

Review Article

Comfort-oriented nursing interventions to improve quality of life in hemodialysis patients: A systematic review

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Abstract

Background: Patients undergoing hemodialysis frequently experience fatigue, pain, muscle cramps, and reduced functional capacity, which adversely affect their quality of life. Non-pharmacological nursing interventions using a comfort-oriented approach are believed to improve patients' physical comfort and functional status. However, the available recent evidence remains heterogeneous and has not been systematically synthesized.

Objective: This study aimed to review and synthesize recent evidence regarding the effectiveness of comfort-oriented nursing interventions in improving physical comfort, functional capacity, and quality of life among patients undergoing hemodialysis.

Methods: A systematic review was conducted by searching Scopus, PubMed, ScienceDirect, Google Scholar, and relevant research registries for studies published between 2020 and April 2026. Eligible studies included randomized controlled trials, quasi-experimental studies, observational studies, and qualitative studies reporting outcomes related to comfort, functional capacity, and quality of life among adult patients undergoing hemodialysis. Methodological quality was assessed using the Cochrane Risk of Bias Tool, Newcastle–Ottawa Scale, and Critical Appraisal Skills Programme checklists. Data were extracted and narratively synthesized to describe intervention effects, underlying mechanisms, and heterogeneity across the findings.

Results: Of the 801 records identified, 10 studies met the inclusion criteria. The interventions demonstrated improvements in physical comfort, muscle strength, mobility, and quality of life. Multicomponent and technology-based interventions also improved patient engagement, treatment adherence, and nutritional markers. Heterogeneity in study populations, intervention duration, and study designs affected the strength of the evidence. Nevertheless, consistent patterns indicated that nurse-delivered interventions provided beneficial outcomes within dialysis care settings.

Conclusion: Comfort-oriented nursing interventions appear to be safe, feasible, and effective in improving physical comfort, functional capacity, and quality of life among patients undergoing hemodialysis. The findings support the integration of physical exercise, relaxation techniques, and multicomponent strategies into routine dialysis nursing care.

Background

Chronic kidney disease (CKD) is a growing global health problem that frequently progresses to kidney failure requiring long-term kidney replacement therapy. According to the Global Kidney Health Atlas 2023, the median global prevalence of CKD is estimated at 9.5%, while more than 850 million people worldwide are living with kidney disease. These figures indicate that kidney disease affects more than one in every ten people globally (Global Kidney Health Atlas, 2023). The high prevalence of CKD is accompanied by substantial disparities in access to diagnosis, treatment, dialysis, and kidney transplantation, particularly in low- and middle-income countries.

Indonesia also faces a considerable burden of CKD and hemodialysis. The Basic Health Research survey reported that the prevalence of physician-diagnosed CKD among individuals aged ≥ 18 years increased from 0.2% in 2013 to 0.38%,

representing approximately 739,208 people, in 2018 (Ministry of Health of the Republic of Indonesia, 2018). Although the prevalence based on physician diagnosis appears lower than global estimates, this figure may not fully reflect the actual disease burden because early-stage CKD is often asymptomatic and can only be detected through kidney function testing. More recent data from the Indonesian Renal Registry showed that 60,526 new patients and 127,900 active patients with stage 5 CKD underwent hemodialysis in Indonesia in 2023. During the same year, the number of dialysis units increased from 1,103 in 2022 to 1,225 in 2023 (Indonesia Renal Registry, 2023). These data demonstrate that the demand for hemodialysis services and long-term care for patients with advanced CKD remains high in Indonesia.

Hemodialysis is an essential life-sustaining therapy for patients with kidney failure; however, it imposes substantial physical and psychological

burdens. Patients undergoing hemodialysis commonly experience fatigue, muscle weakness, sleep disturbances, muscle cramps, depression, and reduced functional capacity, all of which significantly impair their quality of life (Sovatzidis et al., 2020). These burdens are exacerbated by chronic inflammation, oxidative stress, metabolic dysfunction, and sedentary behavior during dialysis sessions, which contribute to the progressive deterioration of functional status (Villar et al., 2020). Data from the Indonesian Renal Registry also indicate that hypotension, hypertension, headache, and muscle cramps are among the events reported during hemodialysis in Indonesia. Therefore, patient management should not focus solely on dialysis adequacy and clinical stability (Indonesia Renal Registry, 2023).

Conventional management strategies that rely primarily on pharmacological therapy often provide incomplete benefits and may cause additional adverse effects. This limitation has increased interest in non-pharmacological interventions as relatively low-risk complementary modalities that may address patients' multidimensional needs. Several techniques, including warm-water foot bathing and massage, have been shown to improve sleep quality and reduce insomnia among patients undergoing hemodialysis (Afrasiabifar et al., 2022). Intradialytic aerobic exercise, resistance training, stretching, and multimodal programs may also improve functional capacity, muscle strength, nutritional status indicators, and quality of life. Structured breathing exercises may further reduce depression and improve patients' emotional well-being (Liu et al., 2024).

In this review, the term nursing intervention was not determined solely by the type of intervention. Exercise, stretching, thermotherapy, massage, breathing exercises, technology-based interventions, and support groups were not automatically classified as nursing interventions. An intervention was categorized as a nursing intervention when it was initiated, planned, delivered, led, supervised, or coordinated by nurses as part of the nursing care process. The intervention was also required to involve an identifiable nursing role, such as assessing patients' needs, determining intervention eligibility and safety, providing education, delivering or facilitating the intervention, monitoring patient responses, evaluating outcomes, and conducting follow-up.

Under this definition, physical exercise was considered a nursing intervention when nurses

had an active role in patient assessment, instruction, supervision, tolerance monitoring, or evaluation of exercise outcomes. Technology-based interventions were classified as nursing interventions when technology was used as a medium for nurse-managed education, monitoring, counselling, or follow-up. Support groups were similarly categorized as nursing interventions when they were led or facilitated by nurses according to clearly defined nursing objectives and protocols. In contrast, interventions delivered entirely by physicians, physiotherapists, psychologists, exercise instructors, or automated digital systems without identifiable nursing involvement were not classified as nursing interventions. This distinction was necessary to prevent the inappropriate attribution of interventions to nursing practice.

Although findings regarding non-pharmacological interventions are promising, the available evidence remains heterogeneous. Substantial variation exists in intervention type, duration, frequency, intensity, provider, timing, and the instruments used to measure outcomes. Several previous systematic reviews have evaluated the effects of intradialytic exercise, massage, and other non-pharmacological interventions among patients undergoing hemodialysis. However, most reviews have focused primarily on physical or metabolic outcomes and have not comprehensively examined comfort, psychosocial well-being, patient experience, or patient satisfaction. Differences in methodologies, populations, care settings, and intervention characteristics have also limited the consistency of findings across studies.

Furthermore, some previous reviews did not distinguish interventions that were genuinely led or delivered by nurses from those that were merely conducted in healthcare settings. Several reviews also inadequately represented Asian populations, thereby limiting the applicability of their findings to the social, cultural, and hemodialysis care contexts of Asian countries. Previous reviews have generally examined intradialytic exercise or massage separately without integrating diverse non-pharmacological approaches, including exercise, stretching, thermotherapy, massage, and breathing exercises, within a single nursing framework oriented toward patient comfort. Consequently, an evidence gap remains regarding the effectiveness of multidimensional, nursing-based non-pharmacological interventions in improving comfort, functional capacity, psychosocial well-

being, and quality of life among patients undergoing hemodialysis.

This evidence gap indicates the need for a systematic review that specifically examines non-pharmacological interventions with clearly identifiable nursing involvement and comfort-oriented outcomes. The PICO framework for this review was defined as follows: Population, adults with CKD undergoing hemodialysis; Intervention, non-pharmacological interventions led, delivered, supervised, or coordinated by nurses, including exercise, stretching, thermotherapy, massage, and breathing exercises; Comparison, usual care, an active control intervention, or no additional intervention; and Outcomes, quality of life, comfort, functional capacity, and psychosocial well-being. This framework enabled the study selection process to distinguish nursing interventions from multidisciplinary interventions or interventions delivered by other healthcare professionals without an identifiable nursing component.

The importance of this review is also supported by the physical, psychological, and social burdens experienced by patients during dialysis, which are often inadequately addressed through conventional approaches. Interventions that emphasize comfort and patients' multidimensional needs may reduce symptom burden, improve patient engagement and treatment adherence, and enhance quality of life (Sharifian et al., 2023). A systematic synthesis of the evidence is therefore necessary to identify the most effective interventions, determine safe and feasible implementation characteristics, clarify the specific roles of nurses, and identify the outcomes most relevant to patients.

The primary objective of this systematic review was to evaluate and synthesize current evidence regarding the effectiveness of nursing-based non-pharmacological interventions in improving comfort, functional capacity, psychosocial well-being, and quality of life among patients undergoing hemodialysis. The review also aimed to compare the characteristics of different interventions, identify nurses' roles in intervention delivery, assess the heterogeneity of the available evidence, and identify gaps that have not been addressed in previous reviews. Overall, the findings are expected to provide more specific clinical recommendations for nurses and multidisciplinary teams and to support the development of holistic interventions centred on the physical and psychosocial needs of patients undergoing hemodialysis.

Methods

Study Design

This study employed a systematic review design with narrative synthesis to evaluate evidence on comfort-oriented, non-pharmacological nursing interventions for adults undergoing hemodialysis. Narrative synthesis was selected because the included studies varied considerably in their research designs, intervention types, duration, intensity, measurement instruments, and reported outcomes. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.

Research Question

The review addressed the following research question: *What are the effects of nurse-led or nurse-supported, comfort-oriented non-pharmacological interventions on physical comfort, symptom burden, functional capacity, psychosocial well-being, and quality of life among adults undergoing hemodialysis?*

The research question was developed using the Population, Intervention, Comparison, and Outcome framework. The population consisted of adults undergoing maintenance hemodialysis. The interventions included non-pharmacological approaches delivered, led, supervised, or coordinated by nurses. Comparators included usual care, active control interventions, or no additional intervention. The primary outcomes included physical comfort, symptom burden, functional capacity, psychosocial well-being, and quality of life.

Inclusion and Exclusion Criteria

Studies were included when they met the following criteria: they were published in English or Indonesian between January 2020 and April 2026; were available as full-text articles; involved adults aged 18 years or older undergoing maintenance hemodialysis; evaluated a non-pharmacological intervention that was led or supported by nurses; and reported at least one outcome related to physical comfort, symptom burden, functional capacity, psychosocial well-being, or quality of life. Eligible research designs included randomized controlled trials, quasi-experimental studies, and analytical observational studies.

Studies involving participants with comorbidities, such as hypertension, heart failure, or pulmonary hypertension, were eligible only when all participants underwent hemodialysis or when data for the hemodialysis subgroup could be extracted separately. Studies involving children, patients receiving peritoneal dialysis, non-hemodialysis populations, or participants with physical disabilities without confirmed hemodialysis status were excluded. Case reports, editorials, commentaries, study protocols without results, review articles without primary data, and studies evaluating pharmacological interventions alone were also excluded.

An intervention was classified as nurse-led when nurses had the principal role in planning, delivering, monitoring, and evaluating the intervention. An intervention was classified as nurse-supported when it was delivered through a multidisciplinary approach but included an identifiable nursing role, such as patient assessment, education, supervision, safety monitoring, counselling, outcome evaluation, or follow-up. The implementation of an intervention in a hemodialysis unit alone was not considered sufficient for its classification as a nursing intervention.

Search Strategy

A comprehensive literature search was conducted in Scopus, PubMed, ScienceDirect, Google Scholar, and relevant research registries. Search terms were developed around four main concepts: hemodialysis, nursing involvement, non-pharmacological interventions, and patient outcomes. Synonymous terms were combined using the Boolean operator OR, whereas concept groups were combined using AND.

The principal search string was as follows: ("hemodialysis" OR "haemodialysis" OR "maintenance hemodialysis") AND ("nursing intervention" OR "nurse-led" OR "nurse-supported") AND ("exercise" OR "stretching" OR "massage" OR "thermotherapy" OR "breathing exercise" OR "non-pharmacological intervention") AND ("comfort" OR "quality of life" OR "functional capacity" OR "fatigue" OR "sleep" OR "pain")

The search syntax was adapted to the indexing requirements of each database. Searches were restricted to studies published between January 2020 and April 2026 in English or Indonesian.

Reference lists of potentially eligible studies were also examined to identify additional relevant publications.

Study Selection Process

The database and registry searches identified 801 records, comprising 290 records from Scopus, 460 from ScienceDirect and Google Scholar, 33 from PubMed, and 18 from research registries. A total of 345 records were removed before screening because of duplication or other documented reasons. The titles and abstracts of the remaining 456 records were screened against the predefined eligibility criteria.

A total of 414 records were excluded because their populations, interventions, topics, or study designs did not meet the eligibility requirements. Full-text retrieval was attempted for 42 reports, of which 30 could not be obtained. Twelve full-text articles were assessed for eligibility, and two were excluded because their populations or interventions did not meet the inclusion criteria. Consequently, 10 studies were included in the final narrative synthesis (See Figure 1).

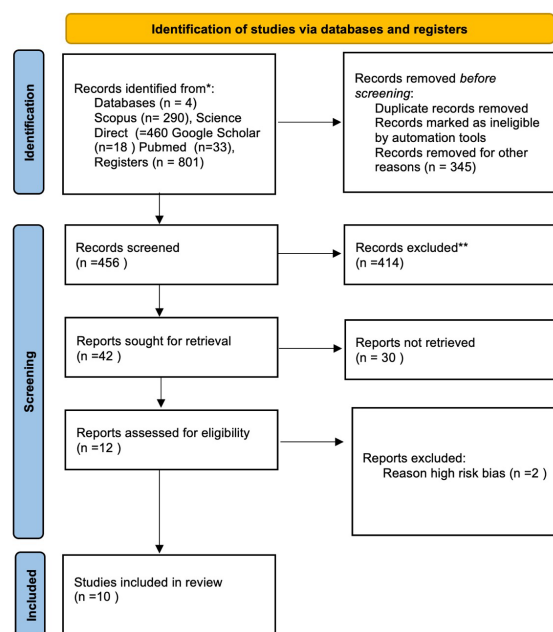


Figure 1. PRISMA Flow Chart

Two reviewers independently conducted the title and abstract screening and full-text eligibility assessment. Any disagreements were resolved through discussion and consensus. A third reviewer was consulted when consensus could not be reached. Reasons for full-text exclusion were

documented and reported in the PRISMA 2020 flow diagram.

Quality Appraisal

The methodological quality and risk of bias of the included studies were assessed according to study design. Randomized controlled trials were evaluated using the Cochrane Risk of Bias 2 tool. Quasi-experimental and non-randomized intervention studies were assessed using the Risk of Bias in Non-randomized Studies of Interventions tool. Observational studies were evaluated using the Newcastle–Ottawa Scale.

Two reviewers independently performed the quality appraisal. Disagreements were resolved through discussion or consultation with a third reviewer. Studies were not automatically excluded solely because they were judged to have a high risk of bias. Instead, appraisal findings were considered when interpreting the direction, consistency, and certainty of the evidence.

Data Extraction and Synthesis

Data were extracted using a standardized form developed for this review. The extracted information included the authors, publication year, country, study design, sample size, participant characteristics, intervention type, duration and frequency of the intervention, form of nursing involvement, comparator, outcome variables, measurement instruments, and principal findings.

The extracted data were synthesized descriptively and narratively according to intervention characteristics and outcome domains. The outcome domains included physical comfort and

symptom burden, functional capacity, psychosocial well-being, and quality of life. Differences in study design, participant characteristics, intervention intensity and duration, measurement instruments, direction of effect, and methodological quality were considered during the interpretation of findings.

Results

The 10 included studies were published between 2020 and 2026 and involved a total of 922 patients undergoing hemodialysis. The studies were conducted in China, Iran, Türkiye, and Egypt. Six studies used randomized controlled trial designs, one used a quasi-experimental design, two used prospective observational or pretest–posttest designs, and one used a retrospective comparative design.

The sample sizes ranged from 45 to 188 participants. Intervention duration varied from brief interventions conducted during individual hemodialysis sessions to structured programs lasting up to six months. The interventions included comfort-oriented nursing care, self-management programs, structured home visits, health ecology-based nursing, sleep education and relaxation, patient-selected music, intradialytic stretching, psychological and educational support, periodic nursing interventions, and stress-ball exercises.

The outcomes assessed across the studies included quality of life, self-care ability, treatment adherence, symptom burden, sleep quality, pain, muscle cramps, psychological distress, comfort, complication rates, biochemical indicators, and health-promoting behaviors (See Table 1).

Table 1. Characteristics and Findings of the Included Studies

Author, Year, Country	Study Aim	Design and Sample	Intervention Focus	Primary Outcomes	Main Findings
Li et al. (2024), China	To evaluate the effects of the Clark Comfort Nursing approach on self-care ability, perceived burden, treatment adherence, quality of life, and complications among patients undergoing hemodialysis.	Randomized controlled trial; 82 patients with kidney failure undergoing hemodialysis, including an intervention group (n = 41) and a control group (n = 41).	A three-month Clark Comfort Nursing intervention addressing physical, psychological, social, and spiritual comfort, together with education and nurse-led monitoring.	Quality of life measured using the SF-36, self-care ability, perceived burden, treatment adherence, and complications.	The intervention group demonstrated improvements in self-care ability, adherence, and all quality-of-life dimensions. Perceived burden decreased, and the complication rate was lower in the intervention group than in the control group, at 9.76% and 29.27%, respectively.
Keivan et al. (2023), Iran	To determine the effect of a self-management program based on	Randomized clinical trial; 60 patients, with 30 participants assigned to each	The 5A nursing model—assess, advise, agree, assist, and arrange—	Quality of life measured using the Kidney Disease	The intervention improved overall quality of life and several domains, including

Author, Year, Country	Study Aim	Design and Sample	Intervention Focus	Primary Outcomes	Main Findings
	the 5A nursing model on the quality of life of patients undergoing hemodialysis.	intervention and control group.	delivered through face-to-face meetings, telephone calls, and text messages over three months.	Quality of Life–Short Form.	cognitive function, symptoms, sleep, social support, dialysis-related problems, and complications of kidney disease, compared with routine care.
Pooresmaei et al. (2023), Iran	To evaluate the effects of a nurse-led structured home-visiting program on quality of life and treatment adherence among patients undergoing hemodialysis.	Quasi-experimental study; 62 patients, including an intervention group (n = 31) and a control group (n = 31).	A five-stage home-visiting program planned and delivered by nurses over three months.	Quality of life measured using the KDQOL-SF and treatment adherence measured using the End-Stage Renal Disease Adherence Questionnaire.	Quality of life and treatment adherence improved significantly in the intervention group. The improvements were significantly greater than those in the control group (p < 0.001).
Shu et al. (2025), China	To evaluate the effects of a nursing intervention based on the health ecology model on the quality of life of patients receiving maintenance hemodialysis.	Prospective randomized controlled trial; 188 patients assigned to intervention and control groups.	A six-month health ecology-based nursing intervention addressing health behavior, social support, digital health literacy, and management of the patient's environment.	Quality of life measured using the SF-36.	The intervention group demonstrated better quality of life, health-promoting behaviors, social support, and digital health literacy. Adherence to calcium, phosphorus, and potassium management was also better than in the control group.
Tao et al. (2024), China	To evaluate the effects of a structured nursing intervention program on sleep quality among middle-aged and older patients undergoing hemodialysis.	Observational pretest–posttest study; 105 patients aged ≥45 years.	A 12-week program involving sleep-hygiene education, relaxation techniques, and nurse-led counselling.	Sleep quality measured using the Pittsburgh Sleep Quality Index.	Poor sleep quality was identified in 68.6% of the patients. Following the intervention, the mean PSQI score decreased from 8.9 ± 3.2 to 5.1 ± 2.7 (p < 0.001), indicating improved sleep quality.
Sayilan et al. (2026), Türkiye	To evaluate the effects of patient-selected music on arteriovenous fistula cannulation pain and comfort among patients undergoing hemodialysis.	Single-blind randomized controlled trial; 60 patients, including an intervention group (n = 30) and a control group (n = 30).	Patients listened to music of their choice for approximately six minutes before fistula cannulation during 12 hemodialysis sessions.	Pain measured using a Visual Analogue Scale and comfort measured using the Hemodialysis Comfort Scale.	The music group had higher comfort scores and lower pain scores than the control group. Pain reduction was particularly evident during the sixth and twelfth sessions (p < 0.001).
Shehata et al. (2026), Egypt	To evaluate the effectiveness of nurse-led intradialytic stretching exercises in reducing muscle-cramp burden among patients undergoing maintenance hemodialysis.	Parallel-group randomized controlled trial; 60 patients, including a stretching group (n = 30) and a usual-care group (n = 30).	Nurse-supervised lower-extremity stretching exercises conducted twice weekly for approximately eight weeks.	Muscle-cramp intensity following the intervention.	A total of 83.3% of participants in the intervention group no longer experienced muscle cramps, compared with 30% in the control group (p < 0.001). Cramp frequency, duration, pain, and discomfort also decreased, with no serious adverse events reported.
Zhang et al. (2021), China	To evaluate the effects of a refined nursing intervention on the psychological condition of patients undergoing hemodialysis during the COVID-19 pandemic.	Prospective cohort study with pretest–posttest measurements; 172 patients receiving maintenance hemodialysis.	Psychological assessment, health education, emotional support, infection prevention, dietary management, and monitoring before, during, and after dialysis.	Psychological symptoms measured using the Symptom Checklist-90, particularly anxiety and depression.	Depression and anxiety scores decreased significantly following the intervention. The intervention also strengthened nurse–patient relationships and reduced complications, although quality of life was not assessed using a specific instrument.

Author, Year, Country	Study Aim	Design and Sample	Intervention Focus	Primary Outcomes	Main Findings
Wang et al. (2024), China	To evaluate the effects of periodic nursing interventions on treatment adherence and health status among patients receiving long-term hemodialysis.	Retrospective comparative study; 88 patients, including an intervention group (n = 44) and a control group (n = 44).	A nursing intervention based on stages of behavioral change, including education, counselling, periodic monitoring, psychological support, dietary guidance, physical activity, telephone follow-up, and home visits.	Treatment adherence, kidney-function indicators, complications, anxiety, and depression.	The intervention group demonstrated better adherence, lower blood urea nitrogen and creatinine levels, and fewer complications. Complication rates were 11.36% in the intervention group and 29.54% in the control group. Anxiety and depression scores were also lower following the intervention.
Kasar et al. (2020), Türkiye	To evaluate the effects of stress-ball exercises on stress, vital signs, and comfort among patients undergoing hemodialysis.	Randomized controlled trial; 45 patients, including an intervention group (n = 23) and a control group (n = 22).	Participants squeezed a stress ball for 10–15 minutes during eight consecutive hemodialysis sessions.	Stress, vital signs, and comfort measured using the Hemodialysis Comfort Scale.	Stress levels decreased significantly in the intervention group, whereas they increased in the control group. However, no significant between-group differences were found in vital signs or overall comfort levels.

Effects on Quality of Life and Self-Management

Li et al. (2024) evaluated the Clark Comfort Nursing approach among 82 patients with kidney failure undergoing hemodialysis. The three-month intervention addressed physical, psychological, social, and spiritual comfort and included education and continuous nursing monitoring. Patients in the intervention group demonstrated improved self-care ability, treatment adherence, and all dimensions of quality of life. Their perceived burden also decreased, and the complication rate was lower in the intervention group than in the control group, at 9.76% and 29.27%, respectively.

Keivan et al. (2023) examined a self-management program based on the 5A nursing model among 60 patients. The intervention incorporated the stages of assess, advise, agree, assist, and arrange through face-to-face meetings, telephone calls, and text messages over three months. The program significantly improved overall quality of life and several specific domains, including cognitive function, symptoms, sleep, social support, dialysis-related problems, and complications associated with kidney disease.

Pooresmaeil et al. (2023) evaluated a nurse-led structured home-visiting program among 62 patients undergoing hemodialysis. The program was delivered through five structured stages over three months. Quality of life and treatment adherence increased significantly in the

intervention group, with greater improvements than those observed in the control group ($p < 0.001$).

Shu et al. (2025) investigated a nursing intervention based on the health ecology model among 188 patients receiving maintenance hemodialysis. The six-month intervention addressed health behaviors, social support, digital health literacy, and the patient's living environment. Patients in the intervention group reported higher quality of life, stronger health-promoting behaviors, greater social support, and better digital health literacy. They also demonstrated better adherence to calcium, phosphorus, and potassium management than patients receiving routine care.

Effects on Physical Comfort and Symptom Burden

Tao et al. (2024) assessed a 12-week structured nursing intervention for middle-aged and older adults undergoing hemodialysis. The intervention included sleep-hygiene education, relaxation techniques, and nurse-led counselling. Before the intervention, 68.6% of participants had poor sleep quality. The mean Pittsburgh Sleep Quality Index score decreased from 8.9 ± 3.2 to 5.1 ± 2.7 following the intervention ($p < 0.001$), indicating a significant improvement in sleep quality.

A randomized controlled trial conducted in Türkiye evaluated the effect of patient-selected music on arteriovenous fistula cannulation pain and comfort. Participants listened to music of their

choice for approximately six minutes before fistula cannulation during 12 hemodialysis sessions. The intervention group reported lower pain scores and higher comfort scores than the control group. The reduction in pain became particularly evident during the sixth and twelfth sessions ($p < 0.001$).

Shehata et al. (2026) evaluated nurse-led intradialytic stretching exercises among 60 patients. Lower-extremity stretching was supervised by nurses twice weekly for approximately eight weeks. After the intervention, 83.3% of participants in the stretching group no longer experienced muscle cramps, compared with 30% in the usual-care group ($p < 0.001$). The intervention also reduced cramp frequency, duration, pain, and discomfort without causing serious adverse events.

Kasar et al. (2020) examined the effect of stress-ball exercises among 45 patients undergoing hemodialysis. Participants in the intervention group squeezed a stress ball for 10–15 minutes during eight consecutive hemodialysis sessions. The intervention significantly reduced stress levels, whereas stress increased in the control group. However, no significant between-group differences were found in vital signs or overall comfort scores.

Effects on Psychosocial Well-Being and Health Status

Zhang et al. (2021) investigated a refined nursing intervention among 172 patients undergoing maintenance hemodialysis during the COVID-19 pandemic. The intervention included psychological assessment, health education, emotional support, infection-prevention measures, dietary management, and monitoring before, during, and after dialysis. Depression and anxiety scores decreased significantly following the intervention. The program was also reported to strengthen nurse–patient relationships and reduce complications, although quality of life was not measured using a specific validated instrument.

Wang et al. (2024) evaluated periodic nursing interventions among 88 patients receiving long-term hemodialysis. The intervention was based on stages of behavioral change and included education, counselling, regular monitoring, psychological support, dietary guidance, physical activity recommendations, telephone follow-up,

and home visits. Patients in the intervention group demonstrated better treatment adherence, lower blood urea nitrogen and creatinine levels, and fewer complications than those in the control group. The complication rates were 11.36% in the intervention group and 29.54% in the control group. Anxiety and depression scores were also lower following the intervention.

Discussion

Nurse-led or nurse-supported non-pharmacological interventions have the potential to improve comfort, reduce symptom burden, and enhance quality of life among patients undergoing hemodialysis. More consistent effects were observed in multidimensional interventions that addressed not only clinical parameters but also patients' physical, psychological, social, and spiritual needs. The Clark Comfort Nursing approach, for example, integrates education, psychological support, continuous monitoring, and reinforcement of self-care, resulting in improved quality of life and treatment adherence, as well as reduced perceived burden and complications (Li et al., 2024). The relevance of this approach is further supported by evidence indicating that nearly half of patients receiving dialysis prioritize comfort-oriented care over life-prolonging treatment. However, these preferences have not always been translated into care planning and service delivery that are consistent with patients' values (Wong et al., 2023).

The effectiveness of the 5A nursing model demonstrates that improvements in quality of life are determined not only by the educational content provided but also by the extent to which the intervention actively engages patients in disease management. The stages of assess, advise, agree, assist, and arrange establish a structured intervention process ranging from the identification of patients' needs to follow-up care. Through this approach, nurses can collaborate with patients to establish realistic goals, identify individual barriers, and provide assistance according to each patient's readiness. This process may improve patients' perceived control, self-efficacy, and self-management abilities while reducing the sense of helplessness associated with long-term dependence on hemodialysis (Keivan et al., 2023). This interpretation is consistent with evidence mapping among populations with chronic conditions, which identifies self-

management support and shared decision-making as key strategies for improving patient engagement and healthcare outcomes (Aboumatar et al., 2022).

Structured home visits and health ecology-based interventions demonstrate that the effectiveness of hemodialysis care is influenced by the interaction among individual capacity, family support, health literacy, and the environment in which patients perform self-care. Home visits allow nurses to identify gaps between clinical recommendations and patients' daily practices, including difficulties with fluid restriction, dietary management, appropriate medication use, and access to family support. This mechanism may explain the improvements in treatment adherence and quality of life following the implementation of nurse-led structured home-visiting programs (Pooresmaeil et al., 2023). Indirect evidence from patients with hypertension and kidney complications also indicates that health literacy and self-care behaviors are associated with blood pressure, blood glucose levels, and kidney function. Although derived from a different population, these findings reinforce the importance of tailoring education to patients' ability to access, understand, and apply health information (Sriprachot et al., 2024).

Sleep quality and psychological well-being are important components of comfort because they influence symptom perception, functional capacity, and patients' ability to adapt to long-term treatment. Sleep-hygiene education, relaxation techniques, and counselling may improve sleep quality by reducing psychological arousal, promoting more adaptive sleep routines, and strengthening patients' ability to manage symptoms that interfere with rest. The reduction in Pittsburgh Sleep Quality Index scores following the intervention suggests that sleep disturbances among patients undergoing hemodialysis are not determined solely by the biological consequences of CKD but are also influenced by modifiable behavioral and psychological factors that can be addressed through nursing interventions (Tao et al., 2024). Reductions in anxiety and depression following a refined nursing intervention also suggest that therapeutic communication, consistent information delivery, emotional support, and structured monitoring can reduce uncertainty and perceived threats during hemodialysis treatment (Zhang et al., 2021).

Interventions directly targeting physical symptoms produced more specific and relatively immediate benefits during hemodialysis. Patient-selected music before fistula cannulation may operate through distraction, relaxation, and modulation of emotional responses to repeatedly performed invasive procedures. The increasingly evident effects during later sessions suggest that personal preference, familiarity, and repeated exposure may strengthen the therapeutic response to music (Sayilan et al., 2026). Nurse-supervised intradialytic stretching also reduced the intensity, frequency, duration, pain, and discomfort associated with muscle cramps. Physiologically, stretching may improve muscle flexibility, enhance local blood flow, and reduce neuromuscular excitability. Nursing involvement ensures that the intervention is adjusted according to patients' tolerance, hemodynamic condition, mobility limitations, and vascular access safety (Shehata et al., 2026).

Although the overall direction of the findings supports the benefits of non-pharmacological interventions, the effects were not consistent across all outcome domains. Stress-ball exercises, for example, reduced stress levels but did not produce significant changes in vital signs or overall comfort scores. These findings suggest that a simple distraction technique may be sufficient to influence short-term emotional responses but may not substantially alter global comfort, which encompasses physical, psychospiritual, social, and environmental dimensions (Kasar et al., 2020). A similar pattern was identified in a support-group study involving patients with pulmonary hypertension, in which disease knowledge, treatment adherence, and confidence in self-care improved without a significant change in quality of life. Although the study did not involve a hemodialysis population, its findings highlight that improvements in mediating factors, such as knowledge and self-efficacy, do not necessarily result in immediate changes in multidimensional outcomes such as quality of life (Giri et al., 2021).

Periodic nursing interventions indicate that continuity in the therapeutic relationship is an important mechanism for producing behavioral change. Improvements in treatment adherence, reductions in complications, and decreases in anxiety and depression may occur because interventions are delivered gradually, tailored to patients' readiness, and evaluated regularly. In this

context, nurses function not merely as providers of information but also as facilitators of behavioral change who monitor progress, identify barriers, and adjust care plans according to patients' responses (Wang et al., 2024). Indirect support for this mechanism was identified in the Community Health Management Activation Technology for African Americans program, which integrated web-based education, self-monitoring, a medication-management application, and nurse counselling. The program did not significantly improve quality of life but increased medication adherence. This finding suggests that technology may be more effective in modifying specific health behaviors when combined with professional support, although it may not be sufficient to improve overall quality of life (Still et al., 2020).

Several limitations should be considered when interpreting the findings of this review. The included studies were heterogeneous in terms of research design, sample size, intervention characteristics, duration, intensity, comparator groups, and measurement instruments. Most studies were conducted at a single center with relatively small samples, several did not employ randomization, and follow-up periods were generally short, preventing conclusions regarding the sustainability of intervention effects. In addition, not all studies directly measured comfort or quality of life, and the specific roles of nurses were not always described in sufficient detail. Digital interventions with limited statistical power may demonstrate trends toward improvement in selected outcomes without establishing significant changes in quality of life or major clinical outcomes (Meyer et al., 2025). Therefore, the findings support the use of non-pharmacological nursing interventions as complementary therapies but do not allow one intervention to be identified as the most effective approach. Multicenter studies with adequate sample sizes, consistent operational definitions of nurse-led interventions, validated comfort instruments, and long-term follow-up are needed to strengthen the certainty and applicability of the evidence (Aboumatar et al., 2022).

Conclusion and Recommendation

This review indicates that nurse-led or nurse-supported non-pharmacological interventions have the potential to improve comfort, reduce symptom burden, strengthen self-care abilities, and enhance quality of life among patients

undergoing hemodialysis. Relatively consistent benefits were identified across multidimensional approaches, the 5A nursing model, structured home-visiting programs, education and counselling, patient-selected music, and intradialytic stretching exercises. Intervention effectiveness was influenced by its alignment with individual patient needs, active nursing involvement, continuity of monitoring, and patient participation in care. However, heterogeneity in study designs, sample sizes, intervention duration, and measurement instruments prevents the identification of a single intervention as the most effective approach.

Nurses working in hemodialysis units are encouraged to integrate safe, simple, and comfort-oriented non-pharmacological interventions into routine care based on individual patient assessments. These interventions may include patient-selected music, intradialytic stretching exercises, relaxation techniques, self-management education, and psychological support. Their implementation should be supported by standardized protocols, clear documentation of nurses' roles, and regular evaluation using validated instruments for measuring comfort and quality of life.

Future studies should employ multicenter randomized controlled trial designs, larger sample sizes, adequate control groups, and consistent operational definitions of nurse-led and nurse-supported interventions. Long-term follow-up is also required to evaluate intervention safety, sustainability of effects, and comparative effectiveness in determining the most beneficial intervention for patients undergoing hemodialysis.

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Declaration on the Use of AI

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Data Availability Statement

Data sharing is not applicable to this article.

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