survival. The overall effects were -0.01 (95% CI, -0.06–0.04) at 6 months ($n = 5$) and 0.03 (95% CI, -0.05–0.10) at 12 months ($n = 3$). The I^2 values were 19% and 59%, respectively (Figure S1).

Physical function

Three trials reported that transitional care was effective in improving physical function: one trial reported improved ADL independence in the intervention group relative to the control group at 3 months (odds ratio [OR], 2.37; 95% CI, 1.20–4.68) and 12 months (OR, 2.04; 95% CI, 1.03–4.06) and decreased ADL dependence at 6 months (OR, 0.52; 95% CI, 0.27–0.98);²⁷ one trial reported improved functional capacity in the intervention group ($p = 0.03$);³⁵ one trial reported IADL dependency was lower in the intervention group (44.1% vs. 55.8%; $p = 0.001$).³¹ However, four other trials reported no ADL improvement in the intervention group.^{29,36–37,43}

Health-related QOL

Health-related QOL was measured using the EQ-5D ($n = 2$), the Medical Outcomes Study Survey (12-item/36-item) ($n = 2$), and the Quality of Well-Being Scale ($n = 1$). Two studies reported a significant effect of the intervention on both the physical and mental components of health-related QOL.^{31,41} Three studies reported no significant

effect of transitional care on health-related QOL.^{29,37–38} Moreover, the meta-analysis showed no effect of transitional care on health-related QOL at 3 months (Figure S2). The overall effect on health-related QOL was 0.47 (95% CI, -0.26–1.20), and the I^2 value was 95%.

Self-rated health and life satisfaction

Four trials reported positive effects on self-rated health and life satisfaction. One trial reported improvement in life satisfaction and self-rated health life satisfaction regarding financial situation ($p = 0.04$) and functional capacity ($p = 0.01$) at 12 months, psychological health at 6 and 12 months ($p < 0.001$);²³ and another trial reported that self-rated health significantly improved in the intervention group.²⁵ Other trials reported higher perceived health (3.7 points vs. 3.0 points; $p = 0.04$) and life satisfaction (3.9 vs. 3.2 points; $p = 0.04$) scores in the intervention group,³⁵ higher health perceptions (50.1 vs. 46.3; $p = 0.01$),³⁶ and higher general health perception score at 1 month (95% CI, -11.35–2.07) and 6 months (95% CI, -6.40–10.30).³⁸

Cost

Three trials reported that the medical costs were lower in the intervention group than in the control group,^{31,35,43} and one found that the intervention was cost-effective considering quality-adjusted life years.³⁷ However, one trial reported that the intervention was not cost-effective.³⁰

Living home and institutionalization

No trial reported on the effect of transitional care on in-home placement or institutionalization. One trial reported no significant effect on nursing home placement between the intervention and control groups (21.4% vs. 29.1%; $p > 0.05$); however, the intervention group spent fewer days in nursing homes (114.7 vs. 170.0 days; $p < 0.05$).³⁵ Another trial reported there was no difference in the institutionalization rate (3% vs. 3%; $p = 0.69$) or days at home (79.7 vs. 80.2 days; $p = 0.61$).²⁹

Satisfaction to care

In one trial, satisfaction was lower in the intervention group (69.81 vs. 76.00; $p = 0.02$).³⁸ However, another trial reported that the intervention group perceived a higher intervention quality in terms of care planning ($p < 0.005$) and knowledge on who to contact ($p < 0.03$);²⁴ however, satisfaction with care was not significantly different between transitional and usual care.

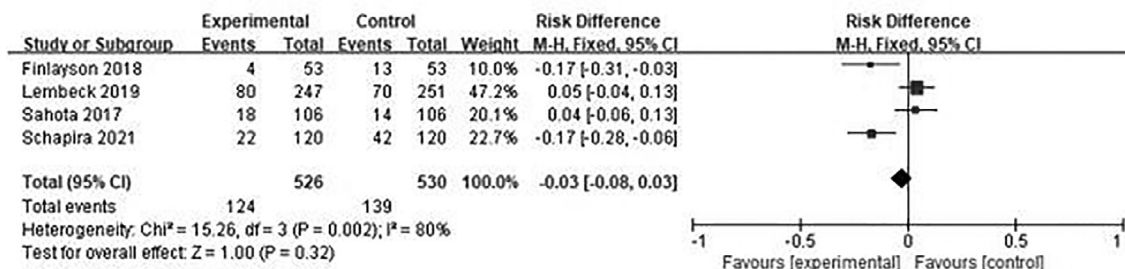
Risk of bias

Overall, the included studies had good methodological quality. Five trials published their protocol in advance. We also determined whether the experiment differed from the predefined protocol to identify any deviation. One study had baseline differences between intervention and control groups, and two studies had some deviations from the intended intervention; thus, their risk of bias was rated as “some concerns”^{35,43} or “high risk”³⁸ (Figure 3).

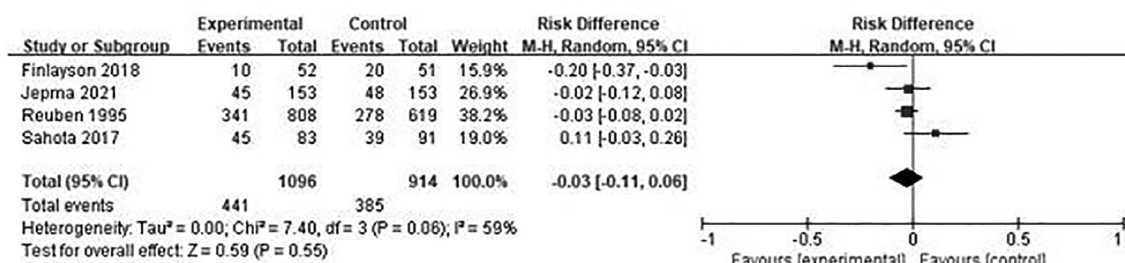
Discussion

This systematic review involving 14 trials examined the types and effects of transitional care provided to frail older adults from hospital discharge to home, and the meta-analysis determined the effects of transitional care on readmission, mortality, and health-related QOL. To our knowledge, this is the first systematic review of all interventions aiming to provide continuity of care from hospital discharge to home, which focused on the frail older population and investigated the effectiveness of these interventions across health outcomes.

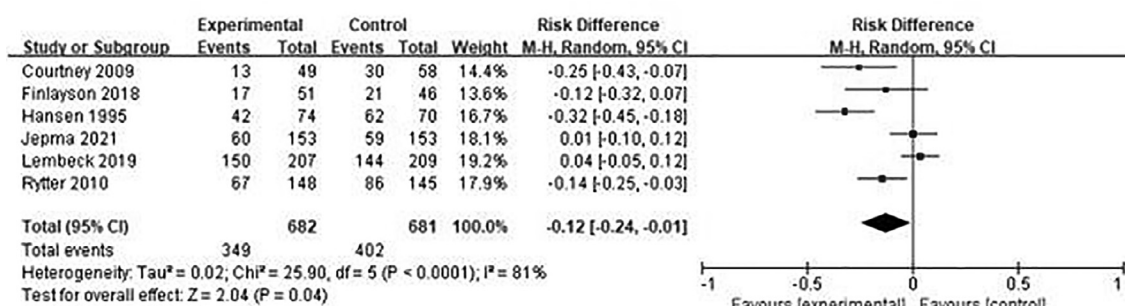
Readmission at 1 month



Readmission at 3 months



Readmission at 6 months



Readmission at 12 months

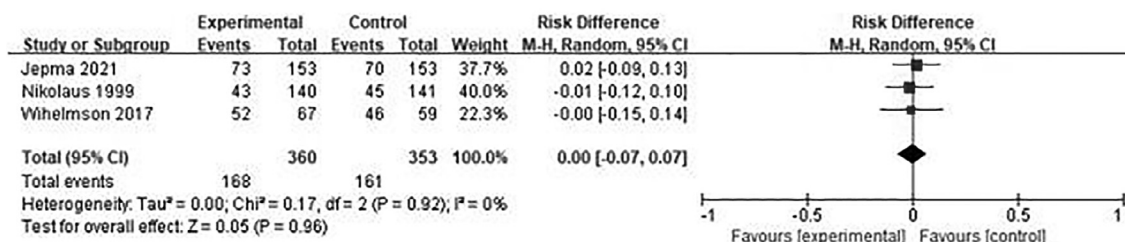


Fig. 2. Forest plot for readmission.

There are several implications of the findings of this review. First, transitional care interventions focusing on frail older adults are scarce; while a lower limit was not set for the publication year, only 14 trials were included in this review. This finding could be attributed to the following: 1) the terminology used in screening and managing frailty has only recently reached a consensus in the field of geriatrics, although the word *frail* has been used before;⁴⁴ and 2) most transitional care studies have focused on specific diseases rather than frailty.¹⁵ Frail older adults may have multiple health problems, such as chronic illnesses and physical/psychological/social function

decline. Thus, further studies should target frail older adults with complex health needs.

Second, the interventions differed in terms of the intervention setting (e.g., hospital or community), healthcare providers and key coordinators involved, follow-up duration (e.g., up to 24 months), measured outcomes, and intervention components. This may indicate that a transitional care method that is effective in improving health outcomes in frail older adults has not been clearly established. For the general older adult population, recent reviews identified the following core components of interventions: engaging older adults and



Fig. 3. Risk of bias for included studies.

caregivers in care planning, managing the complexity of health problems (e.g., medication review) to meet the needs of older adults, educating older adults and promoting self-management, promoting care continuity, establishing accountability of providers, assessing and managing symptoms, and collaborating/coordinating with other healthcare providers.^{45–47} However, for frail older adults, who are regarded as one of the most vulnerable populations, information is limited. In this review, we found that most of the transitional care strategies included the core transitional care components for the general older adult population. Furthermore, they included other components specific to the frail older adult population (i.e., comprehensive geriatric assessment, advanced discharge planning, in-hospital or after-discharge exercise, and rehabilitation to facilitate return to ADLs at home). Regarding intervention intensity, a previous review stated that only high-intensity transitional care was effective in reducing readmission.⁴⁸ Consistent with that, although the current review did not classify the intervention according to intensity, high intensity was deemed necessary to improve health outcomes in frail older adults. For instance, despite reducing cost, one home visit was not effective.³⁴ Interventions including several geriatric assessments and follow-ups for 12 months were effective.^{23–28} Moreover, improving the health outcomes in frail older adults is challenging because of the progressive decline in function and health status.⁴⁹ Thus, future studies must consider the intervention intensity. Additionally, given the complex health care needs of frail older adults, a multidisciplinary team, including clinicians and nurses, is needed to educate and manage illnesses.^{37,50}

Third, the effectiveness of transitional care for frail older adults was still inconclusive. The meta-analysis demonstrated a lack of effectiveness of the intervention in decreasing mortality and improving QOL; however, the intervention was effective in reducing the readmission rate at six months. Moreover, through narrative synthesis, we found that transitional care was effective in improving self-rated health, life satisfaction, and function. Previous reviews reported the effectiveness of transitional care models in reducing admission and mortality rates when mainly targeting a certain disease and in the general older adult population;^{15,51–52} however, an evidence gap exists regarding the effectiveness of transitional care targeting frail groups or multi-domain functions, such as perceived health status and psychosocial well-being. Hence, future studies need to consider measuring outcomes that include diverse subjective⁵³ (e.g.,

restoration and self-efficacy) and objective outcomes in an appropriate time frame.

Limitations and strengths

This study had some limitations. As the reported outcomes varied in terms of the measurement tools, time points, and reported format (e.g., unplanned, all-cause, or unspecified readmission), the interpretation of the meta-analysis results may be limited. Thus, we included a narrative synthesis of the outcomes to avoid biased results. Furthermore, the meta-analysis of each outcome included only a few studies, which were quantitatively extremely small to elicit statistical significance and lacked homogeneity. Nevertheless, our review had several strengths. While previous reviews focused on a specific disease or a certain condition, our review included a broad range of chronic illnesses that manifest as frailty. This represented the typical frail older population seen in the clinical setting. Moreover, our narrative synthesis provided comprehensive information from intervention components to intervention effectiveness based on objective outcomes and the participants' perspective, whereas previous studies were limited to a certain health outcome, such as readmission or mortality.

Conclusions

Various transitional care strategies have been developed to improve the health outcomes of frail older adults discharged from hospitals to their homes. Such strategies were effective in reducing the readmission rates at six months; however, the effectiveness in improving other health outcomes of frail older adults remains unclear. Thus, a novel but evidence-based approach is needed to develop an effective transitional care intervention for this vulnerable population.

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CRedit authorship contribution statement

Ji Yeon Lee: Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing, Funding acquisition. **Yong Sook Yang:** Conceptualization, Methodology, Data curation, Writing – review & editing. **Eunhee Cho:** Conceptualization, Methodology, Supervision, Writing – review & editing, Funding acquisition.

Declarations of Competing Interest

None.

CRedit authorship contribution statement

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.gerinurse.2021.11.003.

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