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SYSTEMATIC REVIEW

Effectiveness of integrating primary healthcare in aftercare for older patients after discharge from tertiary hospitals—a systematic review and meta-analysis

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Abstract

Background: Quality of aftercare can crucially impact health status of older patients and reduce the extra burden of unplanned healthcare resource utilisation. However, evidence of effectiveness of primary healthcare in supporting aftercare, especially for older patients after discharge are limited.
Methods: We searched for English articles of randomised controlled trials published between January 2000 and March 2022. All-cause hospital readmission rate and length of hospital stay were pooled using a random-effects model. Subgroup analyses were conducted to identify the relationship between intervention characteristics and the effectiveness on all-cause hospital readmission rate.
Results: A total of 30 studies with 11,693 older patients were included in the review. Compared with patients in the control group, patients in the intervention group had 32% less risk of hospital readmission within 30 days (RR = 0.68, $P < 0.001$, 95%CI: 0.56–0.84), and 17% within 6 months (RR = 0.83, $P < 0.001$, 95%CI: 0.75–0.92). According to the subgroup analysis, continuity of involvement of primary healthcare in aftercare had significant effect with hospital readmission rates ($P < 0.001$). Economic evaluations from included studies suggested that aftercare intervention was cost-effective due to the reduction in hospital readmission rate and risk of further complications.
Conclusion: Integrating primary healthcare into aftercare was designed not only to improve the immediate transition that older patients faced but also to provide them with knowledge and skills to manage future health problems. There is a pressing need to introduce interventions at the primary healthcare level to support long-term care.

Keywords: systematic review, long-term care, primary health, discharge, older people, aftercare

Key Points

- Continuity of involvement of primary healthcare in aftercare had significant interaction with hospital readmission rates.
- Integrating primary health into aftercare can provide patients with knowledge and skills that could be applied to the future.
- Aftercare intervention was cost-effective due to the reduction of hospital readmission rate and risks of further complications.
- There is a current shift away from interventions stressing human interactions towards those with more technological interaction.

Introduction

Worldwide, the number of people aged 65 or older is projected to increase from 750 million in 2020 to approximately 1.5 billion in 2050 [1]. Older patients are the most frequent users of healthcare services globally, accounting for over half of all hospital admissions [2]. Economists from the UK estimated that appropriate discharge plans for older patients could save up to 1 million days of hospitalisation and about US$1 billion in costs of readmission [3, 4].

The use of primary healthcare to provide transitional aftercare for older adults has been increasing in many countries [5, 6]. Primary healthcare can provide an entry point into the health system, ongoing care coordination and a person-focused approach for patients and their families [7]. In 2000 a new vision of primary healthcare was developed by the WHO as a foundation of universal health coverage. It focuses on integrated healthcare, multisectoral approaches and community engagement in health [8].

The WHO reports that continuity of care is a key element in quality of aftercare [9]. Continuity of care by primary healthcare providers can be categorised as follows: (i) interpersonal continuity: trusting relationships between primary healthcare providers, patients and caregivers; (ii) longitudinal continuity: a history of interaction with the same primary healthcare providers in a series of discrete periods; (iii) management continuity: entailing effective cooperation of different teams across care boundaries to offer seamless healthcare and (iv) informational continuity: availability of clinical and psychosocial information to primary healthcare providers [10].

We know of no existing reviews examining the effectiveness of using primary healthcare as transitional and integrated aftercare for older patients after discharge. Therefore, this study aimed to explore the relationship between integration of primary healthcare in transitional aftercare, and outcomes of healthcare utilisation, patients' health-related quality of life (HRQOL), with the following objectives:

- To identify the effective characteristics of the integration of primary healthcare into transitional aftercare for older patients.
- To determine whether integration of primary healthcare into transitional aftercare reduces healthcare resource utilisation and improves health status of patients after discharge.
- To analyse the costs of integrated primary healthcare aftercare for older patients.

Method

Study design

This systematic review and meta-analysis were conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline [11]. The protocol for this study was registered in PROSPERO (CRD42021242917).

Search strategy

We searched for full-text articles in English published between January 2000 and 31 March 2022 using the following electronic databases: EMBASE, PubMed, Web of Science, Cochrane, CINAHL, PsycInfo and Google Scholar. The references of the relevant articles and reviews were manually checked to identify additional studies. Key search terms were: older adults, patients discharge, primary healthcare and aftercare. Full search strategies in PubMed are available in Appendix 1. Endnote (X8.0, Clarivate Analytics) was used to manage all search results.

Eligibility criteria

Only peer-reviewed randomised control trials (RCTs) were eligible. Inclusion criteria were studies which involved: (i) patients aged 65 or over; (ii) patients hospitalised for chronic diseases for more than one day with aftercare needs; (iii) interventions describing at least one component that aimed to improve the continuity of care between hospital and primary healthcare facilities and (iv) reported outcomes including any of the following: length of hospital stay, hospital readmission rate, and HRQOL. Studies were excluded if: (i) patients had any mental disorder, including cognitive impairment or dementia and (ii) pilot studies, study protocols and studies with only abstracts.

Study selection

Three researchers in parallel screened and selected studies (RL, JWG and JBL). RL and JWG independently screened each reference title and abstract for relevance to this review. RL and JWG evaluated these articles against the eligibility criteria. Controversial issues were discussed among the three researchers.

Data synthesis and analysis

Data extraction was conducted by three investigators individually and cross-checked. A narrative review of intervention characteristics from individual studies was presented. We classified the intervention components, associated with continuity of care between hospitals and primary healthcare facilities, into four elements according to the WHO's guideline mentioned above.

The primary outcome of this review was all-cause hospital readmission rate, stratified by time to within 1 month and within 6 months after discharge from hospital. The secondary outcomes were length of hospital stay, HRQOL and costs of aftercare. R (V4.0.3) was used to perform the meta-analyses and subgroup analyses. The effect size was defined as the standard mean differences (SMDs) in length of hospital stay and the risk ratio (RR) of the hospital readmission rate, between intervention and control groups. A random-effects model was utilised to generate pooled estimates of the overall effects and reported 95% confidence intervals with all measures of effect. Both χ^2 tests (Cochran's Q) and I^2 statistics were used to examine heterogeneity across studies

(I^2 values of 25, 50 and 70% were defined as low, moderate and high level of heterogeneity, respectively). Owing to large differences in assessment methods, we have also presented a narrative review of the results of patients' HRQOL and costs.

We specified subgroups in advance to further identify the relationship between intervention characteristics and the effect on hospital readmission rate controlling for: (i) frequency of follow-up (less or equal to once per month or more than once per month); (ii) discharge coordinators (no more than two professionals or multidisciplinary team) and (iii) intervention components regarding continuity of care between hospitals and primary healthcare providers (single or multifaceted). A leave-one-out sensitivity analysis was performed to assess the robustness of the results.

Quality assessment

Included studies were appraised to assess the risk of bias for methodological quality. The assessment of risk of bias was performed according to guidance in the Cochrane Collaboration's Risk of Bias handbook for RCTs [12]. The risk level in this review was classified as 'high', 'low' or 'unclear'. Features of the process of the randomisation, allocation concealment, blinding of participants and outcome assessors, incomplete outcome and selective reporting were assessed. If more than ten articles were included in the meta-analysis, funnel plots were conducted to detect publication bias. Besides visual inspection, Egger and Begg tests were conducted to adjust potential effect of publication bias on results interpretation.

Results

Search results

We identified 16,214 articles from the seven databases. A total of 744 articles were found for full text reviewing. Of these, 720 were eliminated against eligibility criteria. An additional six articles were found from references of relevant reviews, yielding a total of 30 studies. All 30 studies were involved in qualitative synthesis. Of these 25 studies providing data on length of hospital stay and readmission rate were included in the meta-analysis. A flow diagram of the selected studies is shown in Figure 1.

Study characteristics

These studies were all prospective RCTs published between 2001 and 2020, with 17 published after 2010. All studies were conducted in high income countries or regions, and in urban settings. Seven studies were from Australia [13–19]; six from the United Kingdom [20–25]; five from the United States [26–30]; two each from Canada [31, 32], Norway [33, 34] and Spain [11, 35]; and one each from Denmark [36], Hong Kong (China) [37], France [38], Italy [39], New Zealand [40] and Switzerland [41] (Appendix 2).

The 30 studies involved 11,693 participants in total. The mean sample size was 390, ranging from 42 to 2,494. The mean age range of patients across the 30 articles was 70 to 84 years. The duration of the trials ranged from one to 18 months. Half of the interventions lasted for less than 6 months [16, 17, 19–24, 28, 29, 34, 36, 37, 39, 40]. A total of 28 studies used treatment-as-usual, and standard procedures for discharge and aftercare, as a control [13–20, 22–41].

The 30 studies differed in their overall objectives, including (i) improving quality of aftercare [14, 17, 19–25, 29, 33, 34, 36–38, 42], (ii) facilitating coordination between hospitals and primary healthcare providers [13, 25, 26, 32, 34], (iii) increasing patients' self-management ability [30, 35, 41], (iv) enhancing medication adherence [16, 26], (v) saving costs of aftercare and healthcare services following discharge [23, 27] and (vi) reducing inappropriate healthcare resource utilisation [15, 18, 24, 28, 31, 39, 40].

Intervention characteristics

Every intervention was multicomponent, using a comprehensive program, model, protocol or bundle with a range of specific activities and tools. Characteristics of the 30 studies are described in Appendix 2.

The interventions were applied in one or more stages of pre-discharge, at discharge and post-discharge. All 30 studies focused on aftercare post-discharge: ten of them additionally applied interventions on handover support at discharge [17, 18, 23, 25, 29, 31, 33, 35, 38, 40]. Four studies conducted discharge preparedness activities during hospitalisation, in addition to aftercare [16, 19, 37, 41]. Finally, 11 studies focused on the whole process of the three stages mentioned above [13, 14, 17, 18, 20, 23, 25, 27, 28, 35, 40]. Appendix 3 provides a descriptive overview of activities in different stages of discharge in each study.

Components of engagement of primary healthcare

All of the included studies involved primary healthcare during the process of continuity of care. The major component is longitudinal continuity. Nine studies mentioned that the follow-up after discharge was provided by GPs [13, 16, 23–25, 28, 32, 33, 36, 39, 40]. Other primary healthcare providers included community pharmacists [17, 21, 23, 35], physiotherapists [18, 19, 21], primary care nurse practitioners [14–16, 18, 19, 21, 22, 26–28, 30–32, 34, 36, 37, 40–42] and allied health professionals [35, 42].

Regarding information continuity, ten studies conducted information exchange between primary healthcare providers and other professionals at discharge and aftercare [13, 15, 20, 22, 27, 29, 30, 33, 35, 41]. The information exchange consisted of database-generated discharge summaries and online reference information about rehabilitation. In addition, 10 of the 30 studies explicitly described the components of communication between primary healthcare providers and other healthcare professionals [13, 16, 17, 20, 27, 31, 33, 40, 42]. Relevant activities were face-to-face meetings regarding issues of aftercare and patients' health status and timely conversation through telephone, fax or emails to transmit discharge plans.

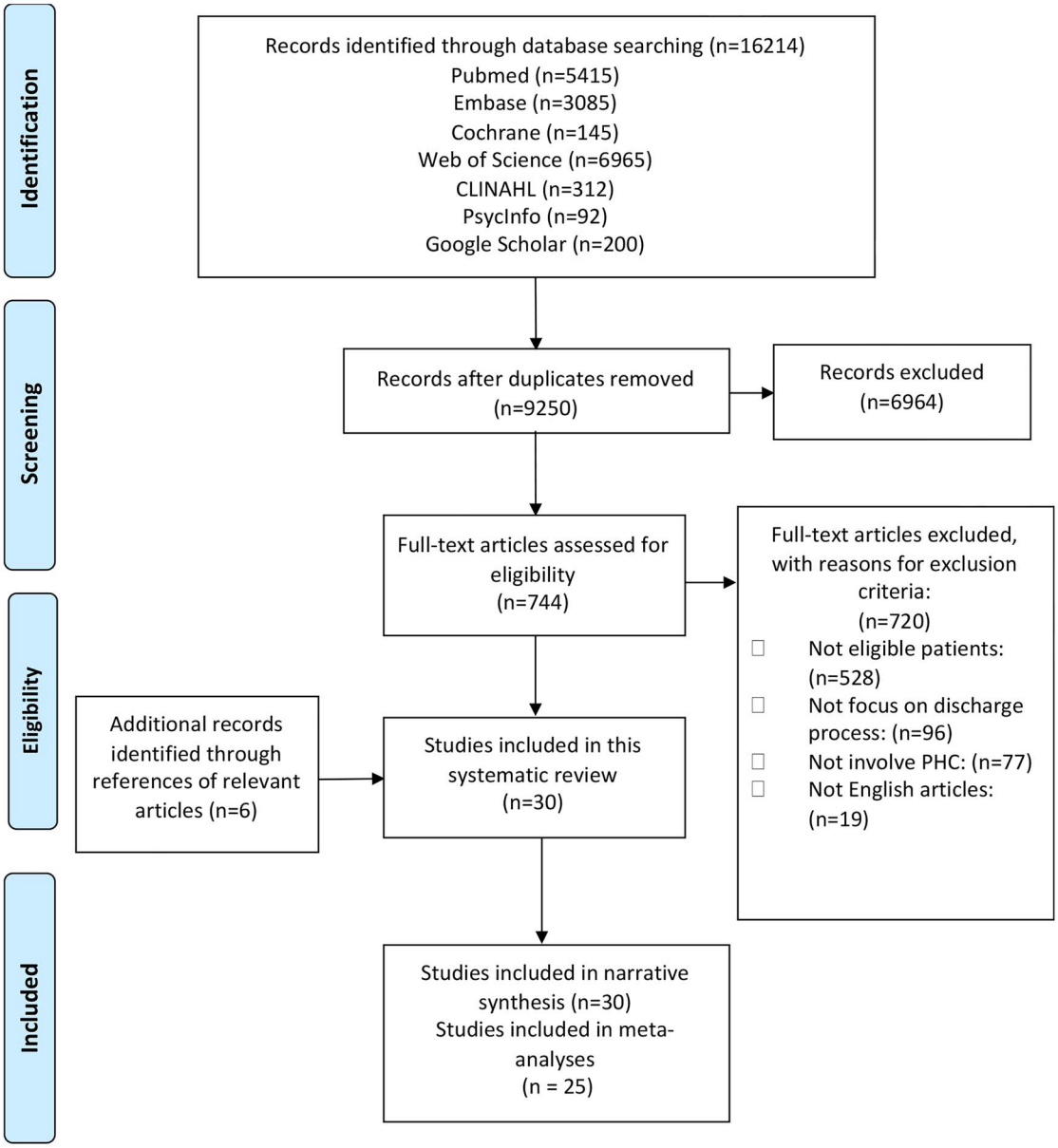

Figure 1. Flow diagram of study selection.

Management continuity was predominantly performed by care coordination in 20 studies [13, 14, 16, 17, 20, 22, 24, 26–31, 33, 36–38, 40–42]. Joint follow-up between hospital nurses and primary healthcare providers was the main activity. All but three studies involved more than two professionals as multidisciplinary teams [35–37]. Two studies implemented mobile health interventions for aftercare and follow-up [29, 33]. They generated patients' daily health records after hospitalisation and provided feedback from healthcare professionals accordingly, through smart phone.

Additionally, three studies tested the consistency between GPs' knowledge of patients' health experience and the subjective experience of patients themselves to assess interpersonal continuity [15, 29, 33]. Half of the included studies comprised more than one component of engagement of primary healthcare [13, 15–17, 20, 22, 23, 27, 28, 32, 33, 37, 41, 42].

Discharge destination and follow-up frequency

The most common discharge destination is home [13–16, 18–22, 24–28, 30–32, 35–37, 40, 41], followed by nursing home [17, 23, 29, 34]. For four studies, patients were discharged to a step-down facility, either geriatric hospitals or nursing home, and then home [33, 38, 39, 42].

For all studies, follow-up was initiated within the first week after hospital discharge. Most of the studies provided follow-up at a fixed interval with frequency varying considerably. For eight studies, follow-up was provided weekly [15, 18, 21, 30–32, 34, 39] with reduction in frequency

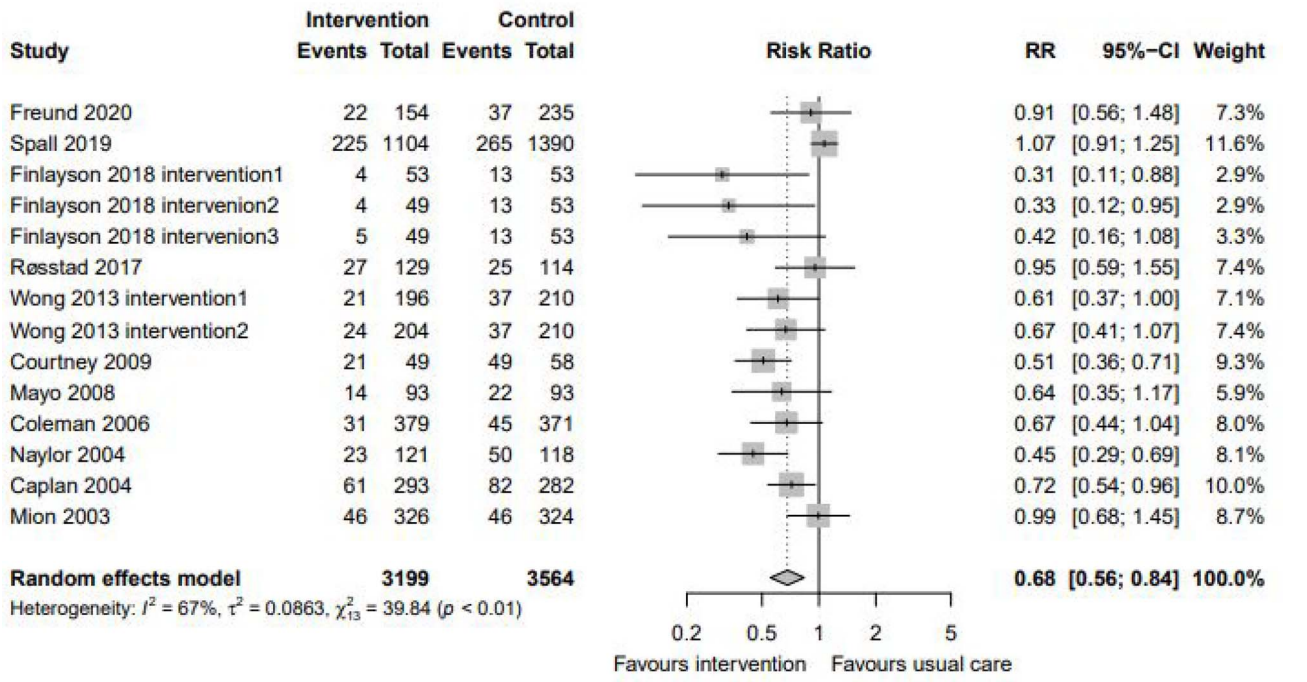

Figure 2. Results of 30-day hospital readmission.

over time. Five studies stated that the frequency of follow-up was tailored to the needs of patients [22, 26, 38, 39, 41]. All studies provided contact information of personnel for patients to contact at any time.

Outcome measures

Among the total 30 studies, 25 were included in the meta-analysis [14–23, 25, 27–33, 35–40, 42]. Nineteen of them reported hospital re-admission rates [14, 15, 18–22, 27, 28, 30–33, 36–39, 42]; 15 reported length of hospital stay [15–17, 21–23, 25, 29–31, 35, 38–40]. In addition, 20 studies assessed HRQOL [13–25, 28, 31–33, 35, 37, 42], and 13 studies conducted economic evaluation [13, 17, 19, 26–30, 35, 36, 39–41].

Meta-analysis of hospital readmission rates and length of hospital stay

As shown in Figure 2, the pooled relative risk shows that patients in the intervention group had 32% less risk of hospital readmission within 30 days than patients in the control group (RR = 0.68, $P < 0.001$, 95%CI: 0.56–0.84), with moderate heterogeneity (I^2 = 67%, χ^2 = 39.84, P = 0.01). Patients in the intervention group were 17% less likely to be readmitted to hospital within 6-month period compared to those in the control group (RR = 0.83, $P < 0.001$, 95%CI: 0.75–0.92) (Figure 3). Heterogeneity was moderate (I^2 = 59%, χ^2=36.53, P = 0.01). Further sensitivity analyses revealed no substantial difference in the overall effect for 30-day and 6-month hospital readmission rate.

Subgroup analyses (Appendix 4) were consistent with the main findings, showing significant effectiveness in both 30-day and 6-month hospital readmission in the intervention groups. Interventions containing multifaceted components of continuity of care [28, 31–33, 36–38, 42] were associated with stronger effectiveness in within 30-day and within 6-month readmission (RR 0.55, 95%CI: 0.45–0.68; RR 0.73, 95%CI: 0.64–0.83, respectively), compared with interventions with only one component [14, 15, 18–20, 27, 30, 35, 39] (RR 0.88, 95%CI: 0.73–1.06; RR 0.96, 95%CI: 0.90–1.02, respectively).

Trials conducted by multidisciplinary teams [14, 15, 18–20, 27, 28, 30–32, 37–39, 42], and with a frequency of follow-up once per month [15, 18, 20, 28, 30, 32, 33, 37–39] showed a larger overall effect on both 30-day and 6-month readmission, compared with interventions conducted by no more than two professionals [33, 35, 36], and with a high-intensity follow-up [14, 19, 27, 31, 35, 36, 42]. These characteristics of the interventions had no significant interaction with effectiveness.

Patients in the intervention group had a marginal reduction in hospital length of stay compared to controls (SMD = –0.01, 95%CI: −0.12 to 0.10, P = 0.9), with moderate heterogeneity (I^2 = 54%, χ2 = 28.34, P = 0.01; Figure 4). No substantial difference in the overall length of hospital stay was revealed in sensitivity analysis.

Patients' HRQOL and economic evaluation

Among all 20 studies which measured HRQOL, 13 studies reported statistically significant improvement in patients' HRQOL [15, 16, 18, 21, 22, 24, 25, 28, 32, 33, 35, 42],

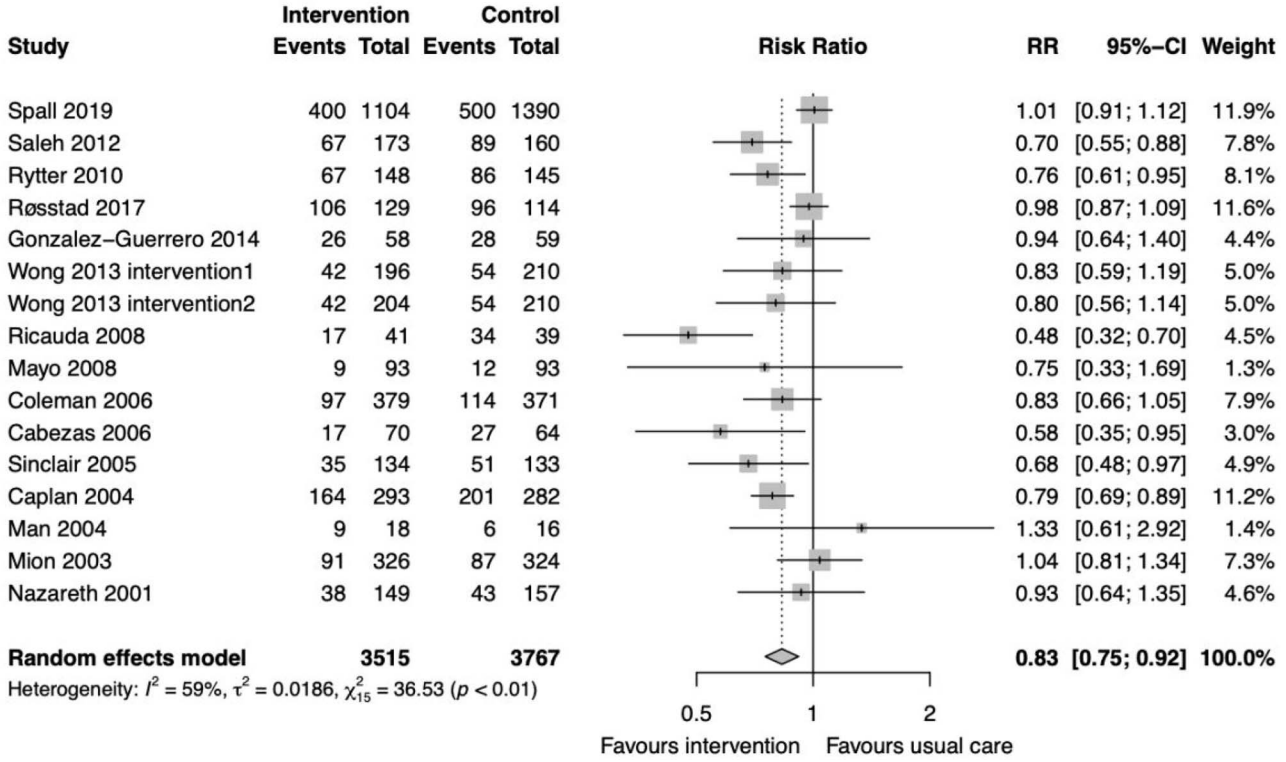

Figure 3. Results of within 6-month hospital readmission.

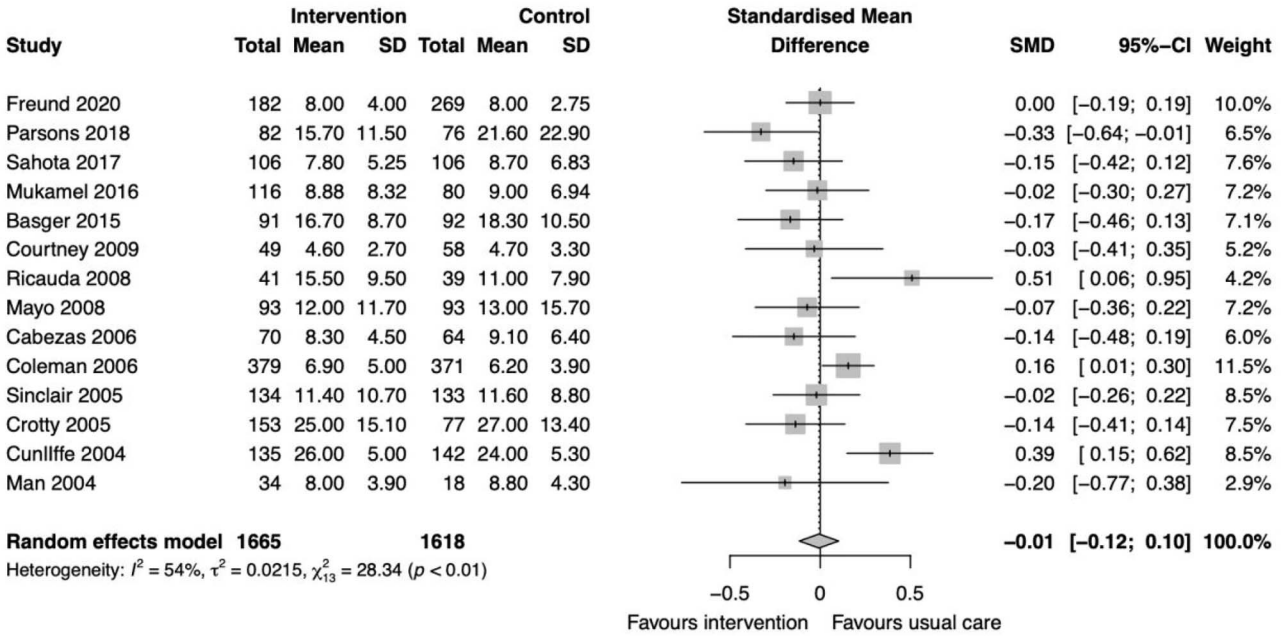

Figure 4. Result of length of hospital stays.

especially more positive effects on physical status than mental status.

Eleven studies conducted cost-saving analyses [13, 17, 19, 28–30, 35, 36, 39–41]. Of these, seven studies found the cost of the interventions was lower than the control [19, 26, 27, 29, 30, 39, 40]. The main costs were from aftercare services, medical equipment, medications and staff costs. Three studies conducted cost–benefit analysis [26, 27, 41]. All of them suggested that aftercare intervention provided considerable cost–benefits due to the reduction of hospital readmission rate and risks of further complications. However, they emphasised the importance of larger sample size and more precise record of cost estimates of subsequent rehospitalisation and utilisation of healthcare.

Quality assessment

No study was absolutely free of bias (Appendix 5). Nine studies were assessed as high risk for selection bias [14, 18, 21, 23, 24, 29, 33, 34, 36, 38], as outcome assessors were unblinded to the allocation. Risk of attrition bias was high in 13 studies, as they reported that less than 5% of participants withdrew from the follow-up and analyses were carried-out on an intention-to-treat basis [13, 18, 20, 21, 24, 28, 31, 34, 36–38, 40, 42]. Pre-specified outcomes were missing in one article leading to high reporting bias [31]. The funnel plot of the comparison of 30-day and 6-month readmission rates suggests no significant publication bias.

Discussion

Summary of principle findings

In this systematic review, we included a total of 30 RCTs with 11,693 older patients with aftercare needs. Transitional aftercare interventions were found to cause a significant reduction in 30-day and 6-month hospital readmission rates by 32% and 28%, respectively, compared with the standard discharge process. Economic evaluations in all the studies suggested that transitional and aftercare interventions were cost-effective considering the overall reduction in unplanned use of healthcare resources.

Transitional care intervention design

Subgroup meta-analysis revealed that interventions using a complex and supportive strategy for the continuity of care contributed to stronger effects on quality of aftercare and healthcare resource use. Documented efficacy components of continuity of care interventions include multidisciplinary team of coordination, shared involvement by hospital and primary healthcare providers, timely follow-up, among others [5, 10]. Hesselink *et al.* [43] also found that comprehensive aftercare intervention with higher quality of handover among multidisciplinary teams is positively correlated with improved HRQOL.

Regarding the effects of varying follow-up frequency, interventions with no more than one follow-up per month had better effects in hospital readmission rates than interventions with higher frequency. Leppin *et al.* [44] reported that interventions with intensive frequency of follow-up could be beneficial. However, the experience of follow-up is not constant between individual and quality of services provided by different healthcare facilities are different [45]. Therefore, the relationship between intensity of follow-up and patients' health-related outcomes is inconsistent and of limited applicability.

The secular trend of intervention designs detected in this review were as follows: (i) in recent studies, transitional aftercare interventions have moved from largely depending on the services provided by health professionals, to improving patients' and caregivers' ability to self-manage after discharge; (ii) studies published recently showed a higher follow-up frequency following discharge, compared with studies published before 2010 and (iii) there is a current shift away from interventions stressing human interactions towards those with more technological interaction.

Strengths and limitations of this review

To our knowledge, this is the first systematic review to analyse the relationship between the characteristics of continuity of primary healthcare involvement in aftercare, hospital utilisation and patients' HRQOL, using both meta-analysis and qualitative synthesis. Importantly, this study categorised the activities of interventions by different stages during aftercare to ensure appropriate characterisation of each intervention. Also, this review adds to a body of knowledge analysing integration of primary healthcare in transitional care according to the WHO's framework of continuity and coordination of care. These methods can be applied to future assessments of complex interventions.

Regarding limitations of this review, self-report was commonly used in most of the included studies. This may of course lead to reporting bias [46]. Though most of the studies reported a calculated sample size for the study and conducted intention-to-treatment analysis, reluctance to be discharged or transferred was reported in five studies [16, 23, 25, 28, 29]. Reasons for the drop-out were as follows: (i) older patients were too ill to be transferred from the hospital; (ii) anxiety about returning home to cope with lingering physical and mental symptoms; (iii) the appointed step-down facilities were located far from the patients' caregivers.

The duration of the 30 interventions was relatively short, with only eight studies lasting for over 1 year [13, 25, 35, 41]. Short-term effects of interventions are primarily affected by the discharge process, while results after a longer intervention period are more likely to be due to events related to the quality of aftercare [47]. The inconsistent performance of managing discharge across different hospitals and different stage of aftercare may have influenced the precision of results.

Implications for policy and further research

In this systematic review, we found value in interventions where follow-up was conducted by a named primary healthcare professional who had information on a patient's previous clinical history [13, 16, 23–25, 28, 32, 33, 36, 39, 40]. This activity increased the willingness to be discharged and reduced readmission rates. As a part of longitudinal continuity of care, a positive and continuing relationship with primary healthcare providers enables details of a patient's medical history to contribute to continuity of care [48].

The ageing population has dramatically increased the burden of chronic diseases, and the proportion and the number of older patients requiring long-term care have increased in countries at all levels of development [49]. Therefore, evidence of integrating primary healthcare into aftercare is very important for delivering appropriate and cost-effective healthcare for older adults.

In addition, a number of studies show that interventions relate to reimbursement structure and lack financial compensation for providing transitional aftercare. Therefore, long-term economic evaluations with larger sample sizes are needed. In particular, one study in this review conducted the intervention in a private hospital. There is a need to analyse the effectiveness of this model in both public and private settings in the future.

Developing new models can introduce new risks of safety for integrating primary healthcare into aftercare, which need to be proactively identified [50]. Evidence from Rytter *et al.* [36] suggested that timely and close communication and coordination with primary healthcare providers and other professionals are an important solution to enhancing safety. Effective interventions need to be implemented following robust guidelines to ensure the quality of primary healthcare providers' services.

Conclusion

Transitional aftercare using primary healthcare was designed not only to improve the immediate transitions that older patients faced but also to provide them with knowledge and skills that could be applied to future health. Continuity of primary healthcare involvement in aftercare could be valuable for older adults' needs after discharge from acute care facilities and in reducing the burden of unplanned hospital utilisation.

Supplementary Data: Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

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Declaration of Conflicts of Interest: None.

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