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Impact of precision nursing intervention based on DCO model on joint function and quality of life of elderly hip arthroplasty patients

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Abstract

Background This study aimed to explore the impact of precision nursing intervention based on Damage Control Orthopedics (DCO) model on joint function and quality of life of elderly hip arthroplasty patients.

Methods Elderly hip arthroplasty patients ($n = 100$) who underwent hip replacement surgery at our hospital from January 2023 to June 2024 were collected and randomly assigned into two groups, with 50 patients in each. The control group received conventional nursing intervention, while the observation group received precision nursing intervention based on the DCO model. The hip joint function (Harris), Self-rating Depression Scale (SDS), Self-rating Anxiety Scale (SAS), Pittsburgh Sleep Quality Index (PSQI), Barthel Index (BI), and SF-36 were employed to assess hip joint function, psychological status, sleep quality, daily living abilities, and quality of life before and after intervention in both groups. Complications in both groups were also recorded.

Results Compared to pre-intervention, the hip joint function scores and BI scores in both groups significantly improved post-intervention, with the observation group scoring higher than the control group ($P < 0.05$). After the intervention, SAS, SDS, and PSQI scores decreased in both groups, with the observation group showing lower scores than the control group ($P < 0.05$). The quality of life scores in the observation group post-intervention were higher than those in the control group ($P < 0.05$).

Conclusion Precision nursing intervention based on DCO model can significantly improve joint function and quality of life in elderly patients with hip arthroplasty.

Keywords Damage control orthopedics model, Precision care, Elderly, Hip arthroplasty, Joint function, Quality of life

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Introduction

Total hip arthroplasty is considered one of the most effective and commonly performed surgeries in the field of orthopedics [1]. The primary goal of treating patients with hip issues is to restore their ability to perform normal hip functions and activities [2]. A well-executed total hip arthroplasty technique can significantly alleviate pain, enhance hip mobility, and reduce both hospital stay and recovery time, ultimately increasing patient satisfaction [3]. However, despite the remarkable clinical success of hip replacement surgery, the rehabilitation process of postoperative patients still faces many challenges, especially in the elderly patient population.

Post-discharge nursing intervention is a crucial long-term rehabilitation process that plays a key role in enhancing hip joint function and improving the quality of life for affected patients [4]. Starting nursing intervention as soon as patients regain consciousness not only boosts their psychological well-being but also increases their focus on postoperative rehabilitation exercises. This early intervention helps alleviate pain and sets a solid foundation for the successful continuation of rehabilitation [5]. Nursing practices are evolving toward a more individualized approach, with an increasing focus on patient-centered clinical decision-making. This shift is being reinforced by the adoption of precision nursing, a methodology designed to address the specific needs of each patient through tailored care [6]. Personalized precision nursing care encompasses several key areas: providing explanations of genetic test results, offering patient advocacy and emotional support, anticipating treatment outcomes, monitoring chronic conditions continuously, and facilitating shared decision-making throughout the patient's journey with the disease [7]. The precision care model stands apart from traditional care by offering a more in-depth, personalized approach. It involves creating custom care plans that consider each patient's unique circumstances, conditions, and risk factors, thus ensuring a more targeted and effective treatment strategy [8]. In emergency orthopedic settings, this individualized approach is especially important, as evidenced by Damage Control Orthopedics (DCO), a critical procedure aimed at stabilizing life-threatening fractures. Techniques such as external fixation are minimally invasive and focus on stabilizing major fractures, particularly in long bones, to control bleeding and prevent further complications [9]. Originally developed to address the "fatal triad"—a combination of acidosis, hypothermia, and coagulopathy—the DCO concept has now expanded into orthopedic practice. This approach emphasizes prompt and straightforward fracture stabilization, followed by definitive fixation once the patient's overall condition is stable [10]. The use of the DCO approach for surgical treatment of femoral neck fractures in patients with chronic renal failure is an effective and relatively safe option [11].

This study aims to investigate the innovative impact of a precision nursing intervention based on the DCO model on postoperative joint function recovery and quality of life in elderly hip replacement patients, offering a personalized and targeted approach to enhance patient outcomes. Through personalized assessment and nursing intervention, we analyzed the changes in the postoperative recovery process and explored the potential of precision nursing care in enhancing the rehabilitation outcomes of elderly hip replacement patients. This study not only helps to improve the nursing care model after hip arthroplasty in the elderly, but also provides a theoretical basis and practical guidance for nursing interventions for other similar diseases.

Materials and methods

Ethics statement

This study was approved by the Ethics Committee of Gansu Provincial Traditional Chinese Medicine Hospital. Written informed consent was attained from all participants. Participants were fully informed about the study's objectives, procedures, and potential risks. Any potential ethical concerns, such as the impact of the intervention on participants, were carefully considered and addressed by monitoring patient outcomes closely and adjusting the intervention protocol when necessary to ensure safety and well-being.

General data

A total of 120 elderly patients who underwent hip replacement surgery at Gansu Provincial Traditional Chinese Medicine Hospital from January 2023 to June 2024 were collected. Inclusion criteria: patients diagnosed through imaging examination; patients able to communicate normally; the study was approved by our hospital's ethics committee. Exclusion criteria: patients with dysfunction of vital organs such as the heart, liver, or kidneys; patients with pre-existing motor dysfunction; patients with coagulation disorders; Montreal Cognitive Assessment Scale (MoCA) score < 26 [12]; patients with other types of fractures; patients unable to tolerate surgery. Finally, 100 patients were included and randomly assigned into two groups, with 50 patients in each. The control group received conventional nursing intervention, while the observation group received precision nursing intervention based on the DCO model. The grouping process for patients is shown in Fig. 1.

Methods

The control group received routine care: routine assistance was provided to the patients for completing preoperative examinations; treatment information was

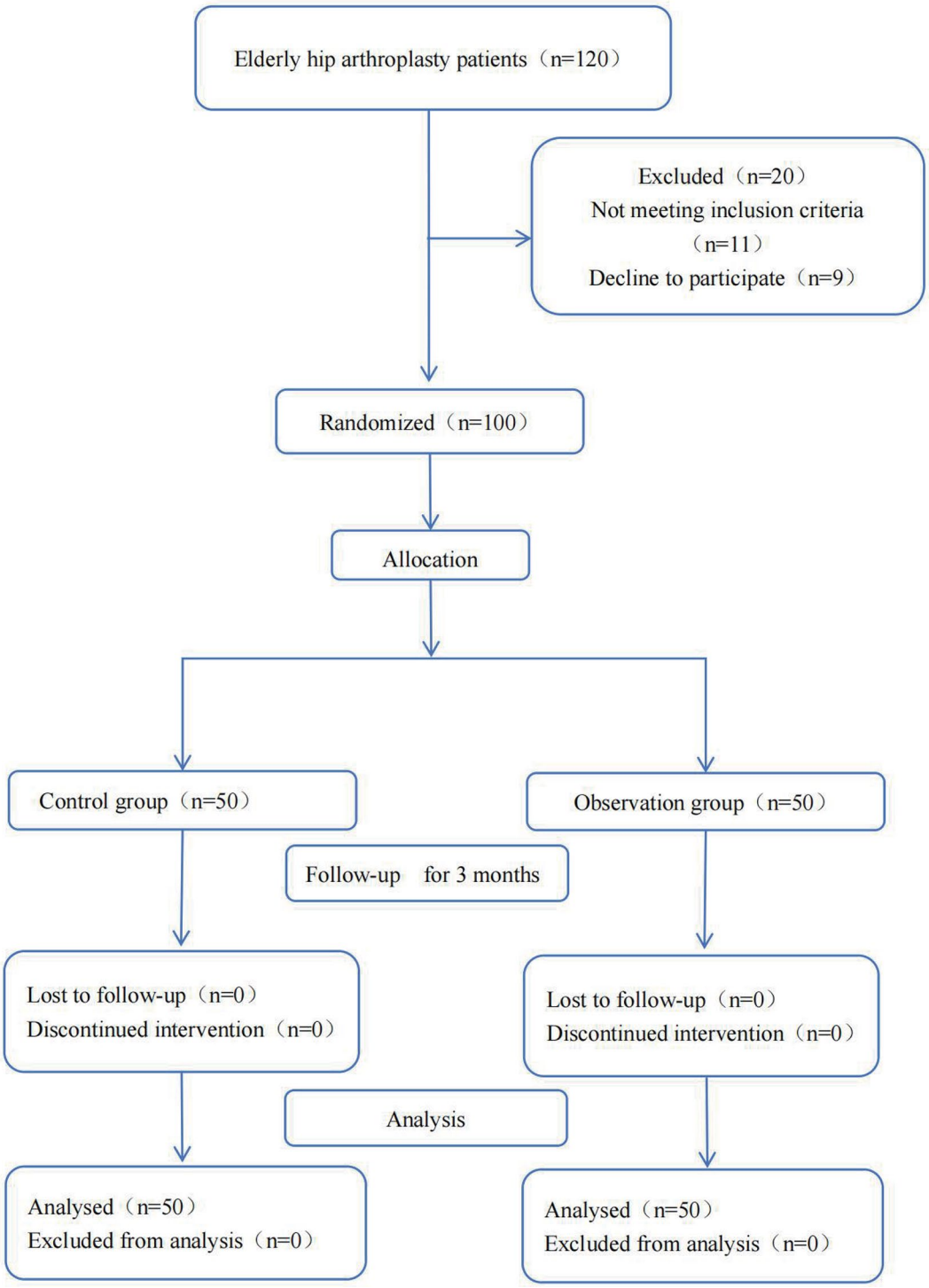

Fig. 1 The grouping process for patients

explained, and patients were instructed to cooperate with various measures; fasting and withholding of fluids for 12 h before surgery were enforced; strict aseptic techniques were implemented during surgery, with continuous monitoring of vital signs; postoperative drainage tubes were routinely placed, and the incision site was closely monitored; routine administration of antibiotics was carried out to prevent infection; information regarding postoperative rehabilitation training was provided, with instructions for the patients to engage in exercises according to recovery status.

The observation group received a precision care intervention based on the DCO model: a care group was established, consisting of one physician, one psychologist, one rehabilitation therapist, and two professional nurses. Before the implementation of care, team members were trained in uniform DCO-based precision care.

Preoperative rehabilitation exercises were beneficial for increasing muscular endurance and have a positive effect on maintaining cardiorespiratory function, and could also play a role in minimizing complications after surgery. The preoperative rehabilitation training included the "four-part" upper extremity exercise (fist clenching exercise, elbow flexion exercise, arm lifting exercise, etc.). Lower limb exercises (ankle pump exercises, quadriceps isometric contraction training, gluteal muscle contraction training, single-leg standing training, lateral leg raises, etc.) were performed three times a day, with each session lasting 15–20 min. During the training, the intensity and frequency were adjusted based on the elderly person's physical condition and tolerance level. If discomfort or pain occurs, the training was stopped immediately, and advice was sought from a physician or rehabilitation therapist.

Preoperative health education was provided to the patients: informational brochures were distributed, and multimedia tools were used to educate patients on disease and surgical knowledge, as well as to inform them of postoperative precautions, potential complications, and corresponding management measures. The head nurse organized in-hospital health education sessions every Saturday afternoon from 3 to 5 PM, during which the nursing goals, concepts, and advantages were also introduced to enhance patients' understanding.

After the patient was admitted, the nursing staff conducted in-depth assessments of the patient's psychological state by consulting with family members or communicating with the patient. The patients were encouraged to express inner feelings and provide genuine care needs. Based on the patients' care requirements, efforts were made to help patients build confidence in their recovery and treatment, thereby promoting better adherence to rehabilitation. A personalized nursing plan was developed, addressing four key areas: hospital environment, health education, psychological guidance, and family cooperation. During communication, a caring attitude was maintained, simple and clear language was used to strengthen nurse-patient trust, and patiently addressed any questions or concerns raised by the patient or their family.

Postoperative intermittent ice compresses were started on the second day after surgery, following the planned schedule for local application. First, a towel was placed on the skin of the anterior-lateral, lateral, and posterior-lateral areas of the affected hip. Three homemade soft ice packs were then placed inside three separate cotton fabric bags, which were sewn to fit. The three ice bags were arranged in an arc and positioned on the anterior-lateral, lateral, and posterior-lateral areas of the affected hip. Finally, the straps were secured on the opposite side to fix the ice packs in place. Intermittent ice application was implemented, with ice applied for 15–20 min, followed by a 4-hour interval before reapplying for another 15–20 min. Local skin was closely monitored to prevent frostbite. Ice application was discontinued based on the presence of local bleeding, drainage amount, and swelling.

Discharge guidance: Before discharge, enhanced health education was provided to the patient. The patient was advised to maintain correct posture in daily activities, avoid sitting cross-legged or with one leg over the other, and refrain from squatting. The patient was also instructed to return to the hospital for follow-up if any abnormalities or discomfort were experienced.

Real-time monitoring and tracking of the patient's medication adherence were conducted, and supervision and documentation of the patient's rehabilitation exercises were also carried out. At the same time, the involvement of the patient's family in the rehabilitation process was encouraged to improve the patient's adherence to disease management and regular rehabilitation exercises.

Both groups were discharged within 10 days and followed up through outpatient visits or phone calls after discharge. Patients' symptoms were inquired about and recorded, with both groups being followed up for 3 months. Comparison of two nursing groups is shown in Fig. 2.

Observation parameters

Harris score [13] was adopted to evaluate the hip joint function before and after the intervention in two groups. The Harris score included joint pain (44 points), joint function (47 points), joint activity (5 points), and joint deformity (4 points), and the score was proportional to the recovery of hip joint function. The questionnaire was completed in 15–20 min and was assessed by a specialist physician.

Self-rating Depression Scale (SDS) [14] and Self-rating Anxiety Scale (SAS) [15] were used to compare the state of depression and anxiety between the two groups before and after intervention. The total score was 80, which was proportional to the state of depression and anxiety. SAS scores < 50 indicate no significant anxiety or normal, 50–59 indicate mild anxiety, 60–69 indicate moderate anxiety, and 70 or above indicate severe anxiety. SDS scores < 53 indicate normal, 53–62 indicate mild depression, 63–72 indicate moderate depression, and above 72 indicate severe depression. The questionnaire took

Comparison parameters	Control group (routine care)	Observation group (precision nursing intervention based on the DCO model)
Nursing team	No special formation	A nursing team was established, consisting of one physician, one psychologist, one rehabilitation therapist, and two professional nurses. The team members received uniform training.
Preoperative nursing	Assist in completing preoperative examinations; educate patients on treatment knowledge and advise cooperation; fasting and drinking are prohibited 12 hours prior to surgery.	Assist with preoperative examinations and rehabilitation exercises (upper and lower limb exercises, three times a day, 15-20 minutes each, adjusted according to physical condition); distribute informational brochures and conduct multimedia education on disease and surgery knowledge, informing patients of postoperative precautions, complications, and management measures; the head nurse organizes in-hospital health education every Saturday afternoon from 3-5 PM, introducing nursing objectives, philosophy, and benefits; fasting and drinking are prohibited 12 hours prior to surgery.
Intraoperative nursing	Strictly adhere to aseptic techniques and continuously monitor vital signs.	
Postoperative nursing	Routine placement of a drainage tube, monitor the incision, and administer routine antibiotics for infection prevention.	"Routine placement of a drainage tube, monitor the incision, and administer routine antibiotics for infection prevention; intermittent ice application (starting on the second postoperative day, place a towel first, then an ice pack in a cloth bag on the affected hip, apply ice for 15-20 minutes, with a 4-hour interval for the next 15-20 minutes, monitor the skin for frostbite, and decide whether to stop based on bleeding, drainage, and swelling); closely monitor the patient's condition.
Out-of-hospital nursing	Inform the patient about rehabilitation exercises, advise them to exercise according to their recovery progress, and follow up via outpatient visits or telephone for 3 months.	Follow-up through outpatient visits or telephone for 3 months; monitor and track medication adherence in real-time, supervise and document rehabilitation exercises; involve family members to improve patient compliance; discharge instructions include maintaining proper posture, avoiding crossing legs, sitting with legs raised, and squatting; return to hospital for reexamination if abnormalities occur.

Fig. 2 Comparison of two nursing groups

10–15 min to complete and was assessed by a psychological counselor.

The Pittsburgh Sleep Quality Index (PSQI) [16] was utilized to compare the changes in sleep quality between the two groups before and after the intervention (21 points). The lower the score, the more obvious the improvement in sleep quality. The questionnaire took 5–10 min to complete and was assessed by a specialist physician.

Table 1 Comparison of general data between the two groups

	Control group (*n* = 50)	Observation group (*n* = 50)	t/X^2	*p*
Gender			1.020	0.313
Male	26 (52.00)	31 (62.00)		
Female	24 (48.00)	19 (38.00)		
Age (years)	63.16 ± 4.55	63.46 ± 4.16	0.344	0.731
Marital status			0.407	0.524
Married	35 (70.00)	32 (64.00)		
Divorced or widowed	15 (30.00)	18 (36.00)		
Workout frequency			2.200	0.138
Frequent workout (at least three times a week)	12 (24.00)	15 (30.00)		
Occasional workout (at least once a week)	20 (40.00)	25 (50.00)		
No workout	18 (36.00)	10 (20.00)		

Barthel Index (BI) [17] was employed to assess patients' ability to live before and after the intervention. A full score of 100 indicated that the activities of daily living could be completely self-care, 75 to 95 indicated mild dysfunction, 50 to 70 indicated moderate dysfunction, 25 to 45 indicated serious dysfunction, and 0 to 20 indicated extremely serious dysfunction. The questionnaire took 5–10 min to complete and was assessed by a specialist physician.

The Short-Form Health Survey Scale (SF-36) [18] was implemented to evaluate the quality of life of the two groups after the intervention. There were a total of 36 items in 8 dimensions: role physical, physiological function, general health status, physical pain, social function, energy, mental health and emotional function. The scores in each dimension were on a percentage basis. The higher the score, the better the quality of life. The questionnaire took 5–10 min to complete and was assessed by a specialist physician.

Complications occurring during the study were collected for both groups, including lower extremity venous thrombosis (leg discomfort or swelling), pressure injuries (localized skin or subcutaneous soft tissue damage), and incision infections (redness, edema, localized skin temperature increase).

Statistical analysis

GraphPad Prism 8.0 software was applied to process the data. The chi-square test was adopted for the categorical data (general information, complications), which was expressed as a percentage (%). Measurement data (general information, hip joint function, psychological status, sleep quality, quality of life, and daily living abilities) were expressed as mean ± standard deviation. Independent sample t-tests were used for group comparisons, and paired sample t-tests were used to compare pre- and post-intervention data within the same group. The difference was regarded as statistically significant when $P < 0.05$.

Table 2 Comparison of hip joint function between the two groups

	Control group (*n* = 50)	Observation group (*n* = 50)	t	*p*
Joint pain				
Before intervention	7.10 ± 1.73	7.28 ± 1.39	0.567	0.567
After intervention	25.62 ± 4.13 *	32.54 ± 3.64 *	8.885	< 0.050
Joint function				
Before intervention	28.16 ± 3.22	28.44 ± 3.46	0.419	0.676
After intervention	34.20 ± 3.46 *	37.14 ± 4.54 *	3.643	< 0.050
Joint activity				
Before intervention	3.00 ± 0.53	3.12 ± 0.52	1.137	0.258
After intervention	3.68 ± 0.47 *	3.98 ± 0.51 *	3.040	< 0.050
Joint abnormality				
Before intervention	2.00 ± 0.20	2.04 ± 0.20	1.000	0.320
After intervention	2.90 ± 0.30*	3.16 ± 0.37*	3.842	< 0.050

Note: * indicates $P < 0.05$ compared to before intervention in the same group

Results

General data

There were no significant differences in gender, age, marital status, and exercise frequency between the two groups, which were comparable ($P > 0.05$) (Table 1).

Hip joint function

Before the intervention, the control group had joint pain, function, activity, and deformity scores of (7.10 ± 1.73), (28.16 ± 3.22), (3.00 ± 0.53), and (2.00 ± 0.20), respectively. The observation group had scores of (7.28 ± 1.39), (28.44 ± 3.46), (3.12 ± 0.52), and (2.04 ± 0.20). After the intervention, the control group's scores for joint pain, function, activity, and deformity were (25.62 ± 4.13), (34.20 ± 3.46), (3.68 ± 0.47), and (2.90 ± 0.30), while the observation group had scores of (32.54 ± 3.64), (37.14 ± 4.54), (3.98 ± 0.51), and (3.16 ± 0.37). Compared to pre-intervention, the hip joint function scores significantly improved in both groups after the intervention, with the observation group scoring higher than the control group (t = 8.885, 3.643, 3.040, 1.000, $p < 0.05$). This indicates that precision nursing based on the DCO model can significantly promote the recovery of hip joint function post-surgery (Table 2).

Psychological states

Before the intervention, the control group had SAS and SDS scores of (55.20 ± 5.07) and (57.30 ± 6.11), respectively, while the observation group had scores of (54.50 ± 5.08) and (56.38 ± 6.13). After the intervention, the control group had SAS and SDS scores of (43.46 ± 4.35) and (44.76 ± 5.59), respectively, while the observation group had scores of (38.66 ± 6.53) and

(40.16 ± 5.55). Compared to pre-intervention, SAS and SDS scores decreased in both groups after the intervention, with the observation group scoring lower than the control group (t = 4.326, 4.127, $p < 0.05$). This indicates that precision nursing based on the DCO model can significantly reduce the psychological burden and alleviate stress in patients ($P < 0.05$) (Table 3).

Sleep quality and daily living ability

Before the intervention, the control group had PSQI and BI scores of (11.16 ± 1.20) and (66.28 ± 2.41), respectively, while the observation group had scores of (11.49 ± 1.06) and (66.06 ± 2.64). After the intervention, the control group had PSQI and BI scores of (9.25 ± 0.84) and (86.24 ± 2.36), respectively, while the observation group had scores of (7.11 ± 0.48) and (89.96 ± 2.36). Compared to pre-intervention, PSQI scores significantly decreased and BI scores significantly increased in both groups after the intervention, with the observation group showing lower PSQI scores and higher BI scores (t = 13.530, 7.873, $p < 0.05$). This indicates that precision nursing based on the DCO model can improve post-operative sleep quality and enhance daily living abilities in patients (Table 3).

Quality of life

After the intervention, the control group had scores of (70.66 ± 5.07), (72.50 ± 6.53), (73.06 ± 5.15), (75.58 ± 7.01), (70.14 ± 5.45), (73.20 ± 6.49), (75.44 ± 6.31), and (77.54 ± 6.79) for role physical, physiological function, general health status, physical pain, social function, energy, mental health and emotional function, respectively. The observation group had scores of (76.46 ± 5.68), (79.22 ± 6.44), (80.68 ± 5.53), (82.40 ± 7.07), (78.14 ± 5.84), (81.54 ± 6.80), (82.66 ± 7.19), and (83.08 ± 6.48), respectively. Compared to pre-intervention, life quality scores significantly increased after the intervention, with the observation group showing higher scores in all quality of life measures compared to the control group (t = 5.386, 5.181, 7.126, 4.846, 7.082, 6.276, 5.336, 4.174, $p < 0.05$). This indicates that precision nursing based on the DCO model can significantly improve post-operative quality of life in patients (Table 4).

Occurrence of complications

The complication rate in the control group was 8% (8/50), while the complication rate in the observation group was 2% (2/50). The percentage of complications in the observation group was lower than in the control group, but statistical analysis showed no significant difference between the two groups (X^2=1.895, $p > 0.05$) (Table 5).

Table 3 Comparison of psychological States, sleep quality, and daily living ability between the two groups

	Control group ($n = 50$)	Observation group ($n = 50$)	t	*p*
SAS				
Before intervention	55.20 ± 5.07	54.50 ± 5.08	0.690	0.492
After intervention	43.46 ± 4.35 *	38.66 ± 6.53 *	4.326	< 0.050
SDS				
Before intervention	57.30 ± 6.11	56.38 ± 6.13	0.752	0.454
After interventions	44.76 ± 5.59 *	40.16 ± 5.55 *	4.127	< 0.050
PSQI				
Before intervention	11.16 ± 1.20	11.49 ± 1.06	1.532	0.129
After intervention	9.25 ± 0.84 *	7.11 ± 0.48 *	13.530	< 0.050
BI				
Before intervention	66.28 ± 2.41	66.06 ± 2.64	0.436	0.664
After intervention	86.24 ± 2.36 *	89.96 ± 2.36 *	7.873	< 0.050

Note: * indicates $P < 005$ compared to before intervention in the same group

Table 4 Comparison of quality of life between the two groups

	Control group ($n = 50$)	Observation group ($n = 50$)	t	*p*
Role physical				
Before intervention	60.52 ± 6.82	62.48 ± 7.59	1.358	0.178
After interventions	70.66 ± 5.07*	76.46 ± 5.68*	5.386	< 0.050
Physiological function				
Before intervention	63.81 ± 6.25	64.82 ± 7.45	0.725	0.470
After interventions	72.50 ± 6.53*	79.22 ± 6.44*	5.181	< 0.050
General health status				
Before intervention	65.74 ± 7.17	66.88 ± 6.99	0.805	0.423
After interventions	73.06 ± 5.15*	80.68 ± 5.53*	7.126	< 0.050
Physical pain				
Before intervention	66.38 ± 6.81	67.56 ± 7.68	0.813	0.418
After interventions	75.58 ± 7.01*	82.40 ± 7.07*	4.846	< 0.050
Social function				
Before intervention	62.88 ± 6.80	63.72 ± 7.07	0.605	0.546
After interventions	70.14 ± 5.45*	78.14 ± 5.84*	7.082	< 0.050
Energy				
Before intervention	64.64 ± 6.73	63.80 ± 6.92	0.616	0.540
After interventions	73.20 ± 6.49*	81.54 ± 6.80*	6.276	< 0.050
Mental health				
Before intervention	67.26 ± 7.51	68.12 ± 7.63	0.512	0.610
After interventions	75.44 ± 6.31*	82.66 ± 7.19*	5.336	< 0.050
Emotional function				
Before intervention	70.22 ± 6.74	71.74 ± 7.98	1.029	0.306
After interventions	77.54 ± 6.79*	83.08 ± 6.48*	4.174	< 0.050

Discussion

Total hip arthroplasty remains one of the most effective surgical options for treating advanced hip osteoarthritis. In addition to this, it is also indicated for conditions such as hip osteonecrosis, congenital hip abnormalities like hip dysplasia, post-traumatic arthritis, and various inflammatory arthritic diseases [19]. With the aging population, nursing homes require specialized

Table 5 Comparison of complications between the two groups

	Control group ($n=50$)	Observation group ($n=50$)	X^2	p
Lower extremity venous thrombosis	1 (2.00)	0(0.00)		
Pressure injury	1 (2.00)	1 (2.00)		
Pressure ulcer	2 (4.00)	0 (0.00)		
Total incidence	4 (8.00)	1 (2.00)	1.895	0.169

multidisciplinary teams. Nurses lead in resident care, education, and teaching, directly impacting care quality [20]. The results of this study not only validate the effectiveness of precision nursing interventions based on the DCO model in a number of clinical indicators, but also reflect the important role of individualized nursing care in improving patients' health and quality of life.

First, in the study, we observed significant improvements in hip function in the participants. This result reflects the potential of precision nursing interventions in the rehabilitation of hip disease or injury. The individualized care plan, combined with the precision assessment and interventions of the DCO model, resulted in improved mobility and joint function. In a comparison of emergency treatment methods, the group that underwent DCO showed a higher rate of successful fracture reduction than the group treated with traditional approaches. This suggests that the DCO emergency treatment model is more effective in promoting proper fracture alignment following surgery [10]. According to Lucchini et al., standardized nursing interventions can enhance the clinical outcomes of total hip arthroplasty [21]. Furthermore, in the study by Yan et al., patients who received precise rehabilitation guided by 3D-CT reconstruction technology experienced significantly greater improvements in muscle strength and hip mobility post-surgery compared to those who followed standard postoperative hip rehabilitation protocols [22]. Under the PDCA cycle management, nursing staff actively monitor patients' conditions and psychological changes, allowing for timely adjustments in care. This approach provides individualized services, improving treatment compliance, enhancing disease recovery, and boosting patient satisfaction and clinical outcomes [23]. Therefore, the results of this study are consistent with the findings in the existing literature and further validate the effectiveness of precision nursing in promoting joint rehabilitation.

Second, it was found that the negative psychological state and sleep quality of the participants were significantly improved after the precision nursing intervention. The integrated intervention of emotional regulation, cognitive support and social support during the nursing process effectively alleviated patients' anxiety and depression and improved sleep quality. In addition, the precision nursing intervention significantly improved the overall quality of life of the patients. This suggests that individualized nursing interventions can not only improve patients' mental health, but also improve their overall quality of life by promoting physical health and enhancing functional ability in various aspects. A similar study has disclosed that six months post-surgery, patients who received DCO for emergency treatment reported higher scores across various health domains, including physiological function, body pain, emotional well-being, social function, vitality, and general health, compared to those treated with traditional methods. This indicates that the DCO approach enhances the overall quality of life for patients [10]. Post-discharge nursing intervention enhances hip joint function, quality of life, and functional independence in patients after total hip arthroplasty [4]. Guo et al. have supported that continuous nursing care is more effective than conventional nursing care in enhancing hip joint recovery, improving quality of life, and reducing anxiety and depression in older patients undergoing total hip arthroplasty [24]. Moreover, evidence-based nursing interventions effectively reduce postoperative complications in hip arthroplasty patients, improve limb function, alleviate neuropsychological symptoms, and significantly enhance quality of life and sleep quality. This care model offers a robust nursing approach for the postoperative management of hip arthroplasty patients [25]. These studies have explored the effects of different nursing approaches on hip arthroplasty patients, indirectly highlighting the significant role of tailored nursing interventions in improving patient outcomes.

Finally, the study data showed that the precision nursing intervention significantly improved the participants' ability to perform activities of daily living. The individualized nursing intervention helped patients better adapt to the challenges of daily life through patient-specific life coaching and rehabilitation training. This result is consistent with findings in other related literature. For instance, Dimitrios Vasileiadis and colleagues conducted a study showing that a six-week preoperative physiotherapy program, led by a physiotherapist, is effective in reducing knee pain, improving knee function, and boosting the ability to perform daily activities before undergoing total knee arthroplasty [26]. This result suggests that precision nursing can enhance patients' self-management and independence by optimizing their quality of life and functional status.

In conclusion, this study suggests that precision nursing interventions based on DCO model are able to improve the physical and psychological health of elderly patients with hip arthroplasty through comprehensive interventions, which in turn improves their quality of life. These results provide strong support for the use of

precision nursing in future nursing practice, especially in improving patients' function, mental health and quality of life, and show good prospects for clinical application. One limitation of this study is that the 3-month follow-up period may not have been sufficient to fully assess the long-term effects of the precision nursing intervention on joint function and quality of life. A longer follow-up duration could provide more comprehensive insights into the lasting impacts of the intervention. For future research, it is recommended to include a justification for the sample size. This study did not provide a calculation of the required sample size to ensure the statistical significance and reliability of the results, which may impact the generalizability and robustness of the findings.

The findings of this study may offer valuable insights for similar patient populations, particularly those with comparable clinical conditions and treatment regimens. However, generalizing these results to other populations or settings should be done with caution. The sample in this study may not fully represent diverse demographic groups or patients with different comorbidities, which could influence the outcomes. Additionally, the specific intervention and follow-up conditions may vary across different healthcare settings, which could affect the applicability of the findings. Future studies should consider broader, more diverse samples and explore the intervention's effectiveness in different healthcare environments to better understand its generalizability.

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Author contributions
J.C. finished the study design. Y.L. and Y.W. the experimental studies. F.G. and D.Y. finished the data analysis. Y.L. finished the manuscript editing. All authors also read and approved the final manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This study was approved by the Ethics Committee of Gansu Provincial Traditional Chinese Medicine Hospital. Written informed consent was attained from. Informed consent was obtained from all individual participants included in the study.

Consent for publication
The participant has consented to the submission of the case report to the journal.

Competing interests
The authors declare no competing interests.

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