RESEARCH ARTICLE

Improving Pain and Sleep Quality in Elderly Hip Fracture Patients with Collaborative Nursing and Intensive Sleep Care

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Abstract

Objective: To analyse the effect of a collaborative nursing model combined with multidimensional intensive sleep care on pain and sleep quality in elderly patients with hip fractures.

Method: The study was conducted at the Nanjing First Hospital, Nanjing Medical University, China, from January 2023 to January 2024, and comprised elderly patients with hip fractures who were randomised into experimental group A receiving collaborative nursing combined with multidimensional intensive sleep care, and control group B receiving routine nursing combined with collaborative nursing. Sleep quality, pain intensity, serum factor levels, negative emotions, quality of life, and complication rates were compared between the groups. Data was analysed using SPSS 23.

Results: Of the 90 patients, 45(50%) were in group A; 27(60%) males and 18(40%) females with mean age 68.53±3.29 years (range: 60-81 years). In group B, there were 45(50%) patients; 26(57.8%) males and 19(42.2%) females with mean age 69.68±3.04 years (range: 61-80 years). (p>0.05). At baseline, there were no significant differences with respect to pain intensity and sleep quality between the groups (p>0.05). Following the intervention, group A demonstrated significantly lower scores than group B (p<0.05). Prostaglandin E2 and tumour necrosis factor-alpha levels showed a more pronounced change in group A than in group B (p<0.05). Depression and anxiety decreased in both the groups, but the drop in group A was more significant than group B (p<0.05). Group A had higher quality of life scores and lower complication rates compared to group B (p<0.05).

Conclusion: The collaborative nursing model combined with multidimensional intensive sleep care effectively alleviated pain, and improved negative emotions, quality of life, and sleep quality in elderly patients with hip fractures.

Keywords: Collaborative nursing, Multidimensional intensive care, Hip fracture, Pain, Sleep quality.

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Introduction

Hip fracture (HF) in the elderly is a common clinical condition, often occurring in individuals with osteoporosis.[1] As China's population ages, HF incidence has gradually increased. Following HF, patients often require prolonged bedrest due to the lengthy healing process, significantly impacting their quality of life (QOL). Timely intervention is crucial to preventing the development of systemic disorders, organ dysfunction, and other complications that may threaten patient safety.[2,3] Surgical treatment is the primary approach for managing HF in clinical settings.[4,5] However, elderly patients are prone to postoperative stress reactions, deep venous thrombosis (DVT) of the lower extremities, pulmonary infections, and other adverse reactions, which can prolong recovery and bedrest periods.

Furthermore, these patients may experience negative emotions, hindering their cooperation with nursing and treatment, exacerbating pain, and compromising clinical outcomes and sleep quality.[6,7] Therefore, it is essential to implement appropriate nursing measures during HF treatment to ensure clinical efficacy, alleviate negative emotions and pain, improve clinical indicators, and enhance sleep quality.[8,9] Multidimensional intensive care, focussing on sleep, pain management and psychological support can improve sleep quality, reduce pain, meet patients' clinical nursing needs, and enhance treatment outcomes. Collaborative nursing, encompassing dietary and fluid management, thrombosis prevention, complication management, and bundled preventive care, strengthens patients' surgical compliance, reduces stress reactions, boosts treatment confidence, and alleviates surgical anxiety, thereby fulfilling patients' nursing need.[10,11]

The current study was planned to evaluate the effectiveness of a collaborative nursing model combined with multidimensional intensive sleep care in improving pain management, sleep quality, emotional wellbeing, and overall QOL in elderly patients with hip fractures.

Patients and Methods

The article has been granted ethics approval by the certificate under the reference number DWSY-21077121.

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The study was conducted at the Nanjing First Hospital, Nanjing Medical University, China, from January 2023 to January 2024, and comprised elderly patients with hip fractures who were divided using the random number generation method into experimental group A receiving collaborative nursing combined with multidimensional intensive sleep care, and control group B receiving routine nursing combined with collaborative nursing. The sample was raised using random sampling technique after taking informed consent from the patients.

Those included were patients of either gender aged at least 60 years who had been diagnosed with hip fracture on the basis of computed tomography (CT) and magnetic resonance imaging (MRI) scans, had surgical indications, possessed cognitive awareness and were willing to participate in the study.

Those excluded were patients with dementia or mental illnesses, those with surgical intolerance or anaemia, those having combined liver or renal dysfunction, and patients who left the study midway.

Routine nursing entailed monitoring patients' vital signs and promptly notifying doctors of any abnormalities, completing preoperative preparations, administering medications as prescribed by doctors, and providing wound care and discharge rehabilitation guidance services in a timely manner.

The collaborative nursing model incorporated seen elements. The first element related to the establishment of the nursing team. The collaborative nursing team consisted of members from the pain management, anaesthesia, rehabilitation and nutrition departments. The team included orthopaedic specialist nurses, rehabilitation specialist nurses, anaesthesia nurses, nutrition nurses, and general nurses having extensive knowledge and the ability to collaborate across departments. Speciality assessments were conducted upon admission, before surgery, and throughout the postoperative period to meet patients' individualised nursing needs. The nursing team collaborated to develop, implement, adjust and evaluate treatment and nursing plans.

The second element was diet and fluid management. Before anaesthesia, the patients were instructed to stay away from protein and carbohydrate intake, and restrict sodium-containing fluids to prevent tissue oedema. Postoperatively, fluid replacement was administered scientifically, and the patients were encouraged to resume eating early. Before ingesting food or water, the patients' physical conditions were assessed for abdominal discomfort, level of consciousness, etc. Water intake of 50mL was allowed 2 hours after the surgery, with gradual increases as tolerated, transitioning to fluids and semi-solids. Based on fluid management principles, the patients were encouraged to eat orally, and, if necessary, total parenteral nutrition was administered to maintain electrolyte balance.

The third element was thrombosis management. Upon admission, in addition to primary and physical prevention measures, the patients without significant bleeding contraindications were administered low-molecular-weight heparin for thrombosis prevention. Incorporating the concept of rapid recovery, patients were assisted with passive movements and limb massages postoperatively. Once anaesthesia wore off, the patients were encouraged to perform active early functional exercises, including ankle pump exercises. Anti-embolism pumps were used twice daily for 1 hour each time to prevent DVT in the lower extremities.

The fourth element was complication management. The patients were instructed on deep breathing and blowing balloons. If medically feasible, they were maintained in a semi-sitting position, and nebulised inhalation or vibratory chest physiotherapy was provided as needed. The patients' conditions were closely monitored, with a focus on complications, such as respiratory infections, tube dislodgement, and urinary tract infections (UTIs).

The fifth element was bundled prevention and nursing. The nursing team synthesised the best evidence from clinical guidelines and expert consensus to formulate and refine nursing checklists for pressure injury, venous thrombosis, and pain prevention. The team discussed and revised these checklists, and responsible orthopaedic nurses assessed the patients' symptoms regularly, incorporating daily nursing issues, assessment results, and risk levels into nursing practices. When necessary, specialist nurses collaborated with the nursing team to conduct nursing consultations and develop nursing interventions.

The sixth element was pressure injury and fall prevention. Upon admission, the patients were provided with pressure-relieving devices, such as gel pads and foam mattresses, to prevent pressure injuries. Those at risk of falls were assigned 24-hour supervision. Postoperatively, nurses guided the patients in gradual ambulation, using hip protectors during activities.

The seventh element was pain relief. Nurses were required to assess the pain level of patients admitted to the hospital and implement non-pharmacological interventions based on the degree of pain, such as skin traction and braking, ice compression, etc. Changing the patient's position was a

task carried out by two nurses. When repositioning the patients with preoperative skin traction, adequate traction was prioritised. For patients without traction, one nurse manually assisted with traction, while the other performed the hip encirclement method during the process.

The multidimensional sleep-enhancing nursing provided to group A had additional seven elements. The first element was pain management. Based on the principle of stepped analgesia, multimodal pain management was implemented for patients to enhance their sleep quality. Analgesic measures were administered both preoperatively and postoperatively, with a patient-controlled analgesia pump providing continuous analgesia. The pain intensity of patients was assessed, and preemptive analgesia management was conducted for patients preoperatively, and in case of intense pain and there being no specific contraindications, celecoxib 0.2g was administered orally 8 hours before surgery. If the analgesic effect was insufficient, weak opioids or an appropriate dose of analgesic drugs could be used in combination, adhering to the principle of stepped analgesia therapy. Postoperatively, non-steroidal anti-inflammatory drugs (NSAIDs) were administered intravenously for 3 days, and, if necessary, weak opioids were added. For patients with severe pain and suboptimal drug response, potent opioids and sedative anxiolytics were prescribed to alleviate pain and ensure sleep quality.

The second element was sleep nursing. The indoor temperature was set appropriately, and noise management in the ward was strengthened to provide a comfortable environment. Nursing staff assisted the patients in maintaining comfortable and relaxed positions during sleep to improve sleep quality. During sleep, family visits were minimised to avoid disruption. Before bedtime, the patients were instructed to reduce water intake, consume warm milk, and soak their feet in warm water to enhance sleep quality.

The third element was supportive nursing, while the fourth element was that of nurse-patient communication. Emphasis was placed on fostering communication to bridge the gap, understand patients' psychological states, analyse the causes of negative emotions, and help patients vent and eliminate such emotions, thereby facilitating sleep.

The fifth element was family support. Nursing staff communicated with family members to encourage them to provide emotional support and companionship, particularly during daytime visits, assisting the patients in activities and promoting good sleep habits at night.

The sixth element was peer communication. During hospitalisation, the patients were encouraged to interact with each other and participate in sharing sessions with those who had achieved good recovery outcomes, fostering a supportive healthcare environment.

The seventh element was respiratory system management. Nursing staff monitored patients' respiratory functions, including oxygen saturation (SaO_2) and blood gas parameters upon admission and postoperatively. A comprehensive assessment of oxygen levels was conducted, and low-flow oxygen therapy or face mask oxygen therapy was provided when partial arterial oxygen (PaO_2) was <60mmHg and SaO_2 was <90%. Routine oxygen therapy was administered for 12 hours postoperatively, and further oxygen supplementation was determined based on respiratory function assessment, ensuring unobstructed breathing, reducing respiratory discomfort, and promoting better sleep.

Data was collected using standard tools. The sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI),[12] which comprised 7 dimensions, each scored 0-3, with a total possible score of 21. A lower score indicated better sleep quality, as the score was inversely related to sleep quality. Pain intensity was assessed using the Numerical Pain Rating Scale (NPRS),[13] ranging from 0=no pain to 10=worst possible pain, and mild pain=1-3), moderate pain=4-6) and severe pain=7-10. A higher NPRS score indicated greater pain intensity.

Before and after the intervention, 5mL of fasting venous blood was collected and centrifuged at 3000 revolutions per minute (rpm) for 10 minutes with a radius of 12cm. The supernatant was then used to measure the levels of prostaglandin E2 (PGE2) and tumour necrosis factor-alpha (TNF-α) by radioimmunoassay.[14]

Negative emotions were assessed using the Self-Rating Depression Scale (SDS)[15] and the Self-Rating Anxiety Scale (SAS),[16] both of which had a maximum score of 80. The cut-off scores for SDS and SAS were 53 and 50, respectively, with higher score indicating more severe negative emotions.

The World Health Organisation Quality of Life-BREF (WHOQOL-BREF) tool was employed to evaluate the domains of physical health, psychological health, social relationships, and environment. A higher score indicated a better QOL.[17]

With respect to complications, the occurrence of UTIs, DVTs, pressure injuries, and atelectasis were recorded.

Data was analysed using SPSS 23. Continuous variables

were analysed using the student's t-test and were presented as mean±standard deviations, while categorical variables were analysed using chi-square test and were presented as frequencies and percentages. P<0.05 was considered statistically significant.

Results

Of the 90 patients, 45(50%) were in each of the two group. In group A, there were 27(60%) males and 18(40%) females with mean age 68.53±3.29 years (range: 60-81 years). In group B, there were 26(57.8%) males and 19(42.2%) females with mean age 69.68±3.04 years (range: 61-80 years). The cause of fracture in group A was falls 34(75.6%) and traffic accidents 11(24.4%). The corresponding values in group B were 32(71.1%) and 13(28.9%) (p>0.05).

Table-1: Comparison of PSQI and NRS scores.

Group	PSQI Scores (in Points)		NRS Scores (in Points)	
	Before Intervention	After Intervention	Before Intervention	After Intervention
Control (n=45)	15.42±2.81	11.84±2.67	6.78±1.39	4.55±1.03
Experimental (n=45)	15.29±2.77	7.18±1.93	6.82±1.41	2.27±0.54
t-test	0.221	9.489	0.136	13.151
p-value	0.826	0.001	0.893	0.001

PSQI: Pittsburgh Sleep Quality Index, NRS: Numerical Rating Scale.

Table-2: Comparison of pain mediator levels between the groups.

Group	PGE2 (pg/mL)		TNF-α (pg/mL)	
	Before Intervention	After Intervention	Before Intervention	After Intervention
Control (n=45)	13.16±2.51	17.43±2.71	4.69±0.53	3.66±0.42
Experimental (n=45)	13.08±2.49	20.51±2.85	4.72±0.52	2.18±0.36
t-test	0.152	5.254	0.271	17.948
p-value	0.879	0.001	0.787	0.001

PGE2: Prostaglandin E2, TNF-α: Tumour necrosis factor-alpha.

Table-3: Comparison of negative emotion scores.

Group	SDS Scores (in Points)		SAS Scores (in Points)	
	Before Intervention	After Intervention	Before Intervention	After Intervention
Control (n=45)	62.41±4.62	51.63±4.38	60.48±4.31	47.52±3.98
Experimental (n=45)	62.56±4.71	45.44±4.21	60.27±4.87	41.09±3.74
t-test	0.153	6.835	0.217	7.898
p-value	0.879	0.001	0.829	0.001

SDS: Self-Rating Depression Scale, SAS: Self-Rating Anxiety Scale.

Table-4: Comparison of quality- of life (QOL) scores between the groups.

Group	Number of Cases	Surrounding Environment (Score)	Social Relationships (Score)	Mental Health (Score)	Physical Health (Score)
Control	45	64.85±6.37	63.68±6.29	61.92±5.94	63.38±5.64
Experimental	45	79.52±6.43	80.01±6.33	77.68±6.01	78.52±5.73
t-test	-	10.873	12.276	12.511	12.632
p-value	-	0.001	0.001	0.001	0.001

Table-5: Comparison of complication incidence rates.

Group	Number of Cases	Urinary Tract Infection	Hypostatic Pneumonia	Pressure Injury	Deep Vein Thrombosis Rate (%)	Complication Incidence
Control	45	3 (6.67)	2 (4.44)	2 (4.44)	3 (6.67)	10 (22.22)
Experimental	45	1 (2.22)	0	1 (2.22)	1 (2.22)	3 (6.67)
x^2	-	-	--	-	4.406	
p-value	-	-	--	-	0.036	

At baseline, there were no significant differences with respect to pain intensity and sleep quality between the groups (p>0.05). Following the intervention, group A demonstrated significantly lower scores than group B (p<0.05) (Table 1).

PGE2 and TNF-α levels showed a more pronounced change in group A than in group B (p<0.05) (Table 2).

Depression and anxiety decreased in both the groups, but the drop in group A was more significant than group B (p<0.05) (Table 3).

Group A had higher QOL scores (Table 4) and lower complication rates (Table 5) compared to group B (p<0.05).

Discussion

HF, as one of the commonly encountered clinical conditions, typically involves severe fracture types, primarily arising from direct or indirect trauma, with femoral neck fractures and subtrochanteric fractures being the most common. Analysis of the clinical manifestations associated with this condition reveals that patients often experience limited mobility, pain and insomnia upon diagnosis, which significantly impair QOL and hinder rapid recovery. Dai et al.[18] demonstrated that HF patients require surgical intervention within 48 hours of admission. However, postoperative patients undergoing this treatment modality are prone to insomnia, pain and other adverse factors, which can hinder effective functional exercise and prolong the recovery period. Even after discharge, the patients may struggle to achieve optimal limb function. Zhang et al.[19] contend that the sudden onset of fracture symptoms and the inability to perform daily activities independently can lead to stress reactions in patients, exacerbated by economic constraints, pain and surgical outcomes. This psychological distress can negatively impact the recovery process. Takeda et al.[20] have emphasised that depression and anxiety serve as stressors, and persistent pain after illness can significantly affect the patients, not only intensifying their negative emotions, but also increasing the risk of delirium. Xiong et al.[21] argue that when intervening in HF patients, clinicians must consider the combined

effects of medical procedures, pain, environmental factors and surgical trauma, all of which can contribute to reduced sleep quality. Consequently, it is crucial to implement appropriate nursing interventions for HF patients to effectively alleviate their negative emotions and pain, thereby enhancing sleep quality and clinical outcomes. Collaborative nursing, as a comprehensive nursing service model, has garnered significant clinical attention in recent years. Rooted in the principle of accountability and centred on the patient, this model effectively mobilises patients' enthusiasm for treatment, enhancing therapeutic outcomes and serving as an effective clinical nursing intervention.[22] Within this framework, training of nursing team members enables the provision of personalised nursing services, health education addresses the informational needs of patients and their families, sharing of successful experiences and psychological guidance alleviates negative emotions, fostering active patient participation in treatment, and bolstering risk awareness. Additionally, pain and temperature management, along with a comfortable medical environment, improves sleep quality, reduces stress responses, and alleviates pain among HF patients.

The multidimensional sleep enhancement nursing approach, through psychological support, intensified pain management and sleep-focussed interventions, effectively alleviates negative emotions, educates patients on their condition, eliminates concerns, encourages the sharing of success stories among patients, fosters a positive treatment atmosphere, and assesses pain levels to administer analgesics, thereby maintaining sleep patterns appropriately. Techniques such as distraction and reassurance further aid in pain relief.[23]

Furthermore, a comfortable medical environment with controlled temperature, humidity and noise levels, along with sleep guidance, contributes to pain alleviation and improved sleep quality.[24] The current study's findings indicate that while PSQI and NPRS scores were comparable before intervention, both scores decreased significantly post-intervention, with the experimental group outperforming the control group ($p<0.05$). This suggests that the combined approach of collaborative nursing and multidimensional sleep enhancement could improve sleep quality, reduce pain, and enhance treatment adherence and outcomes. Serum inflammatory markers PGE2 and TNF-α increase post-trauma due to leukocyte and megakaryocyte release, stimulating nerve endings and exacerbating pain. TNF-α, a pro-inflammatory cytokine released by glial cells and activated macrophages post-nerve injury, contributes to inflammation and pain. The observed increase in PGE2 levels in both groups post-intervention, with the experimental group showing higher levels, and the decrease in TNF-α levels, lower in the experimental group ($p<0.05$), may indicate that the combined nursing approach alleviated pain, mitigating pain-induced stress responses.[25]

Furthermore, post-intervention reductions in SDS and SAS scores, with the experimental group scoring lower ($p<0.05$), suggest that this combined nursing approach mitigated negative psychological states. Higher QOL scores across all metrics in the experimental group ($p<0.05$) underscore the positive impact on patient wellbeing and recovery.[26] The lower complication rate in the experimental group ($p<0.05$) highlights the safety and efficacy of this approach in minimising adverse reactions and promoting patient recovery.

The current study has limitations because the sample size was not calculated, which could have influenced the power of the study and the generalisability of the findings.

Conclusion

The combined application of collaborative nursing and multidimensional sleep enhancement nursing was a viable intervention for HF patients. It alleviated negative emotions and pain, enhanced sleep and QOL, and demonstrated superior safety, fulfilling patient care needs and deserving widespread clinical adoption.

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Conflict of Interest: None.

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