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Effectiveness of nurse-led care in patients with rheumatoid arthritis: a systematic review and meta-analysis

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ABSTRACT

Objectives This study sought to assess the effectiveness of nurse-led care (NLC) in patients with rheumatoid arthritis (RA).

Methods We conducted a comprehensive search of the Cochrane Library, Web of Science, PubMed, Embase, CINAHL, ClinicalTrials.gov databases and the references from relevant literature published prior to May 2023. Two independent reviewers assessed the studies using population/intervention/comparison/outcome/study criteria, and quantitative tools were used to gauge the methodological quality of the included studies. Independent quality assessments were carried out using the Cochrane Collaboration's risk-of-bias tool. Effect sizes were determined using mean difference (MD) or standardised mean difference (SMD) with corresponding 95% CIs.

Results Ultimately, 14 articles were included, encompassing a total of 3369 RA patients. NLC exhibited significant advantages in the primary outcome, disease activity (MD =−0.09, 95% CI (−0.17 to −0.01)), and the secondary outcome, self-efficacy (MD=0.40, 95% CI (0.03, 0.77)). In subgroup analysis, NLC was more effective in reducing disease activity compared with usual care (MD=−0.15, 95% CI (−0.26 to −0.04)), and there was no significant difference in disease activity reduction between NLC and rheumatologist-led care (MD=−0.02, 95% CI (−0.14, 0.10)). In terms of self-efficacy, no significant difference was observed between NLC and usual care (SMD=0.56, 95% CI (−0.09, 1.21)) or between NLC and rheumatologist-led care (SMD=0.20, 95% CI (−0.19, 0.59). When comparing other secondary outcomes (pain, satisfaction, quality of life, fatigue, stiffness, physical function and psychological status), the effectiveness of NLC for RA patients was similar to that of the control group, with no statistically significant differences.

Conclusions NLC proves highly effective in managing RA patients, surpassing usual care and equating to rheumatologist-led care in primary and some secondary outcomes. It may be feasible to allow nurses to participate in the disease management of some RA patients instead of doctors.

PROSPERO registration number CRD42022362071.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ This article provides a comprehensive evaluation of the effectiveness of nurse-led care (NLC) for patients with rheumatoid arthritis (RA).

WHAT THIS STUDY ADDS

⇒ This research compares NLC with routine nursing and physician-led nursing separately, enabling a detailed examination of the differences in outcomes.

⇒ The study employs a primary evaluation index along with seven secondary evaluation indicators, offering a thorough assessment of NLC's effectiveness for RA patients.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ It may be feasible to allow nurses to participate in the disease management of some RA patients instead of doctors.

INTRODUCTION

Rheumatoid arthritis (RA) is a persistent autoimmune disease.[1] Its clinical manifestations are mainly chronic joint pain, morning stiffness, fatigue, impaired quality of life and mostly involving small joints such as hands and feet.[2] According to reports, the global prevalence of RA varies from 0.39% to 0.54%,[3] with a yearly increase.[4] Following discharge, many patients exhibit limited disease awareness and poor self-compliance, significantly impacting their daily functioning.[5 6] As the disease progresses, joint dysfunction escalates, and pain becomes increasingly burdensome for both patients and their families.[7] The core objectives of RA treatment involve pain alleviation, prevention of joint damage and the preservation and enhancement of joint function.[8] Thus, in the nursing process of RA for a long time, scientific and comprehensive nursing is very important.[9]

Past studies have highlighted that most RA patient follow-up falls under the responsibility of physicians, which, in turn, escalates doctors' workloads.[10] Consequently, researchers have explored the potential of nurses in managing RA patients to alleviate the strain on rheumatologists. An increasing body of evidence suggests that nurse-led RA patient management programmes offer more holistic care, potentially preventing or delaying RA-related complications.[11–14]

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However, prior research has yielded conflicting results, impeding the broader implementation of nurse-led care (NLC). This study aims to conduct a meta-analysis to evaluate the effectiveness of NLC and alternative care options for RA patients, thus providing reliable practical guidelines based on the latest published evidence.

METHODS

The meta-analysis was registered on Prospero (CRD42022362071) and guided by the principles of a meta-analysis. We adopted the population/intervention/comparison/outcome/study framework for the study design. We defined NLC as the primary role of nurses in managing RA patients, involving tasks such as monitoring the patient's condition, tracking their blood results, providing continuous patient education and facilitating communication with physicians as needed.

Data sources and searches

From the inception of the database to May 2023, we conducted comprehensive searches in the Cochrane Library, Web of Science, PubMed, Embase, CINAHL and the ClinicalTrials database to identify all relevant RCT literature pertaining to the effectiveness of NLC for RA patients. We employed both 'AND' and 'OR' operators in conjunction with MeSH terms, specifically 'Arthritis, Rheumatoid' and 'Practice Patterns, Nurses', along with their Entry Terms, to maximise search sensitivity. Additionally, we manually reviewed the references cited in the selected literature and related topic reviews. In cases where test reports lacked detail or contained incomplete data, we sought to obtain additional information by contacting the authors via email to maximise the inclusiveness of the literature. The search details can be found in online supplemental file 1.

Study selection

Inclusion criteria: subjects (P): patients aged 18 years or older who met the 2010 American College of Rheumatology (ACR)/European League Against Rheumatism (EULAR) or 1987 ACR classification criteria.[15 16] Intervention (I): encompassing all types of NLC, including education, psychosocial support, counselling and briefings, as well as nurse follow-up of RA patients.[17] Control group (C): UC or RLC. Outcome indicators (O): the primary outcome was disease activity, measured as the Disease Activity Score (DAS)−28 with C-reactive protein (CRP) or erythrocyte sedimentation rate (ESR).[18 19] Secondary outcomes included physical function and psychological status (PFPS), morning stiffness, pain, patient satisfaction, quality of life, self-efficacy and fatigue. Study design (S): only literature in the form of RCTs.

Exclusion criteria: we excluded studies lacking full-text availability and those for which complete data could not be obtained despite author contact. Additionally, we excluded multiple studies conducted in the same centre with duplicate or erroneous data, as well as studies exclusively discussing a single treatment. Reviews, case reports, experimental protocols, animal experiments and non-clinical trials were also excluded.

Data extraction and quality assessment

Initially, two independent reviewers (LY and PX) screened the literature from the search results. For trials that posed difficulty in determining inclusion, discussions were held with other reviewers (DL and GFP) or were assessed by a third party. During the literature extraction process, we meticulously gathered the following crucial information: author of the literature, publication date, research location, patient count, disease incidence, intervention methods, control group specifications, measured indicators, follow-up duration and study design. All data were organised and imported into an Excel spreadsheet for subsequent analysis. We employed the quality assessment method recommended by the Cochrane Review Handbook 5.3 to evaluate the bias in randomised studies.[20]

Data synthesis and analysis

In our meta-analysis, Review Manager 5.3 software was used. We used the weighted mean difference (WMD) or the standardised mean difference (SMD) to calculate the point estimates and 95% CI for each effect size. Statistical significance was indicated when $p<0.05$. Heterogeneity among the results was evaluated using the χ^2 test and I^2 test, with low heterogeneity signified by $p>0.10$ or $I^2\leq 50\%$. High heterogeneity was considered when $p\leq 0.10$ or $I^2>50\%$. To further investigate the source of heterogeneity, subgroup analysis was conducted to compute combined statistics. If heterogeneity persisted even after these analyses, a random-effects model was employed for the meta-analysis. Sensitivity analysis was performed to ascertain result stability and reliability. To test for publication bias, the funnel plot in Review Manager 5.3 software was used.

Participants and public involvement

It's worth noting that the proposed study did not encompass the design, implementation, reporting, or dissemination of patient and public engagement programmes.

RESULTS

Searching process

A total of 566 articles were obtained in our search, including 540 retrieved articles and 26 acquired through other means. After eliminating duplicate articles, 260 remained. Subsequently, the abstracts and titles underwent screening, resulting in the exclusion of 168 articles in the preliminary phase. Following the full-text review, 14 studies[21–34] were retained for analysis. Figure 1 illustrates the selection process.

Characteristics of the studies included

This study encompassed 14 articles,[21–34] involving 3369 cases, with 1589 cases in the observation group and 1780 cases in the control group. To ensure comparability between the two groups, all literature underwent

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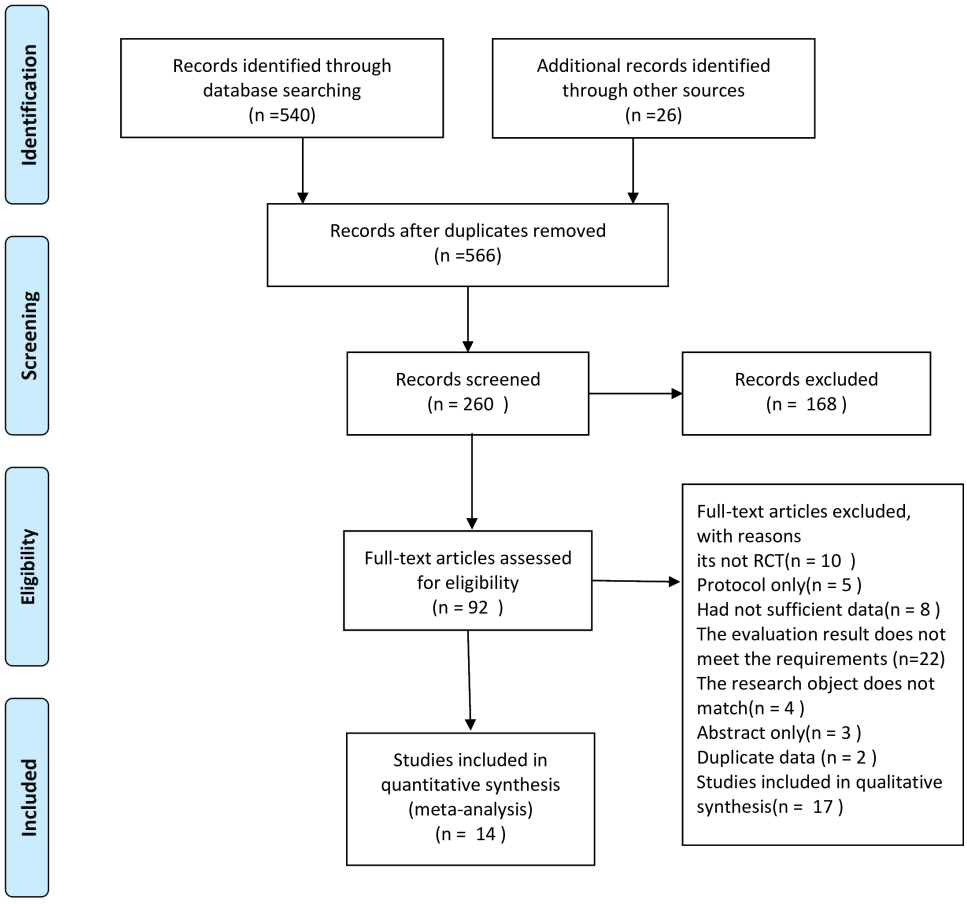


Figure 1 Flow diagram for searches.

baseline comparisons. Furthermore, each literature provided a comprehensive description of the implementation steps and specific interventions for NLC. For patient characteristics and baseline conditions, please refer to table 1. Among the 14 studies, four originated from the UK,[24 25 29 32] three from Denmark,[30 31 33] two from China,[27 34] and the remainder from the USA,[28] Switzerland,[21] Germany,[26] France[23] and South Korea.[22] NLC encompassed a range of interventions, including education, psychosocial support, counselling, briefings and nurse follow-up of RA outpatients in hospitals or clinics. These activities involved nurse consultations, joint tenderness and swelling assessments, blood sample evaluation and monitoring of medical treatment to assess patients' disease activity during consultations.

Literature quality evaluation and results of the publication-bias evaluation

Following the Cochrane Review Handbook 5.3 criteria,[20] we assessed the risk of bias in the 14 articles.[21–34] The specific bias risk assessment is shown in figure 2. The results indicated that ten articles[21–23 26 28–31 33 34] were of high quality, while the remaining four[24 25 27 32] were rated as medium quality. As demonstrated in figure 2, the studies varied in research quality. The overall risk of bias was low for two studies,[22 31] moderate for eight studies[21 23 26 28–30 33 34] and high for four studies.[24 25 27 32]

To evaluate potential publication bias, funnel plots were employed. Based on our observation of the funnel plot, it was determined that there is no substantial evidence of publication bias in this research (online supplemental file 2).

Meta-analysis results

Main results

Disease activity: a total of 12 articles[21–24 26 28–34] were included, evaluating disease activity in 2998 patients using the DAS28 CRP/ESR scale. Lower scores indicate lower disease activity.[35] Statistical heterogeneity was not apparent across the studies (p=0.34>0.10, I^2=10%). We applied the fixed-effect model to combine the effect sizes. In the NLC group, the statistical analysis revealed a lower DAS28 score compared with the control group [MD=−0.09, 95% CI (−0.17 to −0.01)], signifying a significant difference (p=0.03<0.05). However, due to significant differences in the control group's intervention measures and strong clinical heterogeneity, a subgroup analysis method was employed for statistics. Seven studies[21 23 24 28 31–33] explored the effects of NLC vs UC. According to the meta-analysis findings, there was a significant statistical difference between NLC and UC [MD=−0.15, 95% CI (−0.26 to −0.04), p=0.007<0.05], indicating that NLC was more effective in reducing disease activity compared with UC. In the case of seven studies[22 26 29–31 33 34] comparing NLC

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Table 1 Characteristics of included studies

Study ID	Type of study	Patients (N)	patient's condition	Interventions	Comparator	Outcomes	Outcome measures	Follow-up
Bergsten *et al*.[21] (2019) (Sweden)	RCT	70 (36/34)	Medium and severe	NLC	UC	Disease activity	DAS28	26 week
						PFPS	HAQ	
						QoL	EQ-5D	
						Satisfaction	Patient satisfaction	
Skovsgaard *et al*.[33] (2022) (Denmark)	RCT	294 (97/98/99)	Low disease activity or in remission	NLC	UC and RLC	Disease activity	DAS28	1 year
						QoL	EQ-5D	
Hoeper *et al*.[26] (2021) (Germany)	RCT	224 (111/113)	ACPA/RF-positive	NLC	RLC	Disease activity	DAS28	52 week
						Pain	RAID	
						Fatigue	RAID	
						Satisfaction	ZAP	
Liu *et al*.[27] (2020)(China)	RCT	88 (44/44)	Not mentioned	NLC	UC	Self-efficacy	ASES-8	8 weeks
						PFPS	HAQ	
Dougados *et al*.[23] (2015)(France)	RCT	970 (482/488)	Low disease activity	NLC	UC	Disease activity	DAS28	6 months.
						PFPS	HAQ	
Cho *et al*.[22] (2016) (Korea)	RCT	120 (60/60)	Not mentioned	NLC	RLC	Satisfaction	PSQ	2 years
						Disease activity	DAS28	
						PFPS	HAQ	
						QoL	EQ-5D	
Myasoedova *et al*.[28] (2019)(USA)	RCT	149 (74/75)	Not mentioned	NLC	UC	Disease activity	DAS28	24 months
Wang *et al*.[34] (2017) (China)	RCT	220 (110/110)	Stable	NLC	RLC	Satisfaction	LSQ	12 months
						Disease activity	DAS28	
Poggenborg *et al*.[30] (2021)(Denmark)	RCT	282 (140/142)	Not mentioned	NLC	RLC	Disease activity	DAS-28	2 years
						Pain	VAS	
						Fatigue	VAS	
						PFPS	HAQ	
						QoL	EQ-5D	

Continued

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Table 1 Continued

Study ID	Type of study	Patients (N)	patient's condition	Interventions	Comparator	Outcomes	Outcome measures	Follow-up
Ndos *et al*.[29] (2014) (UK)	RCT	181 (91/90)	ALL	NLC	RLC	Disease activity	DAS-28	12 months
						Pain	VAS	
						Fatigue	VAS	
						Morning stiffness	Minutes	
						Satisfaction	LSQ	
						PFPS	HAQ	
						Self-efficacy	ASES	
Hewlett *et al*.[24] (2019) (UK)	RCT	333 (175/158)	Not mentioned	NLC	UC	Disease activity	DAS-28	26 weeks
						Pain	NRS	
						Self-efficacy	RASE	
Primdahl *et al*.[31] (2012) (Denmark)	RCT	191 (94/97)	Low and moderate physical disability	NLC	UC and RLC	Disease activity	DAS28	12 months
						Pain	VAS	
						Fatigue	VAS	
						Self-efficacy	ASES	
						PFPS	HAQ	
Hill *et al*.[25] (2003) (UK)	RCT	80 (39/41)	ALL	NLC	RLC	Pain	AIMS	48 weeks
						Morning stiffness	Minutes	
						Fatigue	Minutes	
						Satisfaction	LSQ	
Ryan *et al*.[32] (2006) (UK)[32]	RCT	71 (36/35)	ALL	NLC	UC	Disease activity	DAS	12 months
						Pain	AIMS	

AIMS, Arthritis Impact Measurement Scale; ASES, Arthritis Self-Efficacy Scale; DAS28, Disease Activity Score-28; EQ-5D, European Quality of Life-5 dimensions; HAQ, Health Assessment Questionnaire; LSQ, Leeds Satisfaction Questionnaire; NLC, nurse-led care; NRS, Numerical Rating Scale; PFPS, Physical function and psychological status; PSQ, Patients' Satisfaction Questionnaire; QoL, quality of life; RAID, Rheumatoid Arthritis Impact of Disease; RASE, Rheumatoid Arthrolitis Self-Efficacy; RLC, rheumatologist-led care; UC, usual care; VAS, Visual Analogue Scale/Score; ZAP, 'Fragebogen zur Zufriedenheit in der ambulanten Versorgung', satisfaction about outpatient care.

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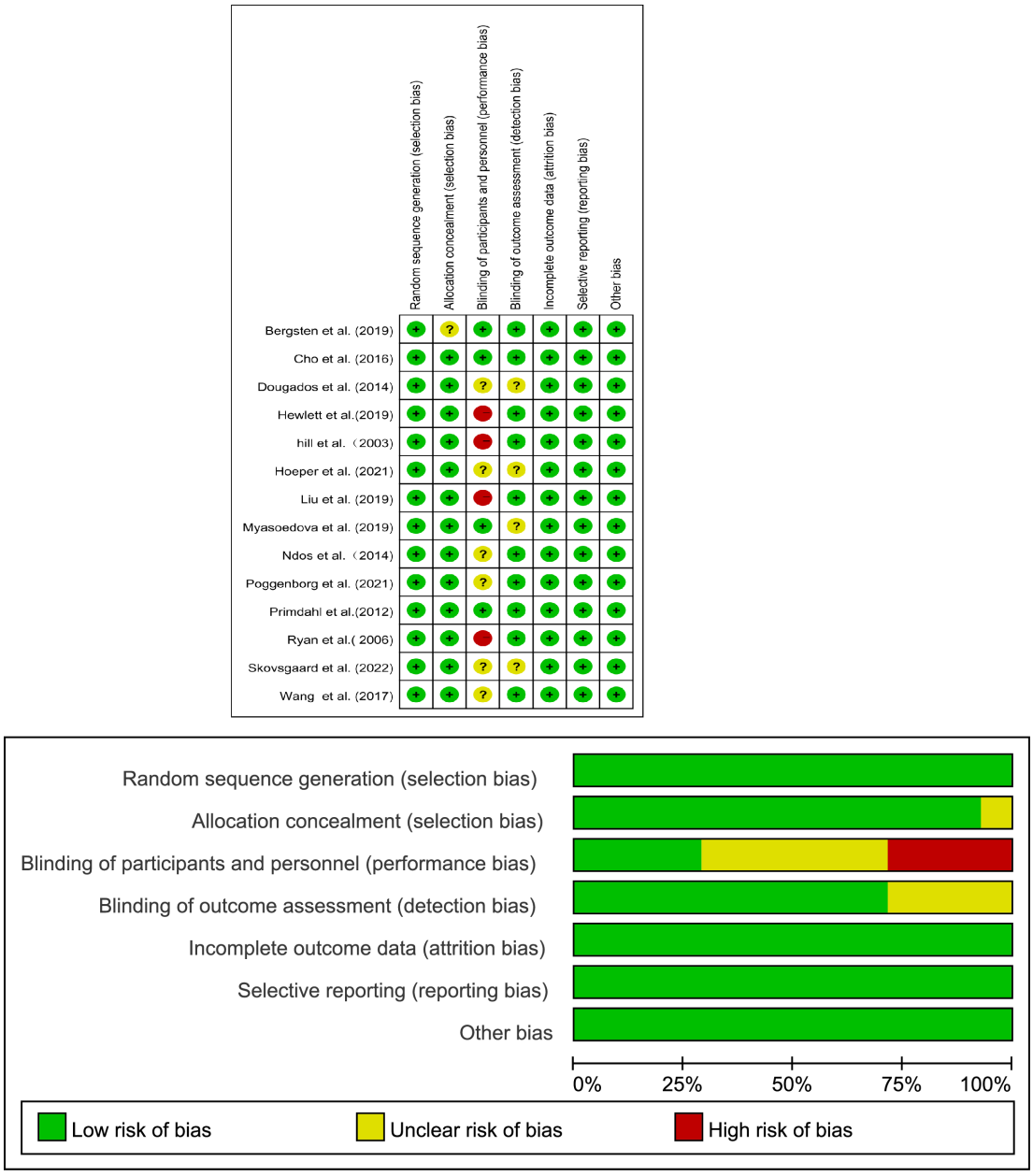


Figure 2 Risk-of-bias graph and risk-of-bias summary.

with RLC, the meta-analysis indicated that the two groups had a similar effect on reducing disease activity, with no statistical significance (p=0.33>0.05) (figure 3).

Secondary results

Self-efficacy: four studies[21 22 30 33] assessed the impact of NLC on the self-efficacy of RA patients using ASES and RASE scales. Higher scores on these scales indicate higher self-efficacy.[36] Statistically significant heterogeneity was observed among the studies (p<0.10, I^2=85%); thus, the random effect model was used to combine the effect size. The meta-analysis results for self-efficacy indicated that the intervention led to higher self-efficacy levels in RA patients compared with the control group, with a statistically significant difference [MD=0.40, 95% CI (0.03, 0.77), Z=2.12, p=0.03<0.05]. Due to the clinical heterogeneity in the study, subgroup analysis was conducted. The results from the meta-analysis demonstrated that self-efficacy increased to the same extent in NLC vs UC and NLC vs RLC groups. Therefore, the results were deemed unstable and require further data for validation (figure 4).

The common finding in the remaining six secondary results (pain, satisfaction, quality of life, fatigue, stiffness, physical function and psychological status) is that the level of improvement in NLC for RA patients is comparable to that observed in the control group, with no statistically significant distinction. Subgroup analysis was performed, and the results for NLC vs UC and NLC vs RLC groups remained consistent, demonstrating a high level of reliability. Detailed forest plots for these results can be found in online supplemental file 3.

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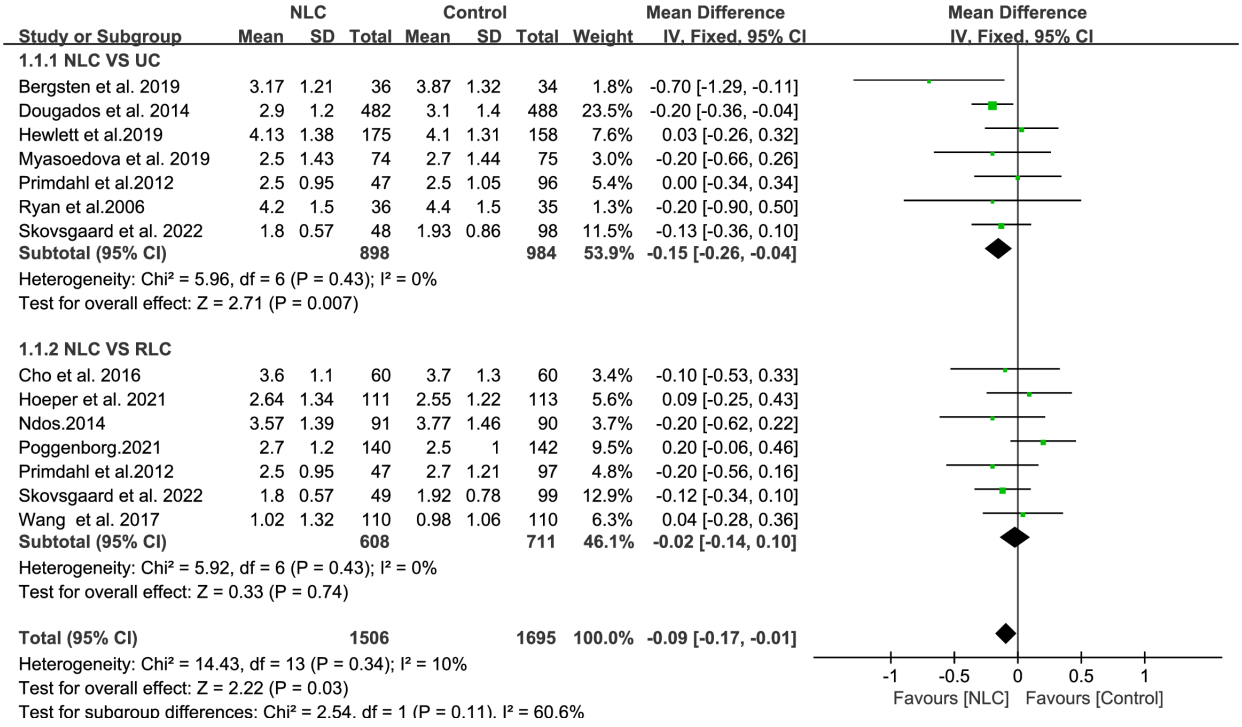


Figure 3 Forest plot of the disease activity.

Sensitivity analysis and heterogeneity analysis

For results exhibiting significant heterogeneity, we conducted sensitivity analysis by systematically excluding one literature at a time. The findings revealed that in most cases, the heterogeneity remained largely unchanged, and the meta-analysis results were not significantly affected. However, in the evaluation of fatigue, the exclusion of Hill *et al*[25] resulted in a substantial reduction in heterogeneity. Although I^2 decreased from 89% to 41%, the p value did not exhibit significant change. Therefore, the results are deemed robust and reliable. Given the clinical heterogeneity stemming from the diverse interventions in each control group, we opted for a subgroup analysis approach to address the issue of heterogeneity. We employed the random-effects model for analysis as statistical heterogeneity could not be further mitigated.

DISCUSSION

In recent years, due to longer life expectancies, the prevalence of RA has been increasing year by year.[37] This condition has emerged as the primary autoimmune rheumatic disease,[38] necessitating an augmented presence of healthcare professionals.[39] Although there have been notable improvements in current treatments, the demand for rheumatologists in many countries remains unmet, requiring greater cost-effectiveness,[40–43] As a result, alternative approaches to traditional RLC have been investigated.[44]

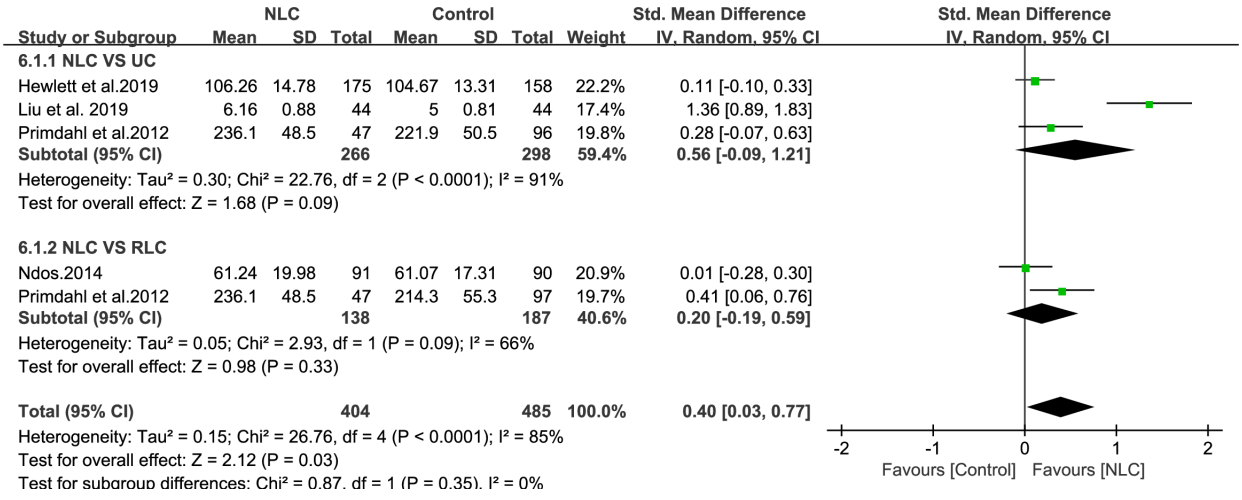


Figure 4 Forest plot of the Self-efficacy.

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NLC has shown enhanced patient compliance, more consistent follow-up and the capacity to offer serum chemistry monitoring and ongoing patient education.[45–51] This meta-analysis assesses the efficacy of various nurse-led interventions for RA patients, demonstrating that the implementation of NLC can ameliorate disease activity, pain levels, patient satisfaction, quality of life, fatigue, self-efficacy, stiffness and PFPS in RA patients. The studies included in this analysis represent different countries at various stages of development, encompassing both developed and developing nations, thus offering potentially global insights.

Disease activity stands as a primary parameter for evaluating the therapeutic impact of RA.[35] Our study indicates that NLC can effectively diminish the disease activity among RA patients, corroborating prior research findings.[52–55] Within our study, NLC outperformed the control group by reducing the DAS28 score, signifying its ability to lower disease activity in RA patients. Subgroup analysis further reveals that NLC yields results superior to UC in reducing DAS28 scores, though it is on par with RLC, demonstrating that NLC is a viable alternative to RLC.

Self-efficacy is an essential factor in assessing the therapeutic outcomes for RA, and it holds significance in our evaluation.[56] According to the findings from the meta-analysis, NLC demonstrated a higher improvement in the self-efficacy of RA patients compared with the control group, indicating its potential to enhance the self-efficacy of RA patients. However, subgroup analysis revealed that the increase in self-efficacy for NLC vs UC and NLC vs RLC was at a similar level. This suggests some instability in the results, necessitating additional data for more robust support.

The meta-analysis of secondary outcomes, including pain, satisfaction, quality of life, fatigue, stiffness, physical function and psychological status, showed no significant differences in the effectiveness of NLC when compared with the control group for individuals with RA. Subgroup analysis further indicated that the efficacy of NLC vs UC and NLC vs RLC in RA patients was comparable. In most cases, there was low heterogeneity, and the strength of the evidence significantly improved.

Limitations

The RLC interventions used in each individual study varied, and many of the included studies had small sample sizes and insufficient follow-up durations, which could reduce the credibility of the results and introduce bias. Additionally, the heterogeneity observed may be attributed to cultural and ethnic differences, which were significant in a small subset of the meta-analysis. The study duration ranged from 8 weeks to 24 months, and the disease severity among patients in different studies was not uniform.

CONCLUSION

NLC demonstrates a positive impact on the management of RA patients. When comparing NLC to UC, it exhibited a more pronounced effect on disease activity and self-efficacy, while the impact on other secondary outcomes was equivalent. When comparing NLC to RLC, no significant differences in the evaluation findings were observed. Consequently, NLC proves to be an effective approach in the nursing care of RA patients, with results comparable to those of RLC. Empowering nurses to engage in the management of certain RA patients, in lieu of doctors, is a feasible and beneficial strategy.

Contributors GP and LL designed this study. LY and PX worked independently by searching for titles and abstracts and evaluating the full text of eligible studies. DL and TW resolved their differences through discussion. LY conducted statistical data analysis and wrote manuscripts. DL and GP help to discuss and revise. LY and DL served as guarantors for the overall content. The final manuscript was reviewed and approved by all authors.

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Competing interests None declared.

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Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information. All the necessary data and supplementary information relevant to this study can be found in the article and Supplementary Material.

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