

Supported transitional care applied to stroke survivors: A meta-analysis

Shuyin Liang^{1,A–F}, Huiling Xie^{2,B–F}, Lili Ye^{3,B–F}, Caifang Huang^{1,B–F}, Fengying Yuan^{1,B–F}, Yanping Tang^{4,B–F}

¹ Department of Neurovascular Center, Zhujiang Hospital of Southern Medical University, Guangzhou, China

² Department of Geriatric Medicine, Zhujiang Hospital of Southern Medical University, Guangzhou, China

³ Department of Day Treatment Center, Zhujiang Hospital of Southern Medical University, Guangzhou, China

⁴ Department of Nursing, Zhujiang Hospital of Southern Medical University, Guangzhou, China

A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;

D – writing the article; E – critical revision of the article; F – final approval of the article

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Address for correspondence

Shuyin Liang
E-mail: lsy0925@126.com

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Abstract

Background. This meta-analysis aims to assess the outcomes of supported intervention transitional care compared to traditional care for stroke survivors.

Materials and methods. A systematic literature review was accomplished and 4,437 stroke patients were recruited for the current study; 2,211 of them were treated with transitional care and 2,226 with traditional care. The inclusion criteria of the current study recruited only randomized clinical trials up until November 2023. A random analysis model was used to analyze the continuous and dichotomous models.

Results. Supported intervention transitional care (early supported discharge) for stroke survivors showed a significant ($p = 0.002$) impact regarding the functional status of patients as expressed by the Barthel index (mean difference (MD) = 0.57, 95% confidence interval (95% CI): 0.20–0.94, $I^2 = 93.72\%$). On the other hand, there were no considerable ($p > 0.05$) differences regarding other outcomes such as activities of daily living, the Caregiver Strain Index (CSI), the modified Rankin scale (mRS), and mortality (MD = 0.29, 95% CI: –0.12–0.69, $I^2 = 94.5\%$; MD = –0.13, 95% CI: –0.40–0.14, $I^2 = 68.65\%$; MD = –0.13, 95% CI: –0.49–0.23, $I^2 = 83.33\%$; and MD = –0.19, 95% CI: –0.58–0.17, $I^2 = 0\%$; respectively).

Conclusions. Supported transitional care allowed stroke survivors to succeed in enhancing their functional status outcomes compared with controls, while there was no significant impact regarding mortality rate. Further investigations and multicenter studies are required to enhance the evidence.

Key words: stroke, rehabilitation, transitional care, early supported discharge

Cite as

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Background

Individuals undergoing recovery after an acute stroke face considerable difficulties in independently managing the transition from hospital to home. The need for these interventions is due to the need to adapt to a change in one's health condition, a new diagnosis and the recognition of ongoing care requirements.¹ Upon discharge from the hospital, numerous stroke survivors require comprehensive and continuous rehabilitation and assistance to regain and develop skills and capacities, adjust to the limits resulting from the stroke, and address their emotional, social and practical needs both in the community and at home. Interventions to achieve these goals, like early supported discharge (ESD), provided to the stroke survivor during the transition to home from the hospital, decrease the duration of hospitalization in addition to reducing the healthcare costs of stroke care.²

The transition of care as an expression is intricate, difficult to define, and is frequently used in several studies and guidance interchangeably with other concepts such as care navigation, care coordination and care continuity. Transitional care includes both the medical component of transferring care and the needs of the stroke patient and their carer.³ The expression "transition of care" can be defined as a series of measures aimed at ensuring the coordination and continuousness of healthcare when patients move from one site to another or to different levels of care. Rehabilitation interventions during care transitions are recognized as crucial for coordinating care and have an impact on the quality of care and the occurrence of hazardous episodes.^{4,5}

Stroke survivors can be offered support interventions, such as educational programs and personalized discharge plans, as they move from organized stroke care to their homes. These interventions seek to promote the consistency and excellence of healthcare, improve functional results, decrease healthcare expenses, and enhance the overall user experience.⁶ Nevertheless, there is a dearth of understanding regarding effective support treatments to optimally handle transitions for this intricate health condition.

Assessment of the impact of transitional care can be evaluated using different parameters such as the Barthel index, activities of daily living, the Caregiver Strain Index (CSI), the modified Rankin scale (mRS), and mortality rate. The objective of these parameters is to assess the patient's ability to perform daily activities and the necessity of nursing care.

The national stroke recommendations of Canada,⁷ USA⁸ and Scotland⁹ utilize ESD as a rehabilitation technique for post-acute care. Early supported discharge is a crucial element of the stroke care system in the UK. The manuals clearly identify the target group, aim, scope, and methodology of ESD.^{10,11}

Objectives

The purpose of this study was to evaluate the effects of transitional care with supported intervention in comparison to traditional care when it is applied to stroke survivors in terms of functional status, physical activity and mortality.

Materials and methods

Study design

The epidemiological declaration¹² was the subject of the present meta-analysis, which encompassed studies that tracked a prearranged study technique.¹³ Data gathering and analysis of recruited studies were conducted using several scientific databases in accordance with the specified inclusion criteria. The study inclusion sequence is illustrated in Fig. 1.

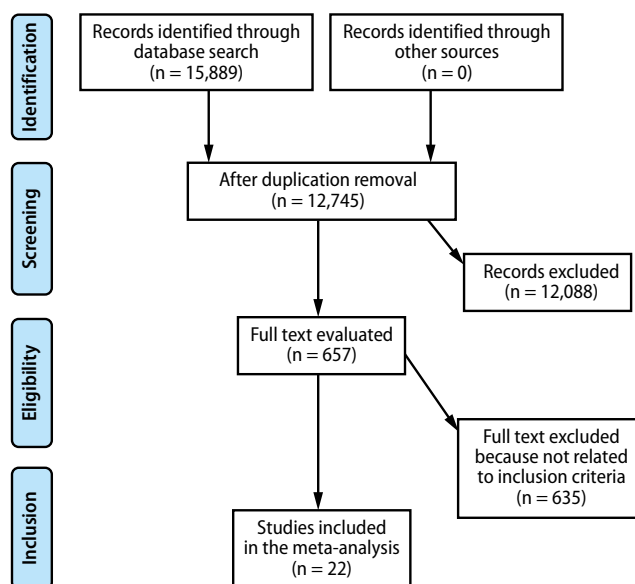


Fig. 1. Diagram representing the study inclusion procedure

Eligibility and inclusion

This study was conducted to assess the impact of assisted intervention transitional care compared to traditional care in individuals who have experienced a stroke. The sensitivity study exclusively encompassed publications that examined the impact of interventions on mortality rate, functional status, validity of daily activity, and the CSI score. To conduct subclass and sensitivity analyses, several patient types were compared to the medical intervention groups.

Inclusion criteria

1. The acceptable study design included in the current study is randomized clinical trials published before November 2023.
2. The study included patients who experienced a stroke (stroke survivors) and are receiving post-stroke care.
3. The design of the study method must be a comparison, comparing outcomes of 2 different interventions (supported transitional care compared to traditional care).

Exclusion criteria

1. Articles that did not present results of the comparison between different interventions in an acceptable form, such as interquartile ranges (IQRs) or medians. The results of different outcomes should be expressed in the form of a mean ($\pm$ standard deviation ($\pm$ SD)) or event/total.
2. Studies in the form of letters, review articles, books, or book chapters.

Identification

We carried out a search concerning papers published up until November 2023 using a combination of several keywords and comparable words for transitional care, rehabilitation, stroke, stroke survivors, supported early discharge, functional status, Barthel index, CSI, and supported nursing intervention.¹⁴ A protocol of our search strategies was defined in accordance with the PICOS principle as follows: P (population) – stroke survivors, I (intervention/exposure) – ESD care (supported transitional care), C (comparison) – transitional care compared to traditional care, O (outcome) – Barthel index, mortality, CSI, mRS, and activity of daily living, and S (study design) – randomized clinical studies (RCTs).

The authors performed a thorough search of the PubMed, Cochrane Library, Embase, Ovid, and Google Scholar databases until November 2023 using the keywords and related terms. Any article that did not discuss and evaluate the role of ESD compared to traditional care was disregarded after an evaluation of the titles and abstracts of the articles that had been collected into a reference managing program. Two authors served as reviewers to find pertinent studies.

Screening

The data were filtered based on specific criteria, including the first author's surname, publication year, country of study, study design, recruited population type, study duration, demographic information, clinical and treatment characteristics, total number of participants, standardized presentation of study-related features, information source, and outcome. Each study was assessed for potential bias, and the methodological quality of the chosen publications was analyzed independently by 2 authors in a blinded manner.

The presence of bias in each of the included studies was assessed using Review Manager v. 5.3 software (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark), and the findings were categorized into 3 levels: low, moderate or high potential for bias. Two of the authors conducted a methodological evaluation of each study.

Statistical analyses

The mean difference (MD) with a 95% confidence interval (95% CI) was calculated using random dichotomous (mortality rate) and continuous models (Barthel index, activities of daily living, mRS, and CSI).¹⁵ All p-values were calculated using 2-tailed tests. We used a random model based on the high level of differences between the included studies and the absence of high similarity regarding study parameters between all studies included for analysis of the model. The selection of the analysis model was determined after an accurate assessment of all included studies and comparisons of these papers to each other. According to the data, a random-effects model was fitted. Using a constrained maximum-likelihood estimator, the level of heterogeneity (Tau^2) was calculated. The I^2 index, which is a numerical number ranging from 0 to 100, was obtained using Jamovi software (<https://www.jamovi.org>). The heterogeneity level was shown with percentages ranging from 0% to 100%, and it was also expressed with percentages indicating low, moderate and high levels of heterogeneity. Begg's and Egger's tests were used to conduct quantitative research on publication bias, and the presence of publication bias was deemed to be present if the p-value was >0.05 .

Results

After reviewing 15,889 pertinent studies, 22 research papers meeting the inclusion criteria from the period of 1997 to 2022 were included in the meta-analysis.^{16–37} The results of these investigations are compiled in Table 1 (characteristics of included research including year, country, subject count, and study design).

Barthel index

A total of 13 studies were included in the analysis of the impact of intervention (transitional care) compared to control (traditional care) for stroke survivors. The analysis of this model showed a significantly ($p = 0.002$) higher impact of transitional care on functional status outcomes compared to the controls (MD = 0.57, 95% CI: 0.20–0.94, $I^2 = 93.72\%$). Both the Begg's and Egger's tests did not show significant evidence of publication bias, with p-values of 0.1289 and 0.1602, respectively (Fig. 2A). Subgroup analysis of these models consisted of 2 subgroups, 1st evaluating the impact of the interventions for up to 3 months (7 studies) and a 2nd subgroup evaluating the impact

Table 1. Characteristics of included studies

Study	Year	Country	Type of study	Intervention group	Control group	Total	Duration
Rudd et al. ¹⁶	1997	UK	RCT	167	164	331	up to 12 month
Andersen et al. ¹⁷	2002	Denmark	RCT	51	44	95	up to 6 months
Allen et al. ¹⁸	2002	USA	RCT	47	46	93	≤3 months
Clark et al. ¹⁹	2003	Australia	RCT	35	33	68	up to 6 months
Lincoln et al. ²⁰	2003	UK	RCT	126	124	250	up to 6 months
Askim et al. ²¹	2004	Norway	RCT	29	29	58	≤3 months
Boter ²²	2004	Netherlands	RCT	263	273	536	up to 6 months
Donnelly et al. ²³	2004	UK	RCT	51	46	97	up to 12 month
Fjaertoft et al. ²⁴	2003	Norway	RCT	160	160	320	up to 12 month
Mayo et al. ²⁵	2008	Canada	RCT	96	94	190	≤3 months
Allen et al. ²⁶	2009	USA	RCT	190	190	380	up to 6 months
Chalermwannapong et al. ²⁷	2010	Thailand	RCT	45	47	92	≤3 months
Hofstad et al. ²⁸	2014	Norway	RCT	104	99	203	up to 6 months
Wong and Yeung ²⁹	2015	China	RCT	54	54	108	≤3 months
Rasmussen et al. ³⁰	2016	Denmark	RCT	31	30	61	≤3 months
Santana et al. ³¹	2017	Portugal	RCT	95	95	190	up to 6 months
Geng et al. ³²	2019	China	quasi-randomization	30	30	60	up to 6 months
Rafsten et al. ³³	2019	Sweden	RCT	63	71	134	up to 12 month
Deng et al. ³⁴	2020	China	RCT	49	49	98	≤3 months
Duncan et al. ³⁵	2020	USA	RCT	407	430	837	4 months
Feng et al. ³⁶	2021	China	RCT	60	60	120	≤3 months
Wong et al. ³⁷	2022	China	RCT	58	58	116	≤3 months

RCT – randomized clinical trial.

of the interventions for up to 6 months. A total of 7 studies comparing the impact of transitional care intervention with a control for up to 90 days after stroke survival were included in the analysis. The finding of this analysis showed a significant difference ($p = 0.001$) between the intervention and control groups, reflecting a higher impact of transitional care ($MD = 0.90$, 95% CI: 0.35–1.46, $I^2 = 92.4\%$). Both the Begg's and Egger's tests did not show significant evidence of publication bias, with p -values of 0.56 and 0.52, respectively. (Fig. 2B). On the other hand, 6 studies were analyzed to evaluate the effects over a longer period (6 months). Findings of this model, in contrast with previous models, showed a nonsignificant ($p = 0.26$) impact between the intervention and control ($MD = 0.14$, 95% CI: -0.11 – 0.39 , $I^2 = 94.6\%$) (Fig. 2C). The Egger's test revealed the presence of funnel plot asymmetry ($p = 0.045$), whereas the Begg's test did not show any significant results ($p = 0.27$).

Activities of daily living

A total of 11 studies were included in the analysis of the impact of the intervention compared to controls on activities of daily living (ADL) for stroke survivors. The analysis of this model showed a nonsignificant ($p = 0.16$) impact of transitional care compared to controls

($MD = 0.29$, 95% CI: -0.12 – 0.69 , $I^2 = 94.5\%$) (Fig. 3). The Begg's test revealed significant funnel plot asymmetry ($p = 0.026$), whereas the Egger's test did not provide significant results ($p = 0.053$).

Modified Rankin scale

A total of 4 studies were included in the analysis of the impact of intervention compared to control on the mRS for stroke survivors. The analysis of this model showed a nonsignificant ($p = 0.47$) impact of transitional care compared to controls ($MD = -0.13$, 95% CI: -0.49 – 0.23 , $I^2 = 83.33\%$) (Fig. 4). Both the Begg's and Egger's tests did not show significant evidence of publication bias ($p = 0.33$ and $p = 0.11$, respectively).

Caregiver Strain Index

A total of 5 studies were included in the analysis of the impact of the intervention compared to controls on the CSI for stroke survivors. The analysis of this model showed a nonsignificant ($p = 0.33$) impact of transitional care compared to controls ($MD = -0.13$, 95% CI: -0.40 – 0.14 , $I^2 = 68.65\%$) (Fig. 5). Both the Begg's and Egger's tests showed no significant evidence of publication bias ($p = 0.82$ and $p = 0.60$, respectively).

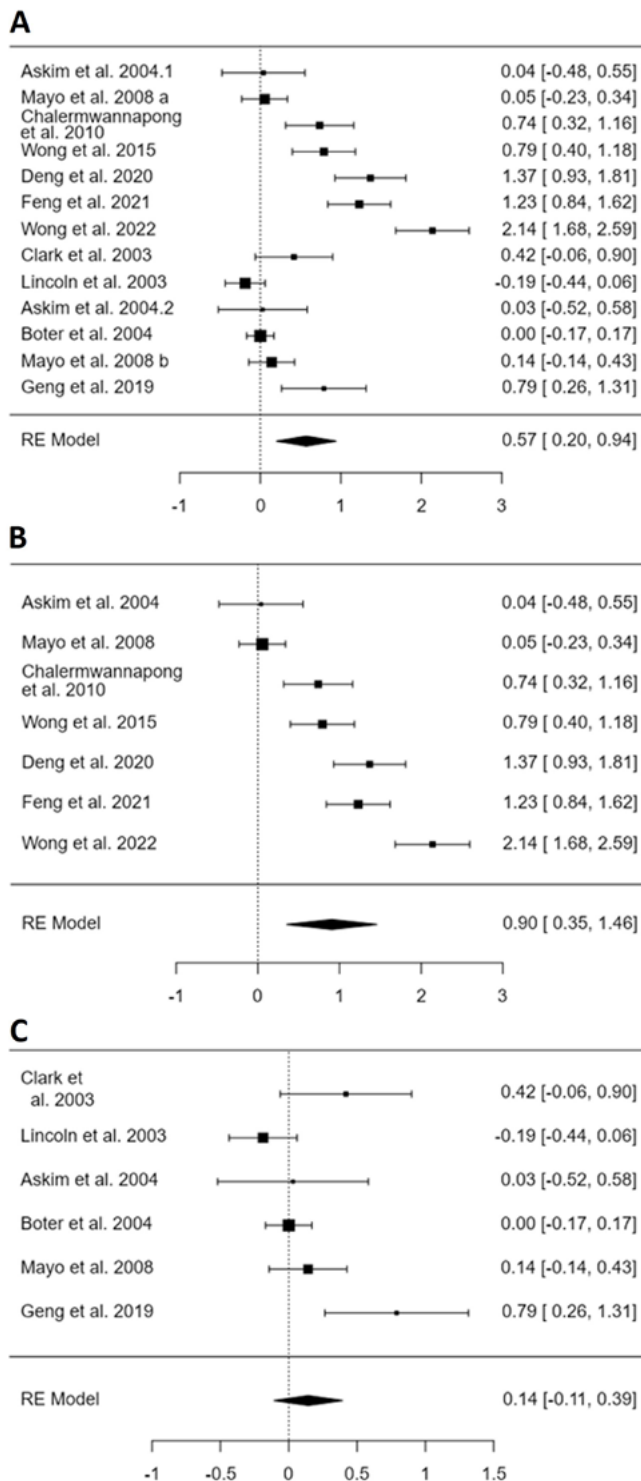


Fig. 2. Forest plot indicating the influence of supported transitional care on the Barthel index compared to controls for all studies (A), studies assessed after 3 months (B) and up to 6 months (C)

Mortality

A total of 8 studies were included in the analysis of the impact of the intervention compared to controls on the mortality rate of stroke survivors. The analysis of this model showed a nonsignificant ($p = 0.30$) impact of transitional care compared to control (MD = -0.19,

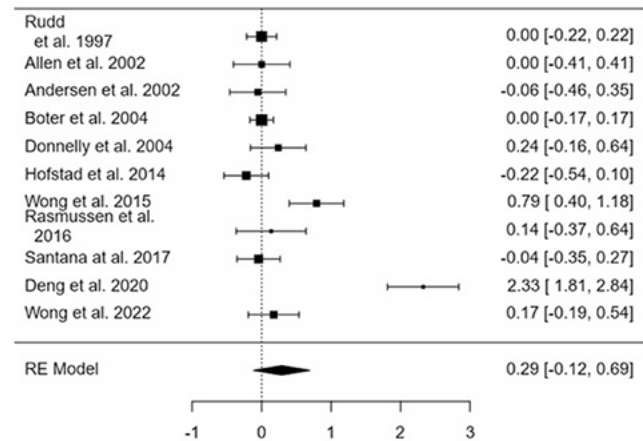


Fig. 3. Forest plot indicating the influence of supported transitional care on the activities of daily living compared to controls

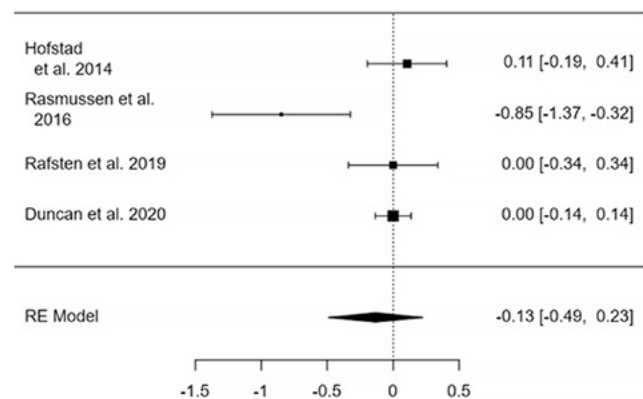


Fig. 4. Forest plot indicating the influence of supported transitional care on the modified Rankin scale compared to controls

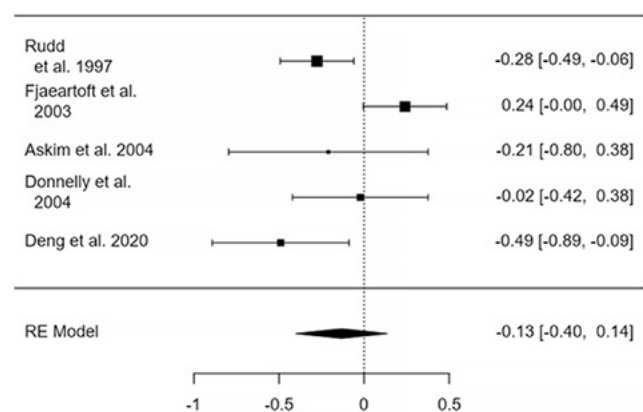


Fig. 5. Forest plot indicating the influence of supported transitional care on the Caregiver Strain Index compared to controls

95% CI: -0.58–0.17, $I^2 = 0\%$ (Fig. 6). Both the Begg's and Egger's tests did not show significant evidence of publication bias ($p = 0.27$ and $p = 0.47$, respectively).

However, the Begg's and Egger's tests determine publication bias statistically, but also visual evaluation of funnel plot symmetry provides supporting evidence. The funnel plots for 6 models showed a different degree of asymmetry (Supplementary Fig. 1), reflecting the presence

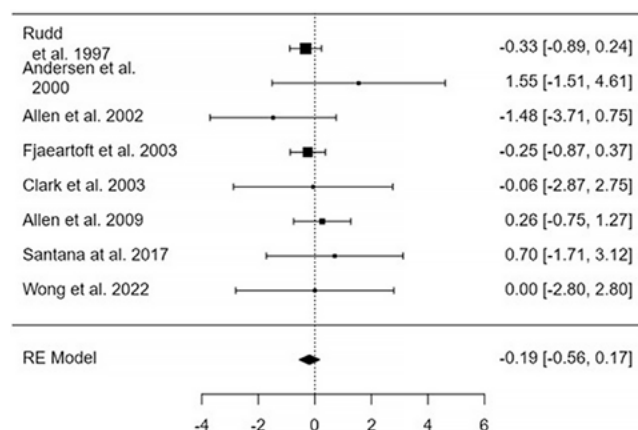


Fig. 6. Forest plot indicating the influence of supported transitional care on mortality rates compared to controls

of publication bias, while the funnel plot for the mortality rate model showed a higher degree of plot symmetry (Supplementary Fig. 2).

Discussion

Twenty-two randomized clinical trials published between 1997 to 2022 were included in the meta-analysis as they met the inclusion criteria.^{16–37} Interventions evaluated using the Barthel index, displaying a mean value of 0.57 and a 95% CI ranging from 0.20 to 0.94, demonstrated that transitional care, also known as ESD, had a substantial influence ($p = 0.002$) on the functional state of stroke survivors. However, it is worth mentioning that there were no noteworthy differences ($p < 0.05$) in relation to the other outcomes, including activities of daily living, mRS, CSI, and death.

Although there have been advancements in acute stroke care on a global scale, deficiencies are still observed in the process of reintegrating stroke patients into their communities and in their ability to manage their own care following a stroke.⁶ Our research indicates that interventions involving multiple components improve short-term functionality. Nevertheless, these interventions seem to have a diminished effect on functional status 6 months following the transition phase. Research indicates that it is challenging to maintain the results attained by self-management tactics. However, it has been found that increased self-efficacy plays a crucial role in the successful and long-lasting benefits of self-management programs.³⁸ This suggests that self-efficacy should be a deliberate goal of self-management programs. There is a need for a deeper comprehension of the tactics that promote long-term self-confidence. Contemporary research explains that healthcare practitioners and healthcare systems must go beyond traditional self-management strategies and customize self-management support to suit the unique needs of each individual, taking into account their life circumstances and the progression of their condition.³⁹

There are several scales to evaluate stroke and other critical care survivors, such as the Barthel index.⁴⁰ It gauges a person's ability to move around and operate independently in daily living tasks, including eating, washing, grooming, dressing, using the restroom, chair transfer, ambulating, and climbing stairs. The scale lists 10 tasks and assigns a grade based on how much time or help the patient needs. The total score ranges from 0 to 100, where lower numbers denote a higher degree of nursing need.⁴¹

A previous study conducted by Langhorne et al. resembled our study.² They carried out a systematic literature review and meta-analysis of 17 randomized controlled trials that involved a total of 2,422 patients. The study found that ESD shortened the duration of hospitalization by approx. 6 days and decreased long-term reliance on assistance for daily activities. Our investigation observed a limited number of instances where ESD resulted in notable disparities in the results. This can be linked to the uniform nature of therapies, which do not include patient-led, family-led or telerehabilitation methods. In contrast, Cochrane's study intentionally included a wide range of criteria for intervention. These disparities resulted in the deletion of several research studies, potentially leading to a decrease in the number of situations where ESD had a significant positive impact on the study results.² Langhorne et al. discovered that the implementation of an ESD program, which includes a multidisciplinary team of specialists, led to reduced long-term functional dependency and readmission rates in stroke patients. Furthermore, the duration of hospitalization was significantly shortened in comparison to the previous service.² Specifically, the overall mean duration of hospitalization decreased to 6 days, and the occurrence of adverse outcomes, such as mortality or readmission, decreased by around 5%. Previous studies did not find any significant variations in the reported outcomes. However, the cost of the ESD program was 15–23% lower compared to traditional treatment.¹⁰

In a comprehensive review of the extant literature on transitional management in Germany, Hempler et al. employed a systematic approach to identify and analyze the current research on this topic.⁴² The literature analysis included a total of 18 studies. However, all of these studies lacked sufficient quality regarding standardized transition management systems. The study findings suggested that Germany requires standardized discharge management services, such as ESD programs. However, countries other than Germany are making efforts to offer alternative services, and these services are gradually being implemented in Asian countries, as reflected by the growing demand for such services in, e.g., South Korea. In contrast to the review study conducted in Germany,⁴² our work holds significance as it involved 2 researchers who independently chose and assessed the papers for meta-analysis.

Limitations

There are a few limitations that apply to this review. In the first place, the quality of the trials, which are fraught with a high risk of bias, inconsistency and imprecision, limits the certainty of the findings. Additionally, there were not many studies that reported on outcomes such as cognition and exhaustion, both of which have the potential to significantly impact functional performance and are essential to stroke survivors. A considerable number of research studies on transitional care did not incorporate outcomes for caregivers, which can influence the utilization of resources and the costs incurred by the healthcare system. Furthermore, there was a limited amount of reporting of adverse occurrences.

Conclusions

The provision of supported transitional care to stroke survivors was found to be effective in enhancing functional status outcomes when compared with a control group. However, there was no discernible impact on mortality rates. To strengthen the evidence, additional research and studies involving multiple centers are required.

Supplementary data

The Supplementary materials are available at <https://doi.org/10.5281/zenodo.10843219>. The package includes the following files:

Supplementary Fig. 1. Funnel plots for assessment of publication bias regarding Barthel index compared to control for all studies (A), studies assessed after 3 months (B) and up to 6 months (C), the activity of daily living compared to control (D), mRS compared to control (E), and the CSI compared to control (F).

Supplementary Fig. 2. Funnel plots for assessment of publication bias regarding mortality rate.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

ORCID iDs

Shuyin Liang  <https://orcid.org/0009-0003-5365-1114>
 Huiling Xie  <https://orcid.org/0009-0009-6326-7259>
 Lili Ye  <https://orcid.org/0000-0002-4257-5561>
 Caifang Huang  <https://orcid.org/0009-0003-3332-8889>
 Fengying Yuan  <https://orcid.org/0009-0000-5846-2476>
 Yanping Tang  <https://orcid.org/0000-0003-1446-3199>

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